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1.1 apache-log4j 1.2.15

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"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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d) If a facility in the modified Library refers to a function or a
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in the event an application does not supply such function or
table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6.

Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

 You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

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  b) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

  c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

  d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on

which the executable runs, unless that component itself accompanies
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  It may happen that this requirement contradicts the license
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the Library and of the other library facilities is otherwise
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    facilities. This must be distributed under the terms of the
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That's all there is to it!

1.3 grub2 2

1.3.1 Available under license :

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Some devices are designed to deny users access to install or run
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protecting users' freedom to change the software. The systematic
pattern of such abuse occurs in the area of products for individuals to
use, which is precisely where it is most unacceptable. Therefore, we
have designed this version of the GPL to prohibit the practice for those

products. If such problems arise substantially in other domains, we stand ready to extend this provision to those domains in future versions of the GPL, as needed to protect the freedom of users.

Finally, every program is threatened constantly by software patents. States should not allow patents to restrict development and use of software on general-purpose computers, but in those that do, we wish to avoid the special danger that patents applied to a free program could make it effectively proprietary. To prevent this, the GPL assures that patents cannot be used to render the program non-free.

The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS

0. Definitions.

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"Copyright" also means copyright-like laws that apply to other kinds of works, such as semiconductor masks.

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To "modify" a work means to copy from or adapt all or part of the work in a fashion requiring copyright permission, other than the making of an exact copy. The resulting work is called a "modified version" of the earlier work or a work "based on" the earlier work.

A "covered work" means either the unmodified Program or a work based on the Program.

To "propagate" a work means to do anything with it that, without permission, would make you directly or secondarily liable for infringement under applicable copyright law, except executing it on a computer or modifying a private copy. Propagation includes copying, distribution (with or without modification), making available to the public, and in some countries other activities as well.

To "convey" a work means any kind of propagation that enables other parties to make or receive copies. Mere interaction with a user through a computer network, with no transfer of a copy, is not conveying.

An interactive user interface displays "Appropriate Legal Notices" to the extent that it includes a convenient and prominently visible

feature that (1) displays an appropriate copyright notice, and (2)
tells the user that there is no warranty for the work (except to the
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the interface presents a list of user commands or options, such as a
menu, a prominent item in the list meets this criterion.

 1. Source Code.

 The "source code" for a work means the preferred form of the work
for making modifications to it. "Object code" means any non-source
form of a work.

 A "Standard Interface" means an interface that either is an official
standard defined by a recognized standards body, or, in the case of
interfaces specified for a particular programming language, one that
is widely used among developers working in that language.

 The "System Libraries" of an executable work include anything, other
than the work as a whole, that (a) is included in the normal form of
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Component, and (b) serves only to enable use of the work with that
Major Component, or to implement a Standard Interface for which an
implementation is available to the public in source code form. A
"Major Component", in this context, means a major essential component
(kernel, window system, and so on) of the specific operating system
(if any) on which the executable work runs, or a compiler used to
produce the work, or an object code interpreter used to run it.

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the source code needed to generate, install, and (for an executable
work) run the object code and to modify the work, including scripts to
control those activities. However, it does not include the work's
System Libraries, or general-purpose tools or generally available free
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which are not part of the work. For example, Corresponding Source
includes interface definition files associated with source files for
the work, and the source code for shared libraries and dynamically
linked subprograms that the work is specifically designed to require,
such as by intimate data communication or control flow between those
subprograms and other parts of the work.

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You may convey a work based on the Program, or the modifications to
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it, and giving a relevant date.

b) The work must carry prominent notices stating that it is
released under this License and any conditions added under section
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"keep intact all notices".

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a) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by the Corresponding Source fixed on a durable physical medium customarily used for software interchange.

b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.

c) Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.

d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

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actually uses, or expects or is expected to use, the product. A product
is a consumer product regardless of whether the product has substantial
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the only significant mode of use of the product.

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and execute modified versions of a covered work in that User Product from
a modified version of its Corresponding Source. The information must
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code is in no case prevented or interfered with solely because
modification has been made.

If you convey an object code work under this section in, or with, or
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by the Installation Information. But this requirement does not apply
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the User Product in which it has been modified or installed. Access to a
network may be denied when the modification itself materially and
adversely affects the operation of the network or violates the rules and
protocols for communication across the network.

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that part of it is a work based on the Library, and explaining
where to find the accompanying uncombined form of the same work.
@end enumerate

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@subheading END OF TERMS AND CONDITIONS

@page
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@end smallexample

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your
school, if any, to sign a ``copyright disclaimer'' for the library, if
necessary. Here is a sample; alter the names:

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Yoyodyne, Inc., hereby disclaims all copyright interest in the library
`Frob' (a library for tweaking knobs) written by James Random Hacker.

@var{signature of Ty Coon}, 1 April 1990
Ty Coon, President of Vice
@end smallexample

That's all there is to it!

Description:
Concatenate two arbitrary file names.

Files:
lib/filenamecat.h
lib/filenamecat-lgpl.c
m4/filenamecat.m4

Depends-on:
dirname-lgpl

configure.ac:
gl_FILE_NAME_CONCAT_LGPL

Makefile.am:
lib_SOURCES += filenamecat-lgpl.c

Include:
"filenamecat.h"

License:
LGPLv2+

Maintainer:
Jim Meyering
Please email the following information to assign@gnu.org, and we
will send you the assignment form for your past and future changes.

Please use your full legal name (in ASCII characters) as the subject
line of the message.

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[For the copyright registration, what country are you a citizen of?]

[What year were you born?]

[Please write your email address here.]

[Please write your postal address here.]

[Which files have you changed so far, and which new files have you written
so far?]
Description:
Provide the GNU Free Documentation License in Texinfo format.

Files:
doc/fdl.texi

Depends-on:

configure.ac:

Makefile.am:

Include:

License:
unmodifiable license text

Maintainer:
all
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Description:
Ensure getcwd(NULL, 0) returns a buffer allocated by the malloc() function.

Files:
lib/getcwd-lgpl.c
m4/getcwd.m4

Depends-on:
unistd
strdup   [test $REPLACE_GETCWD = 1]

configure.ac:
gl_FUNC_GETCWD_LGPL
if test $REPLACE_GETCWD = 1; then
 AC_LIBOBJ([getcwd-lgpl])
fi
gl_UNISTD_MODULE_INDICATOR([getcwd])

Makefile.am:

Include:
<unistd.h>

License:
LGPLv2+

Maintainer:
Eric Blake
Legal Issues about Contributing Code to GNU last updated 14 July 2015

Project GNU has to be careful to obey copyright laws, even though
these laws are wrong when they stop people from sharing generally
useful published information such as software, because we are in the
public eye. We also use copyright to defend users' freedom, by means
of copyleft (though this does not excuse copyright law for helping
to make software proprietary).

This means that if you want to contribute software to GNU, you have to do something to give us legal permission to use it. There are three ways this can be done:

* Assign the copyright to the Free Software Foundation.
This allows the FSF to act to stop violations of the GPL.

* Keep the copyright and release the program yourself under the GNU GPL. (This alternative is too impractical for contributions to a preexisting FSF-copyrighted GNU program.)

* Put the code in the public domain. Then there is nothing to stop hoarding of modified versions, but we can still use the program in GNU.

Most of these alternatives require a signed piece of paper, or in some cases a digital signature, to make it happen.

* Assigning copyright.

Assigning the copyright means signing a contract that makes the Free Software Foundation the "owner" of the program according to the law. As the copyright holder, the Foundation can sue anyone who tries to distribute the program as a proprietary product. We are willing to keep your name on the program as the author for as long as the program remains recognizably distinct. ("Owner" is in quotes to show that we don't really believe in this kind of ownership.)

The assignment contract commits the foundation to setting distribution terms that permit free redistribution.

Often we don't want to do the work of starting to distribute a program right away. There are many things which we will need in order to have a complete system but which aren't really useful until the rest of the system is done. But signing the assignment does not stop you from distributing the program yourself--as long as you do so under the GNU terms. You don't have to wait for us to start distributing. You can start distributing as soon as you attach our standard copyleft to the files. (Ask for our advice on how to do this.)

The assignment contract we normally use has a clause that permits you to use your code in proprietary programs, on 30 days' notice. (The 30 days' notice is there because, through a legal technicality, it would improve our position in a suit against a hoarder.) Although we believe that proprietary software is wrong, we include this clause because it would serve no purpose to ask you to promise not to do it. You're giving us a gift in the first place.

You don't need to invoke this clause in order to distribute copies as

free software under the GNU GPL, since everyone is allowed to do that.

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You can release a program yourself under copyleft distribution terms
such as the GNU GPL. (In order to accept the program as GNU software,
we would have to be happy with your choice of terms.) This does not
require a contract between you and the FSF, but we would appreciate
having a signed piece of paper to confirm your decision.

If someone violates your terms--for example, if someone gets a copy
from us, and uses it as a basis for a proprietary product in violation
of the terms--we cannot sue him. You would have to sue, or he gets
away with it.

* Public domain.

If you put the program in the public domain, we prefer to have a signed
piece of paper--a disclaimer of rights--from you confirming this. If the
program is not very important, we can do without one; the worst that could
happen is that we might some day be forced to stop using it.

The law says that anyone can copyright a modified version of the public
domain work. (This doesn't restrict the original, which remains in the
public domain; only the changes are copyrighted.) If we make extensive
changes, we will probably do this and add our usual copyleft. If we make
small changes, we will leave the version we distribute in the public
domain.

* What about your employer?

If you are employed to do programming, or have made an agreement with your
employer that says it owns programs you write, we need a signed piece of
paper from your employer disclaiming rights to the program. It should be
signed by a vice president or general manager of the company. If you
can't get at them, it is almost as good to find someone who signs licenses
for software that is purchased. Here is a sample wording:

 Digital Simulation Corporation hereby disclaims all copyright interest
 in the program "sample.el" (a program to direct assemblers to make passes
 at compilers under GNU Emacs) written by Hugh Hacker.

 <signature of Mo Ghoul>, 1 April 1987
 Mo Ghoul, President of Vice, Digital Simulation Corp.

The description of what the program does is just to make it clearer
what the disclaimer covers.

If what you did was change an existing program, it should say this:

  ...in the changes and enhancements made by Hugh Hacker to the
  program "sample.el".

* Did anyone else contribute?

If someone else contributed more than a few lines here or there to the
program, then that person too is an author, and that person too needs to
sign papers just as you do. So may that person's employer. However, if
his contribution is just a fraction of the whole work, it is satisfactory
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the minor contributors' work goes in the public domain, that doesn't leave
much of a loophole for hoarders.)

If you incorporated packages which you found floating around as "public
domain", we might still want to track down their authors, to get
disclaimers to reassure us that they really are in the public domain. So
keep track of what these packages are and who wrote them.

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In working on a project for GNU, DO NOT study and follow any Unix
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non-GNU reasons.

It is not considered a serious problem if you have read Unix sources
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to them while you do the work could cause us legal problems later.
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Please email the following information to assign@gnu.org, and we will
send you the assignment form that covers the changes you have already
written. That form will cover subsequent corrections to those
changes, but it will not cover other unrelated future changes to the
same program.

Please use your full legal name (in ASCII characters) as the subject line of the message.

REQUEST: SEND FORM FOR CHANGES ALREADY MADE

[What is the name of the program or package you're contributing to?]

[Did you copy any files or text written by someone else in these changes?
Even if that material is free software, we need to know about it.]

[Do you have an employer who might have a basis to claim to own
your changes? Do you attend a school which might make such a claim?]

[For the copyright registration, what country are you a citizen of?]

[What year were you born?]

[Please write your email address here.]

[Please write your postal address here.]

[Which files have you changed so far, and which new files have you written
so far?]
Please email the following information to assign@gnu.org, and we will
send you the disclaimer form for your changes. This form is preferred
when your changes are small, they do not add any nontrivial new
files, and you are finished making them (aside perhaps from small bug
fixes).

If you would like to make further contributions to the same package,
and you would like to avoid the need to sign more papers when you
contribute them, you have another option: to sign a copyright
assignment covering your future changes. If that is what you want to
do, please tell the maintainer you would prefer to sign an assignment
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Please use your full legal name (in ASCII characters) as the subject
line of the message.

REQUEST: SEND DISCLAIMER FORM

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[Did you copy any files or text written by someone else in these changes?
Even if that material is free software, we need to know about it.]

[Do you have an employer who might have a basis to claim to own
your changes?]

[Please write your email address here.]

[Please write your snail address here.]

[Please list the files involved, or give a brief description of the changes
being disclaimed.]
Description:
realpath, canonicalize_file_name: Provide canonical absolute file name

Files:
lib/canonicalize-lgpl.c
m4/canonicalize.m4
m4/double-slash-root.m4

Depends-on:
extensions
stdlib
nocrash
alloca-opt   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
errno   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
lstat   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test $REPLACE_CANONICALIZE_FILE_NAME
= 1]
malloca   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
memmove   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
pathmax   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
readlink   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]

sys_stat   [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]

configure.ac:
gl_CANONICALIZE_LGPL
if test $HAVE_CANONICALIZE_FILE_NAME = 0 || test $REPLACE_CANONICALIZE_FILE_NAME = 1; then
 AC_LIBOBJ([canonicalize-lgpl])
fi
gl_MODULE_INDICATOR([canonicalize-lgpl])
gl_STDLIB_MODULE_INDICATOR([canonicalize_file_name])
gl_STDLIB_MODULE_INDICATOR([realpath])

Makefile.am:

Include:
<stdlib.h>

License:
LGPLv2+

Maintainer:
all
Description:
Extract specific portions of filenames.

Files:
lib/dirname.h
lib/dirname-lgpl.c
lib/basename-lgpl.c
lib/stripslash.c
m4/dirname.m4

Depends-on:
dosname
double-slash-root
malloc-posix
stdbool

configure.ac:
gl_DIRNAME_LGPL

Makefile.am:
lib_SOURCES += dirname-lgpl.c basename-lgpl.c stripslash.c

Include:
"dirname.h"

License:

LGPLv2+

Maintainer:
Jim Meyering, Eric Blake
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                        Version 3, 29 June 2007

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  Corresponding Source.

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Files:
tests/test-update-copyright.sh

Depends-on:

configure.ac:
abs_aux_dir=`cd "$ac_aux_dir"; pwd`
AC_SUBST([abs_aux_dir])

Makefile.am:
TESTS += test-update-copyright.sh
TESTS_ENVIRONMENT += abs_aux_dir='$(abs_aux_dir)'
Files:
tests/test-canonicalize-lgpl.c
tests/signature.h
tests/null-ptr.h
tests/macros.h

Depends-on:
ignore-value
same-inode
symlink

configure.ac:

Makefile.am:
TESTS += test-canonicalize-lgpl
check_PROGRAMS += test-canonicalize-lgpl
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@center Version 2, June 1991

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@page
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possible use to the public, the best way to achieve this is to make it
free software which everyone can redistribute and change under these terms.

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convey the exclusion of warranty; and each file should have at least
the ``copyright'' line and a pointer to where the full notice is found.

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@end smallexample

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If the program is interactive, make it output a short notice like this
when it starts in an interactive mode:

@smallexample
Gnomovision version 69, Copyright (C) @var{year} @var{name of author}
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.
@end smallexample

The hypothetical commands @samp{show w} and @samp{show c} should show
the appropriate parts of the General Public License. Of course, the
commands you use may be called something other than @samp{show w} and
@samp{show c}; they could even be mouse-clicks or menu items---whatever
suits your program.

You should also get your employer (if you work as a programmer) or your
school, if any, to sign a ``copyright disclaimer'' for the program, if
necessary. Here is a sample; alter the names:

@example
Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.

@var{signature of Ty Coon}, 1 April 1989
Ty Coon, President of Vice
@end example

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consider it more useful to permit linking proprietary applications with the
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$Id: COPYING,v 1.3 2006-10-26 16:20:28 eggert Exp $
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option. The headers of files in the lib directory (e.g., lib/error.c)
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GPL'd programs. But the files in the modules directory (e.g.,
modules/error) state the true license of each file, and when you use
'gnulib-tool --lgpl --import <modules>', gnulib-tool either rewrites
the files to have an LGPL header as part of copying them from gnulib
to your project directory, or fails because the modules you requested
were not licensed under LGPL.

Some of the source files in lib/ have different licenses. Also, the
copy of maintain.texi in doc/ has a verbatim-copying license, and
doc/standards.texi and make-stds.texi are GFDL. Most (but not all)
m4/*.m4 files have nearly unlimited licenses.
Description:
Help make libraries relocatable, that is, to allow them to function
properly when copied to an arbitrary directory.

Files:
doc/relocatable.texi
lib/relocatable.h
lib/relocatable.c
lib/relocatable.valgrind
m4/relocatable-lib.m4

Depends-on:
strdup

configure.ac:
gl_RELOCATABLE_LIBRARY
if test $RELOCATABLE = yes; then
 AC_LIBOBJ([relocatable])
fi

Makefile.am:
DEFS += -DNO_XMALLOC

Include:
"relocatable.h"

License:
LGPLv2+

Maintainer:
Ben Pfaff
Description:
Locating a program in PATH (LGPLed version).

Files:
lib/findprog.h
lib/findprog.c
lib/findprog-lgpl.c
m4/findprog.m4
m4/eaccess.m4

Depends-on:
stdbool
strdup
concat-filename
unistd

configure.ac:
gl_FINDPROG
gl_MODULE_INDICATOR([findprog-lgpl])

Makefile.am:
lib_SOURCES += findprog.h findprog.c

Include:
"findprog.h"

License:
LGPLv2+

Maintainer:
all

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Version 2, June 1991

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Files:
tests/test-getcwd-lgpl.c
tests/signature.h
tests/macros.h

Depends-on:

configure.ac:

Makefile.am:
TESTS += test-getcwd-lgpl
check_PROGRAMS += test-getcwd-lgpl
test_getcwd_lgpl_LDADD = $(LDADD) $(LIBINTL)

1.4 cpio 2.8

1.4.1 Available under license :

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1.5 iputils 20101006

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special exception, the source code distributed need not include
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1.7 libtasn 1.2

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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Section 6 states terms for distribution of such executables.

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threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline

functions (ten lines or less in length), then the use of the object
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Version 3, 29 June 2007

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</div>

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(kernel, window system, and so on) of the specific operating system

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1.8 lsof 4.83

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(Version 8.6, last updated 6/24/1998)

* End endmail LICENSE file.
*/

Found in path(s):
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/lib/snpf.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/lib/snpf.c
No license file was found, but licenses were detected in source scan.

Frequently Asked Questions about lsof

```
******************************************************************
| The latest release of lsof is always available via anonymous ftp   |
| from lsof.itap.purdue.edu.  Look in pub/lsof.README for its       |
| location.                                    |
******************************************************************
```

_____

This file contains frequently asked questions about lsof and answers
to them.

Vic Abell <abe@purdue.edu>
January 18, 2010

_____

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1.0 General Concepts

1.1 Lsof -- what is it?

Lsof is a UNIX-specific tool. Its name stands for LiSt
Open Files, and it does just that. It lists information
about files that are open by the processes running on a
UNIX system.

See the lsof man page, the 00DIST file, the 00QUICKSTART
file, and the 00README file of the lsof distribution for
more information.

1.2 Where do I get lsof?

Lsof is available via anonymous ftp from lsof.itap.purdue.edu.
Look in the pub/tools/unix/lsof sub-directory.

   ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof

Bzip2'd, compressed and gzip'd tar files with GPG certificates
are available.

1.2.1 Are there mirror sites?

On April 28, 2009 these sites appeared to have the lastest
lsof revision:

ftp://ftp.fu-berlin.de/pub/unix/tools/lsof
ftp://sunsite.ualberta.ca/pub/Mirror/lsof

1.2.2 Are lsof executables available?

Some lsof executables are available in the subdirectory
tree pub/tools/unix/lsof/binaries These are neither guaranteed
to be current nor cover every dialect and machine architecture.

I don't recommend you use pre-compiled lsof binaries; I
recommend you obtain the sources and build your own binary.
Even if you're a Sun user without a Sun C compiler, you
can use gcc to compile lsof.

If you must use a binary file, please be conscious of the
security and configuration implications in using an executable
of unknown or different origin. The lsof binaries are
accompanied by GPG certificates. Please use them!

Three additional cautions apply to executables:

1. Don't try to use an lsof executable, compiled for one
   version of a UNIX dialect, on another. Patches can
   make the dialect version different.

2. If you want to use an lsof binary on multiple systems,
   they must be running the same dialect OS version and
   have the same patches and feature support.

1.2.3 How do I check the validity of an lsof distribution?

There are two ways to check the validity of an lsof
distribution:

1. Follow the instructions in the CHECKSUMS_<revision>
   file found with the lsof distribution.

   Checking with GPG is the best method.

2. Follow the instructions in the "Security" section of the
   README.lsof_<revision> file found inside the lsof
   distribution.

   Again, checking with GPG is the best method.

1.2.4 Why can't I get the sum(1) result reported in
README.lsof_<revision>?

The "Security" section of the README.lsof_<revision> file found
inside the lsof distribution gives md5, sum, and GPG certificate
information.

The simplest, the sum(1) signature, seems to be the trickiest.
That's because there are different sum(1) methods, BSD systems
usually have cksum(1) instead of sum(1), and different systems
compute the block size value differently.

First, the lsof sum results are computed with the old,
"alternate" algorithm. On newer systems, you can use sum's
"-r" option to get that computation result.

Second, on BSD systems you usually must use cksum(1) instead
of sum(1), because they have no sum(1). To tell cksum(1)
to use the old, "alternate" algorithm, use its "-o1" option.

Third, the second value that sum reports, the block count, may
be computed differently on different systems -- usually block
size is considered to be 512 or 1,024. The lsof block counts

were computed on a system with a sum(1) option that considers
block size to be 512. The BSD system cksum(1) -o1 option
considers block size to be 1,024. If your sum(1) or cksum(1)
doesn't report a block count that matches the sum(1) signature
given in README.lsof_<revision>, check its man page to see what
block size it uses, then adjust its reported block count
appropriately.

1.2.5 Why won't gpg accept the lsof-signing PGP public key?

An older PGP key that once signed lsof distributions is
included in lsof revisions prior to 4.70. The PGP key is
indeed my key, but is incompatible with GPG. It was created
about ten years ago and is still acceptable to PGP versions
2.6.2 through 6.5.2.

Lsof revisions 4.70 and above are signed with a copy of my PGP
key that has been made acceptable for use with GPG by importing
it under GPG's "--allow-non-selfsigned-uid" option.

You can find my GPG compatible key in lsof revisions 4.70 and
above and at:

    ftp://lsof.itap.purdue.edu/pub/Victor_A_Abell.gpg

If you have an older lsof revision with my PGP key, there are
two possible ways to use it:

* Use it with a PGP version from 2.6.2 through 6.5.2.

* Use GPG's "--allow-non-selfsigned-uid" option when you
  import my PGP key into your GPG key ring.

  $ gpg --allow-non-selfsigned-uid --import Victor_A_Abell.pgp

1.3 Where can I get more lsof documentation?

A significant set of documentation may be found in the lsof
distribution (See "Where can I get lsof?). There is a
manual page, copious documentation in files whose names
begin with 00, and a copy of this FAQ in the file 00FAQ
(perhaps slightly less recent than this file if you're
reading it via a web browser.)

Two URLs provide some documentation that appears in the
lsof distribution:

FAQ: ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ

man page: ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof_man

1.4 How do I report an lsof bug?

If you believe you have discovered a bug in lsof, you can
report it via e-mail to <abe@purdue.edu>. Do NOT report lsof
bugs to the UNIX dialect vendor. Make sure "lsof" appears in
the "Subject:" line so my e-mail filter won't classify your
letter as Spam.

Before you send me a bug report, please read the "Bug Reports"
section of the 00README file of the lsof distribution. It
lists the steps you should take before and when reporting a
suspected bug.

1.5 Where can I get the lsof FAQ?

This lsof FAQ is available in the file 00FAQ in the lsof
distribution and at the URL:

    ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ

1.5.1 How timely is the on-line FAQ?

The on-line FAQ is sometimes too timely. :-)

I update it as soon as new information is available.   That may
include information about support that won't appear in the lsof
source distribution until the next revision. If you encounter
something like that, please send me e-mail at <abe@purdue.edu>. I
may be able to point you at a pre-release distribution that contains
the support of interest. Make sure "lsof" appears in the "Subject:"
line so my e-mail filter won't classify your letter as Spam.

1.6 Is there a test suite?

Yes, as of lsof revision 4.63 there's an automated lsof
test suite in the tests/ sub-directory of the lsof top-level
directory.

More information on using the test suite, what it does,
how to use it and how to configure it may be found in the
00TEST file of the lsof distribution. That file also
explains where the test suite has been tested.

Frequently asked questions about the test suite will be
asked and answered here in the FAQ. (See "Test Suite

Problems.")

After lsof has been configured with the Configure script,
lsof can be made and tested with:

```
$ make
$ cd tests
$ make
```

Under normal conditions -- i.e., unless the lsof tree has
been cleaned or purged severely -- all tests or individual
tests may be run by:

```
$ cd test
$ make
or
$ <run a single test> (See 00TEST.)
```

1.7 Is lsof vulnerable to the standard I/O descriptor attack?

Lsof revisions 4.63 and above are not vulnerable.

Lsof revisions 4.62 and below are vulnerable, but no damage
scenarios have so far been demonstrated.

The standard I/O descriptor attack is a local programmed
assault on setuid and setgid programs that tricks them into
opening a sensitive file with write access on a standard
descriptor, usually stderr (2), and writing error messages
to stderr. If the attacker can control the content of the
error message, the attacker may gain elevated privileges.

The attack was first described in Pine Internet Advisory
PINE-CERT-20020401, available at:

    http://www.pine.nl/advisories/pine-cert-20020401.txt

If you are using an lsof revision below 4.63, you should
remove any setuid or setgid permissions you might have
given its executable. Then you should upgrade to lsof
revision 4.63.

1.8 Can I alter lsof's make(1) behavior?

Yes. There are at least two ways to do that.

You can put replacements for lsof Makefile strings in your
environment. If you specify the -e make option, make will

give environment variable values precedence over strings
from the Makefile. For example, to change the compiler
string CC from the environment, you might do this with the
Bourne shell:

```
$ CC=foobar; export CC
$ make -e
```

You can also replace lsof Makefile strings in the make
command invocation. Here's the previous example done that
way:

```
$ make CC=foobar
```

Changing the CFGF, CFGL, and DEBUG strings used in lsof
Makefiles, either from the environment or from the make
invocation, can significantly alter lsof make(1) behavior.
I commonly use DEBUG to change the -O option to -g so I
can build an lsof executable for debugging -- e.g.,

```
$ make DEBUG=-g
```

(Look for DEBUG in this FAQ for other examples of its use.)

Consult the Makefiles to see what CFGL, CFGL, and other
lsof Makefile strings contain, and to see what influence
their alteration might have on lsof make(1) behavior.

1.9 Is there an lsof license?

No.

The only restriction on the use or redistribution of lsof
is contained in this copyright statement, found in every
lsof source file. (The copyright year in or format of the
notice may vary slightly.)

```
/*
 * Copyright 2002 Purdue Research Foundation, West Lafayette,
 * Indiana 47907.  All rights reserved.
 *
 * Written by Victor A. Abell
 *
 * This software is not subject to any license of the American
 * Telephone and Telegraph Company or the Regents of the
 * University of California.
 *
 * Permission is granted to anyone to use this software for
```

1.10 Language locale support

1.10.1 Does lsof support language locales? How do I use the support?

Most UNIX dialect versions of lsof support 8 bit language
locale characters -- e.g., the ability to print 8 bit
characters that have accents and other marks over them.

See the answer to the "Does lsof support wide characters in
language locales?" question for information on when lsof's
language locale support covers characters wider than 8 bits.

To see if lsof supports language locales for your dialect, look
in the dialect's machine.h header file for the HASSETLOCALE
definition. If it is present and not disabled, then lsof has
language locale support for the dialect.

To enable lsof's language locale support, you must specify in a
locale environment variable (e.g., LANG) a language locale
known to your system that supports the printing of marked
characters -- e.g, en_US. (On some dialects locale(1) may be
used to list the known language locales.)

Note that LANG=C and LANG=POSIX are NOT language locales that
support the printing of marked characters.

If the language locale doesn't support the printing of marked
characters, lsof's OUTPUT of them follows the rules for
non-printable characters described in the OUTPUT section of
lsof(8).

Consult your dialect's setlocale(3) man page for the names of
environment variables other than LANG -- e.g., LC_ALL,
LC_TYPE, etc. -- which may be used to define language locales.

1.10.2 Does lsof support wide characters in language locales?

When lsof's language locale support is enabled with the
HASSETLOCALE definition, for selected dialects lsof will also
print wide characters (e.g., from UTF-8) when iswprint(3)
reports them to be printable.

Wide character support is available when HASWIDECHAR is defined
in a dialect's machine.h header file. As of this writing on
July 22, 2004, the following dialect versions have wide character
support:

    AIX >= 4.3.2
    Apple Darwin >= 7.3.0
    FreeBSD >= 5.2
    HP-UX >= 11.00
    /proc-based Linux
    NetBSD >= 1.6
    SCO OpenServer >= 5.0.6
    Solaris >= 2.6
    Tru64 UNIX 5.1

1.11 Are any files in the lsof distribution copyrighted?

Yes. Most files carry the copyright of the Purdue Research
Foundation and may be redistributed under the terms that
accompany the copyright notice. Those terms may also be found
in the answer to the question, "Is there an lsof license?")

A few files carry other copyright notices. Some are BSD
notices and they explain the terms under which they are
included in the lsof distribution.

Those that carry vendor copyright notices have been reproduced
in their original or modified forms with permission from the
copyright owners. That permission is indicated in the README
files that accompany the files.

1.12 Are there other lsof-related resources?

There are other resources available, connected to lsof. Among
them are FreeBSD and Linux packages whose products use lsof and
two particularly interesting resources.

The two interesting resources are a Gnome Tool Kit (GTK) GUI
for lsof and a Perl wrapper module.

The GTK GUI is called Glsof and was developed by Gnele. It can
be found at:

   http://www.sourceforge.net

The Perl wrapper module by Marc Beyer can be found at:

   http://search.cpan.org/dist/Unix-Lsof/

1.13 What does the "WARNING: unsupported dialect or version" mean?

The lsof configure script issues that message for UNIX dialects
or their versions where I have been unable to test the current
revision of lsof. The message doesn't mean that lsof won't
work, just that I have no direct evidence that it will.

If the COnfigure script succeeds, except for the warning, try
compiling) lsof. If that succeeds, try the lsof test suite.

2.0 Lsof Ports

2.1 What ports exist?

The pub/lsof.README file carries the latest port information:

   AIX 5.[23] and 5.3
   FreeBSD 4.9 for x86-based systems
   FreeBSD 7.[012] and 8.0 for AMD64-based systems
   Linux 2.1.72 and above for x86-based systems
   Solaris 9, 10 and 11

In the above list the only UNIX dialects present are ones for
which I test the current lsof revision. Lsof may still support
unlisted dialect versions -- e.g., HP-UX 10.20, Solaris 7, etc.
-- but I don't have access to systems where I could test lsof
on them, so I can't claim lsof works on them. If your dialect
isn't in the list, you should try building lsof on it anyway.

Lsof version 4 predecessors, versions 2 and 3, may support older
version of some dialects. Contact me via e-mail at <abe@purdue.edu>
if you're interested in their distributions. Make sure "lsof"
appears in the "Subject:" line so my e-mail filter won't classify
your letter as Spam.

2.2 What about a new port?

The 00PORTING file in the distribution gives hints on doing
a port. I will consider doing a port in exchange for
permanent access to a test host. I require permanent access
so I can test new lsof revisions, because I will not offer
distributions of dialect ports I cannot upgrade and test.

2.2.1 User-contributed Ports

Sometimes I receive contributions of ports of lsof to
systems where I can't test future revisions of lsof. Hence,
I don't incorporate these contributions into my lsof
distribution.

However, I do make descriptions of these contributions
available. You can find them in the 00INDEX and README
files at:

   ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/contrib

Consult the 00INDEX file in the contrib/ directory for a
list of the available contributions and consult README
there for information on how to obtain them.

2.3 Why isn't there an AT&T SVR4 port?

I haven't produced an AT&T SVR4 port because I haven't seen
a UNIX dialect that is strictly limited to the AT&T System
V, Release 4 source code. Every one I have seen is a
derivative with vendor additions.

The vendor additions are significant to lsof because they
affect the internal kernel structures with which lsof does
business. While some vendor derivatives of SVR4 are similar,
each one I have encounted so far has been different enough
from its siblings to require special source code.

If you're interested in an SVR4 version of lsof, here are
some existing ports you might consider:

   DC/OSx (This obsolete port is only available upon
    special request.)
   Reliant UNIX (This obsolete port is only available
   upon special request.)
   SCO|Caldera UnixWare (This is the most likely choice.)
   Solaris

2.4 Why isn't there an SGI IRIX port?

Lsof support for IRIX was terminated at lsof revision 4.36,
because it had become increasingly difficult for me to
obtain information on the IRIX kernel structures lsof needs
to access.

At IRIX 6.5 I decided the obstacles were too large for me
to overcome, and I stopped supporting lsof on IRIX. I have
sources to the last revision of lsof (4.36) for IRIX, but
that version of lsof does not work on IRIX 6.5 and is
vulnerable to the standard I/O descriptor attack. (See
the "Is lsof vulnerable to the standard I/O descriptor
attack?" Q&A for more information.) Contact me to discuss
obtaining those sources.

If you wish to pursue the issue, don't contact me, contact
SGI. This case was opened with SGI on the subject:

    Case ID: 0982584
    Category: Unix
    Priority: 30-Moderate Impact

    Problem Summary:
    kernel structure header files needed for continued lsof
    support

    Problem Description:
    Email In 07/17/98 19:09:23

2.5 Why does lsof's Configure script report "WARNING: unsupported
dialect or version"?

Lsof's Configure script issues this message when it encounters
a dialect or its version that lsof once supported, but no
longer does. Usually I drop support for a dialect or version
when I can no longer test lsof on it.

However, it's worth trying to compile and use lsof. Be sure to
run the test suite. (See the answer to the "Is there a test
suite? question for information on the test suite.)

If you have problems with an unsupported dialect or version,
contact me via e-mail at <abe@purdue.edu> and I may be able to help.
Make sure "lsof" appears in the "Subject:" line so my e-mail filter
won't classify your letter as Spam.

3.0 Lsof Problems

3.1 Configuration Problems

3.1.1 Why can't Configure determine the UNIX dialect version?

The lsof Configure script uses UNIX shell commands, often in a command pipeline, to determine the UNIX dialect version. (Consult the dialect stanza in Configure to determine which commands are used.) If Configure can't determine the dialect version, probably one of the commands is not behaving as Configure expects.

Symptoms of the failure include Configure warning messages and incorrect version definitions in the Makefile CFLAGS.

If you suspect that the lsof Configure script is failing to determine the dialect version correctly, try running the commands from Configure stanza one at a time. That will usually reveal the source of the problem. Be particularly mindful that the PATH environment variable can cause commands to be executed from non-standard directories.

If you can't determine the source of the problem, there is a work-around. You can supply the UNIX dialect version in the LSOF_VSTR environment variable. Use Configure as a guide to forming what it expects in LSOF_VSTR. There is also some information on LSOF_VSTR in the 00XCONFIG documentation file of the lsof distribution.

3.2 Compilation Problems

3.2.1 Why does the compiler complain about missing header files?

When you use make to build lsof, the compiler may complain that it can't find header files -- e.g.,

```
$ make
(cd lib; make DEBUG="-O" CFGF="-DAIXA=0 -DAIXV=4330 \
-DLSOF_VSTR=\"4.3.3.0\"")
gcc  -DAIXA=0 -DAIXV=4330 -DLSOF_VSTR="4.3.3.0" -O \
-c ckkv.c
In file included from ckkv.c:33: ../machine.h:70: \
sys/types.h: A file or directory in the path name \
does not exist. \
```

That type of complaint doesn't represent an lsof problem. It represents a problem with a missing system header file

that probably should be found in /usr/include or in the
system source tree.

As a first step try using find(1) to locate the problem
header file. If it's a system header file and can't be
found, here are some possible causes:

1. The file set, RPM or package containing the header files
   has not been installed. Instructions for doing that
   are specific to the UNIX dialect and beyond the scope
   of this document.

2. If the compiler is gcc, the private gcc header files:

   * May not have been installed;

   * May have been installed incorrectly;

   * May not have been updated properly after the last
     compiler or system update;

   * Ones from a previous installation may not have been
     removed.

   A path leading to the gcc private header files can be
   found with `gcc -v`. Consult the gcc documentation for
   instructions on proper installation of the private gcc
   header files.

3. On some dialects -- e.g., FreeBSD, NetBSD, OpenBSD --
   lsof may need to use header files that are located in
   the system source tree -- /sys or /usr/src/sys, for
   example. Make sure the system source tree has been
   installed.

3.2.2   Why does gcc complain about the contents of header files
distributed by the system's vendor?

When you use make to build lsof and gcc to compile it, gcc
may complain that it finds errors in system header files
-- e.g.,

    $ make
    (cd lib; make DEBUG="-O" CFGF="-Dsolaris=80000 \
     -DHASPR_GWINDOWS -m64 -DHASIPv6 -DHAS_VSOCK \
     -DLSOF_VSTR=\"5.8\"")
    gcc -Dsolaris=80000 -DHASPR_GWINDOWS -m64 -DHASIPv6 \
     -DHAS_VSOCK -DLSOF_VSTR="5.8" -O -c dvch.c

```
In file included from /usr/include/sys/proc.h:31, \
      from /homes/abe/gnu/gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/ \
   3.2.1/include/sys/user.h:267, from /usr/include/kvm.h:13, \
   from ../dlsof.h:53, from ../lsof.h:172, from dvch.c:43: \
   /homes/abe/gnu/gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/\
    3.2.1/include/sys/task.h:59: parse error before "uint_t"
```

Errors like the above are most likely not problems in the
system's header files, but in the private copies of them
that were created when gcc was made or installed. Note
the presense of
".../gcc-3.2.1/lib/gcc-lib/sparcv9-sun-solaris2/3.2.1/include/..."
in the paths for user.h and task.h. It indicates both
header files are gcc-specific.

To solve errors like this requires comparing the header
files in the vendor's /usr/include tree to the gcc-specific
ones in gcc's private gcc-lib/.../include tree. It may be
necessary to regenerate gcc-specific header files, correct
them or remove them. See the gcc distribution for the
appropriate tools.

A possible temporary work-around is to direct gcc to use
the vendor's header files instead of its temporary ones by
declaring -I/usr/include in the compilation flags.

3.2.3 Other header file problems

Don't overlook any vendor tools that might validate the
vendor header files installed on the system -- e.g., the
Solaris pkgchk tool can be used to check the header files
that were installed from the SUNWhea package.

For other header file problems contact me at <abe@purdue.edu>.
Please follow the reporting guidelines in the "How do I
report an lsof bug?" section of this FAQ.

3.3 Why doesn't lsof report full path names?

Lsof reports the full path name when it is specified as a
search argument for open files that match the argument.
However, if the argument is a file system mounted-on
directory, and lsof finds additional path name components
from the kernel name cache, it will report them.

Lsof reports path name for file system types that have path
name lookup features -- e.g., some versions of AdvFS for
Digital and Tru64 UNIX. The Linux /proc-based lsof reports

full path names, because the Linux /proc file system provides
them. Lsof on recent builds of Solaris 10 also report full
path names, because those Solaris kernels record the full path
name in the vnode structure.

Otherwise, lsof uses the kernel name cache, where it exists
and can be accessed, and reports some or all path name
components (e.g., the sys and proc.h components of
/usr/include/sys/proc.h) for these dialects:

 Apple Darwin
 DC/OSx
 FreeBSD
 HP-UX, /dev/kmem and PSTAT based
 Linux, /dev/kmem-based
 NetBSD
 NEXTSTEP
 OpenBSD
 OPENSTEP
 Reliant UNIX
 SCO OpenServer
 SCO|Caldera UnixWare
 Solaris 2.x, 7, 8 and 9 (except for some VxFS versions;
     see the "Why doesn't Solaris
     lsof report VxFS path name
     components?" section for more
     information)
 Solaris 10 (early builds) Tru64 UNIX

As far as I can determine, AFS path lookups don't share in
kernel name cache operations, so lsof can't identify open AFS
path name components. Apparently Solaris VxFS versions 4 and
above don't share in kernel name cache operations, either, so
lsof can't display path name components for those open files.

Since the size of the kernel name cache is limited and the
cache is in constant flux, it does not always contain the names
of all components in an open file's path; sometimes it contains
none of them.

Lsof reports the file system directory name and whatever
components of the file's path it finds in the cache, starting
with the last component and working backwards through the
directories that contain it. If lsof finds no path
components, lsof reports the file system device name instead.

When lsof does report some path components in the NAME
column, it prefixes them with the file system directory

name, followed by " -- ", followed by the components --
e.g., /usr -- sys/path.h for /usr/include/sys/path.h. The
" -- " is omitted when lsof finds all the path name components
of a file's name.

The PSTAT-based HP-UX lsof relies on kernel name cache
contents, too, even though its information comes to lsof
via pstat() function calls. Consequently, PSTAT-based
HP-UX lsof won't always report full paths, but may use the
" -- " partial path name notation, or may occasionally
report no path name at all but just the file system mounted-on
directory and device names.

Lsof can't obtain path name components from the kernel name
caches of the following dialects:

   AIX

Only the Linux kernel records full path names in the
structures it maintains about open files; instead, most
kernels convert path names to device and node number doublets
and use them for subsequent file references once files have
been opened.

To convert the device and node number doublet into a
complete path name, lsof would have to start at the root
node (root directory) of the file system on which the node
resides, and search every branch for the node, building
possible path names along the way. That would be a time
consuming operation and require access to the raw disk
device (usually implying setuid-root permission).

If the prospect of all that local disk activity doesn't
concern you, think about the cost when the device is
NFS-mounted.

Try using the file system mount point and node number lsof
reports as parameters to find -- e.g.,

   $ find <mount_point> -inum <node_number> -print

and you may get an appreciation of what a file system
directory tree search would cost.

3.3.1 Why do lsof -r reports show different path names?

When you run lsof with its repeat (``-r'') option, you may
notice that the extent to which it reports path names for

the same files may vary from cycle to cycle. That happens
because other processes are making kernel calls affecting
the cache and causing entries to be removed from and added
to it.

3.3.2 Why does lsof report the wrong path names?

Under some circumstances lsof may report an incorrect path
name component, especially for files in a rapidly changing
directory like /tmp.

In a rapidly changing directory, like /tmp, if the kernel
doesn't clear the cache entry when it removes a file, a
new file may be given the same keys and lead lsof to believe
that the old cache entry with the same keys belongs to the
new file.

Lsof tries to avoid this error by purging duplicate entries
from its copy of the kernel name cache when they have the
same device and inode number, but different names.

This error is less likely to occur in UNIX dialects where the
keys to the name cache are node address and possibly a
capability ID. The Apple Darwin, Digital UNIX, FreeBSD, HP-UX,
NEXTSTEP, OPENSTEP, Solaris, Tru64 UNIX, and UnixWare dialects
use node address. Apple Darwin, FreeBSD, NetBSD, OpenBSD,
Tru64 UNIX, and also use a capability ID to further identify
name cache entries.

3.3.3 Why doesn't lsof report path names for unlinked (rm'd) files?

When lsof gets path name components from the kernel's name
cache, it does not report the path names of a file that has
been unlinked from its parent directory -- e.g., deleted via
rm, or the unlink() system call -- even when some process may
still hold the file open; lsof reports only the file system's
mounted-on directory and device. That's because path name
components are removed from the kernel name cache when the file
is unlinked.

Unlinked open files are sometimes used by applications for
temporary, but invisible storage (i.e., ls won't show them,
and no other process can open them.) However, they may
occasionally consume disk space to excess and cause concern
for a system administrator, who will be unable to locate
them with find, ls, du, or other tools that rely on finding
files by examining the directory tree.

By using lsof's +L option you can see the link count of
open files -- in the NLINK column. An unlinked file will
have an NLINK value of zero. By using the option +L1 you
can tell lsof to display only files whose link count is
less than one (i.e., zero).

There are some UNIX dialect-specific exceptions to lsof's
inability to report unlinked path names. They are described in
the answer to the "When will lsof report path names for deleted
files?" question.

3.3.4 Why doesn't lsof report the "correct" hard linked file path
name?

When lsof reports a rightmost path name component for a
file with hard links, the component may come from the
kernel's name cache. Since the key which connects an open
file to the kernel name cache may be the same for each
differently named hard link, lsof may report only one name
for all open hard-linked files.   Sometimes that will be
"correct" in the eye of the beholder; sometimes it will
not. Remember, the file identification keys significant
to the kernel are the device and node numbers, and they're
the same for all the hard linked names.

3.3.5 When will lsof report path names for deleted files?

Lsof will report path names for deleted files for two
dialects: Linux and later builds of Solaris 10.

Deleted Linux path names are reported by default and have
"(deleted)" at their ends.

The display of Solaris 10 deleted path names may be selected
with the -X option. When selected they are also reported with
"(deleted)" at their ends.

3.4 Why is lsof so slow?

Lsof may appear to be slow if network address to host name
resolution is slow. This can happen, for example, when the
name server is unreachable, or when a Solaris PPP cache daemon
is malfunctioning.

To see if name lookup is causing lsof to be slow, turn it off
with the ``-n'' option.

Port service name lookup or portmap registration lookup may

also be causes of slow-down. To suppress port service name
lookup, specify the ``-P'' option.

Lsof doesn't usually make direct portmap calls -- only when +M
is specified, or when HASPMAPENABLED is defined during lsof
construction. (The lsof help panel, produced with `lsof -h`
will display the default portmap registration reporting
state.) The quickest first step in checking if lsof is slow
because of the portmapper is to use lsof's ``-M'' option.

Lsof may be slow if UID to login name lookups are slow.
Suppress them with ``-l''.

On dialects where lsof uses the kernel name cache, try
disabling its use with ``-C''. (You can tell if lsof uses the
kernel name cache by looking for ``-C'' in lsof's ``-h''
output.) Of course, disabling kernel name cache use will mean
that lsof won't report full or partial path names, just file
system and character device names.

If you're just interested in the open files of one process, try
using the ``-p <Process-ID>'' option to limit lsof to that
process. (The ``-p'' option may also be followed with a list
of Process-IDs.)

If you're interested in including or excluding certain
commands, try lsof's "-c[^]cmd" option.

If you're interested in certain Internet TCP and UDP states
(e.g., ESTABLISHED) or in excluding some (e.g., CLOSE_WAIT), try
lsof's "-s p:s" option. More information on it may be found in
the answer to the "How are protocol state name exclusion and
inclusion used?" question.

Your UNIX dialect may not support "-s p:s" and its associated
performance improvments to Internet-only file processing. You
can find more information on those topics in the answer to the
"Why doesn't my dialect support state name exclusion and
inclusion?" question.

Older AIX lsof may be slow to start because of its oslevel
identity comparison. (Newer AIX lsof uses uname(2).) See the
"Why does AIX lsof start so slowly?" and "Why does lsof warn
"compiled for x ... y; this is z.?" sections for more
information.

3.5 Why doesn't lsof's setgid or setuid permission work?

If you install lsof on an NFS file system that has been
mounted with the nosuid option, lsof may not be able to
use the setgid or setuid permission you give it, complaining
it can't open the kernel memory device -- e.g., /dev/kmem.

The only solution is to install lsof on a file system that
doesn't inhibit setgid or setuid permission.

3.6 Does lsof have security problems?

I don't think so. However, lsof does usually start with
setgid permission, and sometimes with setuid-root permission.
Any program that has setgid or setuid-root permission,
should always be regarded with suspicion.

Lsof drops setgid power, holding it only while it opens
access to kernel memory devices (e.g., /dev/kmem, /dev/mem,
/dev/swap). That allows lsof to bypass the weaker security
of access(2) in favor of the stronger checks the kernel
makes when it examines the right of the lsof process to
open files declared with -k and -m. Lsof also restricts
some device cache file naming options when it senses the
process has setuid-root power.

On a few dialects lsof requires setuid-root permission
during its full execution in order to access files in the
/proc file system. These dialects include:

    DC/OSx 1.1 for Pyramid systems
    Reliant UNIX 5.4[34] for Pyramid systems

When lsof runs with setuid-root permission it severely
restricts all file accesses it might be asked to make with
its options.

The device cache file (typically .lsof_hostname in the home
directory of the real user ID that executes lsof) has 0600
modes. (The suffix, hostname, is the first component of
the host's name returned by gethostname(2).) However, even
when lsof runs setuid-root, it makes sure the file's
ownerships are changed to that of the real user and group.
In addition, lsof checks the file carefully before using
it (See the question "How do I disable the device cache
file feature or alter it's behavior?" for a description of
the checks.); discards the file if it fails the scrutiny;
complains about the condition of the file; then rebuilds
the file.

See the 00DCACHE file of the lsof distribution for more information about device cache file handling and the risks associated with the file.

3.7 Will lsof show remote hosts using files via NFS?

No. Remember, lsof displays open files for the processes of the host on which it runs. If the host on which lsof is running is an NFS server, the remote NFS client processes that are accessing files on the server leave no process records on the server for lsof to examine.

3.8 Why doesn't lsof report locks held on NFS files?

Generally lock information held by local processes on remote NFS files is not recorded by the UNIX dialect kernel. Hence, lsof can't report it.

One exception is some patch levels of Solaris 2.3, and all versions of Solaris 2.4 and above. Lsof for those dialects does report on locks held by local processes on remotely mounted NFS files.

3.8.1 Why does lsof report a one byte lock on byte zero as a full file lock?

When a process has a lock of length one, starting at byte zero, lsof can't distinguish it from a full file lock. That's because most UNIX dialects represent both locks the same way in their file lock (flock or eflock) structures.

3.9 Why does lsof report different values for open files on the same file system (the automounter phenomenon)?

On UNIX dialects where file systems may be mounted by an automounter with the ``direct'' type, lsof may sometimes report difference DEVICE, SIZE/OFF, INODE and NAME values when asked to report files open on the file system.

This happens because some files open on the file system -- e.g., the current directory of a shell that changed its directory to the file system as the file system's first reference -- may be characterized in the kernel with temporary automounter node information. The cd doesn't cause the file system to be mounted.

A subsequent reference to the file system -- e.g., an ls of any place in it -- will cause the file system to be

mounted. Processes with files open to the mounted file
system are characterized in the kernel with data that
reflects the mounted file system's parameters.

Unfortunately some kernels (e.g., some versions of Solaris
2.x) don't revisit the process that did only a change-directory
for the purpose of updating the data associated with the
open directory file. The file continues to be characterized
with temporary automounter information until it does another
directory change, even a trivial ``cd .''.

Lsof will report on both reference types, when supplied
the file system name as an argument, but the data lsof
reports will reflect what it finds in the kernel. For the
different types lsof will display different data, including
different major and minor device numbers in the DEVICE
column, different lengths in the SIZE/OFF column, different
node numbers in the INODE column, and slightly different
file system names in the NAME column.

In contrast, fuser, where available, can only report on
one reference type when supplied the file system name as
an argument. Usually it will report on the one that is
associated with the mounted file system information. If
the only reference type is the temporary automounter one,
fuser will often be silent about it.

3.10 Why don't lsof and netstat output match?

Lsof and netstat output don't match because lsof reports
the network information it finds in open file system objects
-- e.g., socket files -- while netstat often gets its
information from separate kernel tables.

The information available to netstat may describe network
activities never or no longer associated with open files,
but necessary for proper network state machine operation.

For example, a TCP connection in the FIN_WAIT_[12] state
may no longer have an associated open file, because the
connection has been closed at the application layer and is
now being closed at the TCP/IP protocol layer.

3.10.1 Why can't lsof find accesses to some TCP and UDP ports?

Lsof stands for LiSt Open Files. If there is no open file
connected to a TCP or UDP port, lsof won't find it. That's
the most common reason why lsof doesn't find a port netstat

might report open.

One reason I've found on some UNIX dialects is that their
kernels set aside TCP and UDP ports for communicating with
support activities, running in application layer servers
-- the automounter daemons, and the NFS biod and nfsd
daemons are examples. Netstat may report the ports are in
use, but lsof doesn't.

Another reason is that netstat may also be able to report
a port is open on a particular dialect, because it uses a
source of data different from what lsof uses -- e.g.,
netstat might examine kernel tables or use streams messages
to MIB2, while lsof relies on the information it finds in
open file structures and their descendants.

Sometimes it's possible to search the data netstat and lsof
use. For example, on Linux /proc/tcp and /proc/udp can be
examined. There might an entry there for a particular
protocol and port, but if the line on which the port appears
doesn't have an inode number that matches an inode number
of an open file, lsof won't be able to identify the process
using the port.

This is a tough question to which there is no easy answer.

3.11 Why does lsof update the device cache file?

At the end of the lsof output you may see the message:

   lsof: WARNING: /Homes/abe/.lsof_vic was updated.

In this message /Homes/abe/.lsof_vic is the path to the
private device cache file for login abe. (See 00DCACHE.)

Lsof issues this message when it finds it necessary to
recheck the system device directory (e.g., /dev or /devices)
and rebuild the device cache file during the open file
scan. Lsof may need to do these things it finds that a
device directory node has changed, or if it cannot find a
device in the cache.

3.12 Why doesn't lsof report state for UDP socket files?

Lsof reports UDP TPI connection state -- TS_IDLE (Idle),
TS_BOUND (Bound), etc. -- for some, but not all dialects.
TPI state is stream-based TCP/IP information that isn't
available in many dialects.

A fairly weak general rule is if netstat(1) reports UDP
TPI state, lsof may be able to report it, too. But don't
be surprised if lsof fails to report UDP TPI state for your
dialect. Other factors influence lsof's ability to report
UDP TPI state, including the availability of state number
data in kernel structures, and state number to state name
conversion data.

3.13 I am editing a file with vi; why doesn't lsof find the file?

Classic implementations of vi usually don't keep open the file
being edited. (Newer ones may do so in order to maintain an
advisory lock.) Instead classic vi opens the file, makes a
temporary copy (usually in /tmp or /usr/tmp), and does its work
in that file. When you save the file being edited from a
classic vi implementation, it reopens and rewrites the file.

During a classic vi session, except for the brief periods when
vi is reading or rewriting the file, lsof won't find an open
reference to the file from the vi process, because there is
none.

3.14 Why doesn't lsof report TCP/TPI window and queue sizes for my
dialect?

Lsof only reports TCP/TPI window sizes for Solaris, because
only its netstat reports them. The intent of providing
TCP/TPI information in lsof NAME column output is to make
it easier to match netstat output to lsof output.

In general lsof only reports queue sizes for both TCP and
UDP (TPI) connections on BSD-derived UNIX dialects, where
both sets of values appear in kernel socket queue structures.
SYSV-derived UNIX dialects whose TCP/IP implementations
are based on streams generally provide only TCP queue sizes,
not UDP (TPI) ones.

While you may find that netstat on some SYSV-derived UNIX
dialects with streams TCP/IP may report UDP (TPI) queue
sizes, you will probably also find that the sizes are always
zero -- netstat supplies a constant zero for UDP (TPI)
queue sizes to make its headers align the same for TCP and
UDP (TPI) connections. Solaris seems to get it right --
i.e., its netstat does not report UDP (TPI) queue sizes.

When in doubt, I chose to avoid reporting UDP (TPI) queue
sizes for UNIX dialects whose netstat-reported values I

knew to be a constant zero or whose origin I couldn't determine. OSR is a dialect in this category.

3.14.1 Why doesn't lsof report socket options, socket states, and TCP flags and values for my dialect?

The lsof -T argument, 'f', that selects the reporting of socket options, socket states and TCP flags was implemented at lsof revision 4.71 for the following UNIX dialects, providing the indicated information:

  AIX 4.3.2 and 5.1 and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.
  Apple Darwin 7.2 and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.
  Digital UNIX and Tru64 UNIX 4.0
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.
  FreeBSD 4.9 and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.
  HP-UX 11.00 (/dev/kmem-based lsof)
All socket options and values are reported. No socket states are reported. Only the TF_NODELAY TCP flag and the TF_MSS value are reported.
  HP-UX 11.11 and iiiv2 (PSTAT-based lsof)
All socket options and values, and socket states are reported. No TCP flags or values are reported.
  Linux
No socket options and values, socket states, or TCP flags and values are reported. The support for "-Tf" could not be added to Linux, because socket options, socket states, and TCP flags and values are not available via the /proc file system.
  NetBSD 1.6G and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.
  OpenBSD 3.4 and above
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.
  OPENSTEP 4.2
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.
  OpenUNIX 8
All socket options and values, socket states, and TCP flags and values described in lsof(8) are reported.

SCO OpenServer Release 5.0.6
All socket options and values, socket states, and TCP
flags and values described in lsof(8) are reported.
    Solaris 2.6, 8 and above
The socket option display is limited to BROADCAST,
DEBUG, DGRAM_ERRIND, DONTROUTE and OOBINLINE. Socket
values are limited to KEEPALIVE and LINGER. No socket
states are reported. The TCP DELACK, NODELAY and
SENTFIN flags are reported. The TCP MSS value is
reported.
    UnixWare 7.1.[134]
All socket options and values, socket states, and TCP
flags and values described in lsof(8) are reported.

3.14.2 Why doesn't lsof report the partial listen queue connection
 count for my dialect?

 The reporting of partial listen queue connections was added to
 -Tf processing at lsof revision 4.76. Currently it is reported
 for these dialects:

    AIX 4.3.2
 This dialect is no longer supported, so no attempt
 was made to add partial listen queue length support
 for it.
    AIX 5.1 and above
 Partial listen queue information is available.
    Apple Darwin 7.2 and above
 Partial listen queue information is available.
    Digital UNIX 4.0
 This dialect is no longer supported, so no attempt
 was made to add partial listen queue length support
 for it.
    FreeBSD 4.9 and above
 Partial listen queue information is available.
    HP-UX 11.00 (/dev/kmem-based lsof)
 No partial listen queue information is available.
    HP-UX 11.11 and iiiv2 (PSTAT-based lsof)
 No partial listen queue information is available.
    Linux
 No partial listen queue information is available.
    NetBSD 1.6G and above
 Partial listen queue information is available.
    OpenBSD 3.4 and above
 Partial listen queue information is available.
    OPENSTEP 4.2
 Partial listen queue information is available.
    OpenUNIX 8

This dialect is no longer supported, so no attempt
was made to add partial listen queue length support
for it.
    SCO OpenServer Release 5.0.6
No partial listen queue information is available.
    Solaris 2.6, 8 and above
Partial listen queue information is available.
    Tru64 UNIX 5.0
This dialect is no longer supported, so no attempt
was made to add partial listen queue length support
for it.
    Tru64 UNIX 5.1
Partial listen queue information is available.
    UnixWare 7.1.[134]
Partial listen queue information is available.

3.15 What does "no more information" in the NAME column mean?

When lsof can find no successor structures -- a gnode,
inode, socket, or vnode -- connected to the file structure
of an open descriptor of a process, it reports "no more
information" in the NAME column. The TYPE, DEVICE, SIZE/OFF,
and INODE columns will be blank.

Because the file structure is supposed to contain a pointer
to the next structure of a file's processing support, if
the pointer is NUL, lsof can go no further.

Some UNIX dialects have file structures for system processes
-- e.g., the sched process -- that have no successor
structure pointers. The "no more information" NAME will
commonly appear for these processes in lsof output.

It may also be the case that lsof has read the file structure
while it is being assembled and before a successor structure
pointer value has been set. The "no more information" NAME
will again result.

Unless lsof output is filled with "no more information"
NAME column messages, the appearance of a few should be no
cause for alarm.

3.16 Why doesn't lsof find a process that ps finds?

If lsof fails to display open files for a process that ps
indicates exists, there may be several reasons for the
difference.

The process may be a "zombie" for which ps displays the
"(defunct)" state. In that case, the process has exited
and has no open file information lsof can display. It does
still have a process structure, sufficient for the needs
of ps.

Another possible explanation is that kernel tables and
structures may have been changing when lsof looked for the
process, making lsof unable to find all relevant process
structures. Try repeating the lsof request.

3.17 Why doesn't -V report a search failure?

The usual reason that -V won't report a search failure is
that lsof located the search item, but was prevented from
listing it by an option that doesn't participate in search
failure reporting.

For example, this lsof invocation:

    $ lsof -V -i TCP@foobar -a -d 999

won't report it can't find the Internet address TCP@foobar,
even if there is an open file connected to that address,
unless the open file also has a file descriptor number of
999 (the ``-a -d 999'' options).

Compile-time options can also affect -V results in much the
same way. For example, if HASSECURITY and HASNOSOCKSECURITY
are defined at compile time, this lsof invocation, run by a
non-root user:

    $ lsof -V -c inetd

won't report that it can't find the inetd command, even if
there is a process running the inetd command, because the
HASSECURITY and HASNOSOCKSECURITY options prevent the
listing of all but the socket files of another user, and
no socket file selector (e.g., "-i") was specified.

3.18 Portmap problems

3.18.1 Why isn't a name displayed for the portmap registration?

When portmap registration reporting is enabled, any time
there is a registration for a local TCP or UDP port, lsof

displays it in square brackets, following the port number
or service name -- e.g., ``:1234[name]'' or ``:name[100083]''.

The TCP or UDP port number or service number (what follows
the `:') is displayed under the control of the lsof -P
option. The registration identity is held by the portmapper
and may be a name or a number, depending on how the
registration's owner declared it. Lsof reports what the
port map holds and cannot derive a registration name from
a registration number.

Lsof can be compiled with registration reporting enabled
or disabled by default, under the control of the HASPMAPENABLED
#define (usually in machine.h). The lsof help panel (`lsof
-h`) will show the default. Lsof is distributed with
reporting disabled by default.

3.18.2 How can I display only portmap registrations?

Lsof doesn't have an option that will display only TCP or
UDP ports with portmap registrations. The +M option only
enables the reporting of registration information when
Internet socket files are displayed; +M doesn't select
the displaying of Internet socket files -- the -i option
does that.

This simple lsof pipe to grep will do the job:

 $ lsof -i +M | grep "\["

This works because -i selects Internet socket files, +M
enables portmap registration reporting, and only output
lines with opening square brackets will have registrations.

When portmap registration reporting is enabled by default,
because the lsof builder constructed it that way, +M is
not necessary. (The lsof help panel, produced with `lsof
-h` will display the default portmapper registration
reporting state.) However, specifying +M when reporting
is already enabled is acceptable, as is specifying -M when
reporting is already disabled.

Digression: lsof will accept `+' or `-' as a prefix to most
options. (That isn't documented in the man page or help
panel to reduce confusion and complexity.) The -i option
is as acceptable as +i, so the above example could be
written a little more tersely as:

$ lsof +Mi | grep "\["

But be careful to use the ``Mi'' ordering, since ``iM''
implies M is an address argument to `i'.

3.18.3 Why doesn't lsof report portmap registrations for some ports?

Lsof reports portmap registrations for local TCP and UDP
ports only. It identifies local ports this way:

* The port appears in the local address section of the
   kernel structure that contains it.

* The port appears in the foreign address section of a
   kernel structure whose local and foreign Internet
   addresses are the same.

* The port appears in the foreign address section of a
   kernel address structure whose Internet address is
   INADDR_LOOPBACK (127.0.0.1).

Following these rules, lsof ignores foreign portmapped
ports. That's done for reasons of efficiency and possible
security prohibitions. Contacting all remote portmappers
could take a long time and be blocked by network difficulties
(i.e., be inefficient). Many firewalls block portmapper
access for security reasons.

Lsof may occasionally ignore portmap registration information
for a legitimate local port by virtue of its local port
rules. This can happen when a port appears in the foreign
part of its kernel structure and the local and foreign
Internet addresses don't match (perhaps because they're on
different interfaces), and the foreign Internet address
isn't INADDR_LOOPBACK (127.0.0.1).

3.19 Why is `lsof | wc` bigger than my system's open file limit?

There is a strong temptation to count open files by piping
lsof output to wc. If your purpose is to compare the number
you get to some Unix system parameter that defines the
number of open files your system can have, resist the
temptation.

One reason is that lsof reports a number of "files" that
don't occupy Unix file table space -- current working
directories, root directories, jail directories, text files,
library files, memory mapped files are some. Another reason

is that lsof can report a file shared by more than one
process that itself occupies only one file table slot.

If you want to know the number of open files that occupy
file table slots, use the +ff option and process the lsof
output's FILE_ADDR column information with standard Unix
tools like cut, grep, sed, and sort.

You might also consider using use lsof's field output with
+ff, selecting the file struct address with -FF, and
processing the output with an AWK or Perl script. See the
list_fields.awk, list_fields.perl, and shared.perl5 scripts
in the scripts/ subdirectory of the lsof distribution for
hints on file struct post-processing filters.

3.20 Why doesn't lsof report file offset (position)?

Lsof won't report a file offset (position) value if the -s
option has been specified, or if the dialect doesn't support
the displaying of file offset (position).

That lsof is reporting only file size is indicated by the
fact that the appropriate column header says SIZE instead
of SIZE/OFF.

If lsof doesn't support the displaying of file offset
(position) -- e.g., for Linux /proc-based lsof -- the -h
or -? output panel won't list the -o option.

Sometimes the availability of file offset information
depends on the dialect's kernel. This is particularly true
for socket file offsets.

Maintenance of offsets for pseudo-terminal devices varies
by UNIX dialect and is related to how the dialect kernel
implements pseudo-terminal support. Kernels like AIX, for
example, that short-circuit the transfer of data between
socket and pseudo devices to reduce TCP/IP daemon interrupt
rates won't advance offsets in the TCP/IP daemon socket
files. Instead they will advance offsets in the open
standard I/O files of the shell child precess where the
pseudo-terminal devices are used.

When in doubt about the behavior of lsof in reporting file
offset information, do some carefully measured experiments,
consult the lsof sources, or contact me at <abe@purdue.edu>
to discuss the matter. Please follow the reporting guidelines
in the "How do I report an lsof bug?" section of this FAQ.

3.20.1 What does lsof report for size when the file doesn't really have one?

When a file has no true size -- e.g., it's a socket, a
FIFO, or a pipe -- lsof tries to report the information it
finds in the kernel that describes the contents of associated
kernel buffers.

Thus, for example, size for most TCP/IP files is socket
buffer size. The size of the socket read buffer is reported
for read-only files; the size of the write buffer for
write-only files; and the sum of the buffers sizes for
read-write files.

3.21 Problems with path name arguments

3.21.1 How do I ask lsof to search a file system?

You can ask lsof to search for all open files on a file
system by specifying its mounted path name as an lsof
argument -- e.g.,

   $ lsof /

Output of the mount command will show file system mounted
path names. It will also show the mounted-on device path
for the file system.

If the mounted-on device is a block device (the permission
field in output of `ls -l <device>` starts with a `b/`),
you can specify it's name, too -- e.g.,

   $ lsof /dev/sd0a

If the mounted-on device isn't a block device -- for example,
some UNIX dialects call a CD-ROM device a character device
(ls output starts with a `c') -- you can force lsof to
assume that the specified device names a file system with
the +f option -- e.g.,

   $ lsof +f -- /dev/sd0a

(Note: you must use ``--'' after +f or -f if a file name
follows immediately, because +f and -f can be followed by
characters that specify flag output selections.)

When you use +f and lsof can't match the device to a file

system, lsof will issue a complaint.

The +f option may be used in some dialects to ask lsof to search for an NFS file system by its server name and server mount point. If the mount application reports an NFS file system mounted-on value that way, then this sample lsof request should work.

    $ lsof +f -- fleet:/home/fleet/u5

Finally, you can use -f if you don't want a mounted file system path name to be considered a request to report all open files on the file system. This is useful when you want to know if anyone is using the file system's mounted path name. This example directs lsof to report on open access to the `/' directory, including when it's being used as a current working or root directory.

    $ lsof -f -- /

The lsof -f option performs the same function as -f does in some fuser implementations. However, since the lsof -c option was chosen for another purpose before the `f' option was added to lsof, +f was selected as the analogue to the fuser -c option. (Sorry for the potential confusion.)

3.21.2 Why doesn't lsof find all the open files in a file system?

Lsof may not find all the open files in a file system for several reasons.

First, some processes with files open on the file system may have been changing status when lsof examined the process table, and lsof "missed" them. Remember, the kernel changes much faster than lsof can respond to the changes.

Second, be sure you have specified the file system correctly. Perhaps you specified a file instead. You can use lsof's -V option to have lsof report in detail on what it couldn't find. Make sure the report for the file system you specified says "file system." Here's some -V output:

    $ /lsof -V /tmp ./lsof.h ./lsof
    COMMAND PID USER FD   TYPE DEVICE SIZE/OFF INODE NAME
    lsof   2688 abe txt VREG 18,1,7 1428583 226641 ./lsof
    lsof   2689 abe txt VREG 18,1,7 1428583 226641 ./lsof
    lsof: no file use located: ./lsof.h

You can also use lsof's +f option to force it to consider
a path name as a file system. If lsof can't find a file
system by the specified name, it will issue a complaint --
e.g.,

    $ lsof +f -- /usr
    lsof: not a file system: /usr

(/usr is a directory in the / file system.)

3.21.3 Why does the lsof exit code report it didn't find open files
when some files were listed?

Sometimes lsof will list some open files, yet return a
non-zero exit code, suggesting it hasn't found all the
specified files.

The first thing you should when you suspect lsof is incorrect
is to repeat the request, adding the -V option. In the
resulting report you may find that your file system
specification really wasn't a file system specification,
just a file specification.

Finally, if you specify two files or two file systems twice,
lsof will credit all matches to the first of the two and
believe that there were no matches for the second. It's
possible to specify a single file system twice with different
path names by using both its mounted directory path name
and mounted-one device name.

    $ lsof +f -V spcuna:/sysprog /sysprog
    COMMAND   PID USER   FD   TYPE DEVICE SIZE/OFF INODE NAME
    ksh   11092 abe cwd   VDIR 39,0,1   1536 226562 /sysprog
    (spcuna:/sysprog)
    ...
    lsof: no file system use located: spcuna:/sysprog

All matches were credited to /sysprog; none to spcuna:/sysprog.

3.21.4 Why won't lsof find all the open files in a directory?

When you give lsof a simple directory path name argument
(not a file system mounted-on name), you are asking it to
search for processes that have the directory open as a
file, or as a process-specific directory -- e.g., root or
current working directory.

If you want to list instances of open files inside the

directory, you need to specify the individual path names
of those files, or use the lsof +D and +d options.

See the answer to the question "Why are the +D and +d
options so slow?" before you use +D or +d casually.

See the answer to the question "Why do the +D and +d options
produce warning messages?" for an explanation of some
process authority limitations of +D and +d.

3.21.5 Why are the +D and +d options so slow?

The +D and +d options cause lsof to build a path name search
list for a specified directory. +D causes lsof to descend
the directory to its furthest subdirectory, while +d
restricts it to the top level. In both cases, the specified
directory itself is included in the search list. In both
symbolic links are ignored.

Building such a search list can take considerable time,
especially when the specified directory contains many files
and subdirectories -- lsof must call the system readlink()
and stat() functions for each file and directory. Storing
the search list can cause lsof to use more than its normal
amount of dynamic memory -- each file recorded in the search
list consumes dynamic memory for its path name, characteristics,
and search linkages. Using the list means lsof must search
it for every open file in the system.

Building the search list for a directory specified on some
file systems can be slow -- e.g., for an NFS directory with
many files. Some file systems have special logging features
that can introduce additional delays to the building of
the search list -- e.g., NFS logging, or logging on a
Solaris UFS file system. The bottom line is that slow
search list construction may not be so much an lsof problem
as a file system problem. (Hint: if you're using Solaris
UFS logging, consider specifying the "logging,noatime"
option pair to reduce the number of atime writes to the
UFS logging queue and disk.)

A somewhat risky way to speed up lsof's building of the
search list is to use lsof's ``-O'' option. It forces lsof
to do all system calls needed to build the search list
directly, rather than in a child process. While direct
system calls are much faster, they can block in the kernel
-- e.g., when an NFS server stops responding -- stopping
lsof until the kernel operation unblocks.

As an example of the load +D can impose, consider that an
`lsof +D /` on a lightly loaded NeXT '040 cube with a 1GB
root file system disk took 4+ minutes of real time. It
also generated several hundred error messages about files
and directories the lsof process didn't have permission to
access with stat(2).

The bottom line is that +D and +d should be used cautiously.
+D is more costly than +d for deeply nested directory trees,
because of the full directory descent it causes. So use
+d where possible. And you might need to consider the
performance of the file system that holds the directory
you name with +d or +D.

In view of these warnings, when is it appropriate to use
+D or +d? Probably the most appropriate time is when you
would specify the directory's contents to lsof with a shell
globbing construct -- e.g., `lsof *`. If that's what you
need to do, `lsof +d .` is probably more efficient than
having the shell produce a directory list, form it into an
argument vector, and pass the vector to lsof for it to
unravel.

See the answer to the question "Why do the +D and +d options
produce warning messages?" for an explanation of some
process authority limitations of +D and +d.

3.21.6 Why do the +D and +d options produce warning messages?

+D and +d option processing is limited by the authority of
the lsof process -- i.e., lsof can only examine (with
lstat(2) and stat(2)) files the owner of the process can
access.

If the ownership, group membership, or permissions of the
specified directory, file within it, or directory within
it prevents the owner of the lsof process from using lstat(2)
or stat(2) on it, lsof will issue a warning message, naming
the path and giving the system's (lstat(2's or stat(2)'s)
reason (errno explanation text) for refusing access.

As an example, assume user abc has a subdirectory in /tmp,
owned by abc and readable, writable and searchable by only
its owner. If user def asks lsof to search for all /tmp
references with +D or +d, lsof will be unable to lstat(2)
or stat(2) anything in abc's private subdirectory, and will
issue an appropriate warning.

Lsof warnings can usually be suppressed with the -w option.
However, using -w with +D or +d means that there will be
no indication why lsof couldn't find an open reference to
a restricted directory or something contained in it.

Hint: if you need to use +D or +d and avoid authority
warnings, and if you have super-user power, su and use lsof
with +D or +d as root.

3.22 Why can't my C compiler find the rpcent structure definition?

When you try to compile lsof your compiler may complain
that the rpcent structure is undefined. The complaints
may look like this:

>print.c: In function `fill_portmap':
>print.c:213: dereferencing pointer to incomplete type
>...

The most likely cause is that someone has allowed a BIND
installation to update /usr/include/netdb.h (or perhaps
/usr/include/rpc/netdb.h), removing the rpcent structure
definition that lsof expects to find there.

Only Solaris has an automatic work-around. (See dlsof.h
in dialects/sun.). The Solaris work-around succeeds because
there is another header file, <rpc/rpcent.h>, with the rpcent
structure definition, and there is a Solaris C pre-processor
test that can tell when the BIND <netdb.h> is in place and
hence <rpc/rpcent.h> must be included.

Doubtlessly there are similar work-arounds possible in
other UNIX dialects whose header files have been "touched"
by BIND, but in general I recommend restoration of the
vendor's <netdb.h> and any other header files BIND might
have replaced. (I think BIND replaces <resolv.h>,
<sys/bitypes.h>, <sys/cdefs.h> -- and maybe others.)

3.23 Why doesn't lsof report fully on file "foo" on UNIX dialect
"bar?"

Lsof sometimes won't report much information on a given
file, or may even report an error message in its NAME
column. That's usually because the file is of a special
type -- e.g., in a file system specific to the UNIX dialect
-- and I haven't used a system where the file appeared
during my testing.

If you encounter such a situation, send me e-mail at
<abe@purdue.edu> and we may be able to devise an addition to
lsof that will report on the file in question. Please follow
the reporting guidelines in the "How do I report an lsof bug?"
section of this FAQ. Make sure "lsof" appears in the
"Subject:" line so my e-mail filter won't classify your letter
as Spam.

3.24 Why do I get a complaint when I execute lsof that some library
file can't be found?

On systems where the LIBPATH (or the equivalent) environment
variable is used to record the library search path in
executable files when they are built, an incorrect value
may make it impossible for the system to find the shared
libraries needed to load lsof for execution.

This may be particularly true on systems like AIX >= 4.1.4,
where the lsof Makefile takes the precautionary step of
using the -bnolibpath loader flag to insure that the path
to the private static lsof library is not recorded in the
lsof binary. Should LIBPATH be invalid when lsof is built,
it will be recorded in the lsof binary as the default
library path search order and lead to an inability to find
libraries when lsof is executed.

So, if you get missing library complaints when you try to
execute lsof, check LIBPATH, or whatever environment variable
is used on your system to define library search order in
executable files. Use the tools at your disposal to look
at the library paths recorded in the lsof binary -- e.g.,
chatr on HP-UX, dump on AIX, ldd on Solaris.

Make sure, too, that when the correct library search path
has been recorded in the executable file, the required
library files exist at one or more of the search paths.

3.25 Why does lsof complain it can't open files?

When lsof begins execution, unless it has been asked to
report only help or version information, typically it will
attempt to access kernel memory and symbol files -- e.g.,
/unix, /dev/kmem. Even though lsof needs only permission
to open these files for reading, read access to them might
be restricted by ownerships and permission modes.

So the first step to diagnosing lsof problems with opening
files is to use ls(1) to examine the ownerships and permission
modes of the files that lsof wants to open. You may find
that lsof needs to be installed with some type of special
ownership or permission modes to enable it to open the
necessary files for reading. See the "Installing Lsof"
section of 00README for more information.

3.26 Why does lsof warn "compiled for x ... y; this is z."?

Unless warnings are suppressed (with -w) or the kernel
identity check symbol (HASKERNIDCK) definition has been
deleted, all but one lsof dialect version (exception:
/proc-based Linux lsof) compare the identity of the running
kernel to that of the one for which lsof was constructed.
If the identities don't match, lsof issues a warning like
this:

    lsof: WARNING: compiled for Solaris release 5.7; this is 5.6.

Two kernel identity differences can generate this warning
-- the version number and the release number.

Build and running identity differences are usually significant,
because they usually indicate kernels whose structures are
different -- kernel structures commonly change at dialect
version releases. Since lsof reads data from the kernel
in the form of structures, it is sensitive to changes in
them. The general rule is that an lsof compiled for one
UNIX dialect version will not work correctly when run on
a different version.

There are three work-arounds: 1) use -w to suppress the
warning -- and risk missing other warnings; 2) permanently
disable the identity check by deleting the definition of
HASKERNIDCK in the dialect's machine.h header file -- with
the same risk; or 3) rebuild lsof on the system where it
is to be run. (Deleting HASKERNIDCK can be done with the
Customize script or by editing machine.h.)

Generally checking kernel identity is a quick operation
for lsof. However, it is potentially slow under AIX, where
lsof must run /usr/bin/oslevel. To speed up lsof, use -w
to suppress the /usr/bin/oslevel test. See "Why does AIX
lsof start so slowly?" for more information.

3.27 How can I disable the kernel identity check?

The kernel identity check is controlled by the HASKERNIDCK
definition. When it is defined, most dialects (exclusion:
/proc-based Linux lsof) will compare the build-time kernel
identity with the run-time one.

To disable the kernel identity check, disable the HASKERNIDCK
definition in the dialect's machine.h header file. The
Customize script can be used to do that in its section
about the kernel identity check.

Caution: while disabling the kernel identity check may
result in smaller lsof startup overhead, it comes with the
risk of executing an lsof that may produce warning messages,
error messages, incorrect output, or no output at all.

3.28 Why don't ps(1) and lsof agree on the owner of a process?

Generally the user ID lsof reports in its USER column is
the process effective user ID, as found in the process
structure. Sometimes that may not agree with what ps(1)
reports for the same process.

There are sundry reasons for the difference. Sometimes
ps(1) uses a different source for process information,
e.g., the /proc file system or the psinfo structure.
Sometimes the kernel is lax or confused (e.g., Solaris
2.5.1) about what ID to report as the effective user ID.
Sometimes the system carries only one user ID in its process
structure (some BSD derivatives), leaving lsof no choice.

The differences between lsof and ps(1) user identifications
should be small and normally it will be apparent that the
confusion is over a process whose application has changed
to an effective user ID different from the real one.

3.29 Why doesn't lsof find an open socket file whose connection
state is past CLOSE_WAIT?

TCP/IP connections in states past CLOSE_WAIT -- e.g.,
FIN_WAIT_1, CLOSING, LAST_ACK, FIN_WAIT_2, and TIME_WAIT
-- don't always have open files associated with them. When
they don't, lsof can't identify them. When the connection
state advances from CLOSE_WAIT, sometimes the open file
associated with the connection is deleted.

3.30 Why don't machine.h definitions work when the surrounding
comments are removed?

The machine.h header files in dialect subdirectories have
some commented-out definitions like:

    /* #define HASSYSDC "/your/choice/of/path */

You can't simply remove the comments and expect the definition
to work. That's intended to make you think about what
value you are assigning to the symbol. The assigned value
might have a system-specific convention. HASSYSDC, for
example, might be /var/db/lsof.dc for FreeBSD, but it might
be /var/adm/lsof.dc for Solaris.

Symbols defined in the lsof documentation are described in
00PORTING, other machine.h comments, and other lsof
documentation files. HASSYSDC, for example, is discussed
in 00DCACHE. When comments and documentation don't suffice,
consult the source code for hints on how the symbol is
used.

3.31 What do "can't read inpcb at 0x...", "no protocol control
   block", "no PCB, CANTSENDMORE, CANTRCVMORE", etc. mean?

Sometimes lsof will report "can't read inpcb at 0x00000000",
"no protocol control block", "no PCB, CANTSENDMORE,
CANTRCVMORE" or a similar message in the NAME column for
open TCP socket files. These messages mean the file's socket
structure lacks a pointer to the INternet Protocol Control
Block (inpcb) where lsof expects to find connection addresses
-- local and foreign ports, local and foreign IP addresses.
The socket file has probably been submitted to the shutdown(2)
function for processing.

In some implementations lsof issues the "no PCB, CANTSENDMORE,
CANTRCVMORE" message, which tries to explain the absence
of a protocol control block by showing the socket state
settings that have been made by the shutdown(2) function.

If a non-zero address follows the "0x" in the "can't read
inpcb" message, it means lsof couldn't read inpcb contents
from the indicated address in kernel memory.

3.32 What do the "unknown file system type" warnings mean?

Lsof may report a message similar to"

    unknown file system type, v_op: 0x10472f10

in the NAME column for some files.

This means that lsof has encountered a vnode for the file
whose operation switch address (from v_op) references a
file system type for which there is no support in lsof.
After lsof identifies the file system type, it uses
pre-compiled code to locate the file system specific node
for the file where lsof finds information like file size,
device number, node number, etc.

To get some idea of what the file system type might be,
use nm on your kernel symbol file to locate the symbol name
that corresponds to the v_op address -- e.g., on Solaris
do:

    $ nm -x /dev/ksyms | grep 0x10472f10
    0x10472f10 ... |file_system_name_vnodeops

Where "file_system_name" is the clue to the unsupported
file system.

Lsof doesn't use the v_op address to identify file system
types on all dialects. Sometimes it uses an index number
it finds in the vnode. It will translate that symbol to
a short name in the warning message -- e.g., "nfs3" -- if
possible.

3.33 Installation

3.33.1 How do I install lsof?

There is no "standard" way to install lsof. Too much
depends on local conditions for me to be able to provide
working install rules in the lsof make files. (The skeleton
install rules you will find just give "hints.") See the
"Installing Lsof" section of 00README for a fuller explanation.

To install lsof you will need to consider these questions:

* Who should be able to use lsof? (See HASSECURITY and
   HASNOSOCKSECURITY in the "Security" section of 00README.)

* Where should lsof be installed? This is a decision
   mostly dictated by local conditions. Somewhere in
   /usr/local -- etc/ or sbin/ -- is a common choice.

* What permissions should I give the lsof executable?
   The answer to this varies by dialect. The make files
   have install rules that give hints. The "Installing

Lsof" section of 00README gives information, too.

* What if I want to install lsof in a shared file system
  for machines that require different lsof configurations?
  See the next question and answer, "How do I install a
  common lsof when I have machines that need differently
  constructed lsof binaries?"

3.33.2 How do I install a common lsof when I have machines that
need differently constructed lsof binaries?

A dilemma that faces some system administrators when they
install lsof in a shared file system -- e.g., NFS -- is
that they must have different lsof executables for different
systems.

The answer is to build an lsof wrapper script that is
executed in place of lsof. The script can use system
commands to determine which lsof binary should be executed.

Consider this example. You have HP-UX machines with 32
and 64 bit kernels that share the /usr/local/sbin directory
where you want to install lsof. Consequently, on each
system you must use a different lsof executable, built for
the system's bit size. (That's because lsof reads kernel
structures, sized by the kernel's bit size.)

One answer is to install three things in /usr/local/sbin:
1) a 32 bit lsof as lsof32; 2) a 64 bit lsof as lsof64;
and 3) an lsof script. The script might look like this
one, based on work by Amir J. Katz:

```
#!/bin/sh
x=`/usr/bin/getconf KERNEL_BITS`  # returns 32 or 64
if /usr/bin/test "X$x" = "X32"
then
  lsof32 $*
else
  if /usr/bin/test "X$x" = "X64"
  then
lsof64 $*
  else
echo "Can't determine which lsof executable to use;"
echo "getconf KERNEL_BITS says: $x"
exit 1
  fi
 fi
```

Solaris users should consult "How do I install lsof for
Solaris 7, 8 or 9?" for information on a similar trick
using the Solaris isaexec command.

Users of other dialects might be able to use a command like
uname(1) that can identify a distinguishing feature of the
system to be incorporated in pre-installed lsof executable
names. For example, use `uname -r` and install binaries
with suffixes that match `uname -r` output.

3.34 Why do lsof 4.53 and above reject device cache files built
by earlier lsof revisions?

When lsof revisions 4.53 run and encounter a device cache
file built by an earlier revision, it will reject the file
and build a new one. The rejection will be advertised with
these messages:

    lsof: WARNING: no /dev device in <name>: 2 sections
    ...
    lsof: WARNING: created device cache file: <name>

This happens because the header line of the device cache
file was changed at revision 4.53 to contain the number of
the device on which the device directory resides. The old
device cache file header line -- the "2 sections" line in
the above warning message, node reads "2 sections, dev=600".

This is not a serious problem, since lsof automatically
rebuilds the device cache file with the correct header
line.

3.35 What do "like block special" and "like character special" mean
in the NAME column?

When lsof comes across an open block or character file
whose device, raw device and inode place it somewhere other
than /dev (or /devices), lsof doesn't report the /dev (or
/devices) name in the NAME column. Instead lsof reports
the file system name and device or path name in the NAME
column and parenthetically adds "like block special <path>"
or "like character special <path>".

The value for <path> will point to a block or character
device in /dev (or /devices) whose raw device number matches
that of the open file being reported, but whose device
number or node number (or both) don't match.

Such an open file is connected to a device node that has
been created in a directory other than /dev (or /devices.)
See mknod(8) for information on how such nodes are created.
(Generally one needs root power to create device nodes with
mknod.)

3.36 Why does an lsof make fail because of undefined symbols?

When lsof is compiled via the `make` step and the final
load step fails because of missing symbols, the problem
may not be lsof. The problem may be that ld, called by
the compiler as part of the `make` step, can't find some
library that lsof needs.

First check the last compiler line of the make operation
-- e.g., the last line with cc or gcc in it before the
undefined symbol report -- for loader arguments, i.e.,
ones beginning with "-l". Except for "-llsof" the rest
name system libraries. ("-L./lib" precedes "-llsof" to
tell the loader its location.)

Check that all the named system libraries exist. Look in
/lib and /usr/lib as a start, but that may not be the only
place system libraries live. Consult your dialect's
documentation, e.g., the compiler and loader man pages,
for other possible locations.

If some system library doesn't exist, that may mean it was
never installed or was removed. You'll have to re-install
the missing library.

You may find that all the system libraries lsof uses exist.
Your next step might be to use nm and grep to see if any
of them contain the undefined symbols.

    $ nm library | grep symbol

If the undefined symbol exists in some library named by
the lsof make step, then you might have a problem with some
environment variable that controls the load step. The most
common is LD_LIBRARY_PATH. It may have a setting that
causes ld to ignore a directory containing a library lsof
names. If this is the case, try unsetting LD_LIBRARY_PATH
in the environment of the ld process -- e.g., do:

    $ unset LD_LIBRARY_PATH
or
    % unsetenv LD_LIBRARY_PATH

Consult your ld man page for other environment variables
that might affect library searching -- e.g., LIBPATH, LPATH,
SHLIB_PATH, etc.

If the undefined function doesn't exist in any libraries
lsof names, check other libraries. See if the function
has a man page that names its library. If the latter is
true, please let me know, because that is an lsof problem
I need to fix.

If none of these solutions work for you, send me some
documentation via e-mail at <abe@purdue.edu>. Include `uname
-a` output, the output of the lsof `Configure ...` and `make`
steps, and the contents of the environment in force when the
`make` step was executed -- e.g., `env` or `printenv` output.
If you've located the libraries lsof names, send me that
information, too. Make sure "lsof" appears in the "Subject:"
line so my e-mail filter won't classify your letter as Spam.

3.37 Command Regular Expressions (REs)

3.37.1 What are basic and extended regular expressions?

Lsof's ``-c'' option allows the specification of regular
expressions (REs), enclosed in two slash ('/') characters and
followed by these modifiers:

   b the RE is a basic RE.
   i ignore case.
   x the RE is an extended RE (the default).

Note: the characters of the regular expression may need to
be quoted to prevent their expansion by the shell.

Example: this RE is an extended RE that matches exactly
four characters, whose third may be an upper ('O') or lower
case ('o') oh:

   -c /^..o.$/i

For simplicity's sake, an RE that is acceptable to egrep(1)
is usually called an extended RE.

REs suitable for the old line editor, ed(1), are often
called basic REs (and sometimes also called obsolete).

These are some ways basic REs usually differ from extended

REs. (There are other differences.)

* `|', `+', `?', '{', and '}' are ordinary characters.

* `^' is an ordinary character except at the beginning of
  the RE.

* `$' is an ordinary character except at the end of the
  RE.

* `*' is an ordinary character if it appears at the
  beginning of the RE.

For more information on REs and the distinction between
basic and extended REs, consult your dialect's man pages
for ed(1), egrep(1), sed(1), and possibly regex(5) or
regex(7).

3.37.2 Why can't I put a slash in a command regular expression?

Since a UNIX command name is the last part of a path to
the command's executable, the lsof command regular expression
(RE) syntax uses slash ('/') to mark the beginning and end
of an RE. Slash may not appear in the RE and the `\'
back-slash escape is ineffective for "hiding" it.

More likely than not, if you try to put a slash in an lsof
command RE, you'll get this response:

    $ lsof -s/.\// ...
    lsof: invalid regexp modifier: /

Lsof is complaining the the first character it found after
the second slash isn't an lsof command RE modifier -- 'b',
'i', or 'x'.

3.37.3 Why does lsof say my command regular expression wasn't found?

When you use both forms of lsof's -c option --
``-c <command>" and ``-c /RE/[m]" -- and ask that lsof
do a verbose search (``-V"), you may be surprised that
lsof will say that the regular expression wasn't found.

This can happen if the ``-c <command>" form matches first,
because then the ``-c/RE/[m]" test will never have been
applied. For example:

    $ ./lsof -clsof -c/^..o.$/ -V -adcwd

```
COMMAND  PID USER   FD   TYPE DEVICE SIZE/OFF  NODE NAME
lsof  7850  abe  cwd  VDIR   6,0    2048 96442 / (/dev/sd0a)
lsof: no command found for regex: ^..o.$
```

The ``-clsof'' option matched first, so the ``-c/^..o.$/
option wasn't tested.

3.38 Why doesn't lsof report on shared memory segments?

Lsof reports on shared memory segments only if they're
associated with an open file. That's consistent with lsof's
mission -- to LiSt Open Files. Shared memory segments with
no file associations aren't open files.

That's not to say that a report on shared memory segments
and their associated processes wouldn't be useful. But it
calls for a new tool, not more baggage for lsof.

3.39 Why does lsof report two instances of itself?

When you ask lsof to report all open files and it has
permission to do so, you may see two lsof processes in the
output. The processes are connected via pipes -- e.g.,
here's an HP-UX 11 example.

```
COMMAND    PID USER  FD  TYPE    DEVICE ...
...
lsof     29450  abe   7w  PIPE 0x48732408 ...
lsof     29450  abe   8r  PIPE 0x48970808 ...
...
lsof     29451  abe   6r  PIPE 0x48732408 ...
lsof     29451  abe   9w  PIPE 0x48970808 ...
```

The first process will usually be the lsof you initiated;
the second, an lsof child process that is used to isolate
its parent process from kernel functions that can block --
e.g., readlink() or stat().

Information to and from the kernel functions is exchanged
via the two pipes. When the parent process detects that
the child process has become blocked, it attempts to kill
the child. Depending on the UNIX dialect that may succeed
or fail, but the parent won't be blocked in any event.

See the "BLOCKS AND TIMEOUTS" and "AVOIDING KERNEL BLOCKS"
sections of the lsof man page for more information on why
the child process is used and how you can specify lsof
options to avoid it. (Caution: that may be risky.)

3.40 Why does lsof report '\n' in device cache file error messages?

Lsof revisions prior to 4.58 may report '\n' in error
messages it delivers about problems in the device cache
file -- e.g.,

    lsof: WARNING: no ...: 4 sections\n

That's deliberately done to show the exact contents of the
device cache file line about which lsof is complaining,
including its terminating NL (New Line) '\n' character.
In the above example the line in the device cache file
causing the lsof complaint contains "4 sections" and ends
with a '\n'.

At revision 4.58 and above, device cache error messages
like the one in the above example have been changed to
read:

    lsof: WARNING: no ...: line "4 sections"

The terminal '\n' is no longer reported, the line contents
are enclosed in double quote marks (""), and the word
"line" has been added as a prefix to denote that what
follows is a line from the device cache file.

3.41 Kernel Symbol and Address Problems

3.41.1 What does "lsof: WARNING: name cache hash size length error: 0"
mean?

When run on some systems, lsof may issue this warning:

    lsof: WARNING: name cache hash size length error: 0

That is an example from a FreeBSD system where lsof reads
the kernel's _nchash variable and finds its value is zero.

Similar warnings include:

    WARNING: kernel name cache size:
    WARNING: can't read kernel's name cache:
    WARNING: no name cache address
    WARNING: name cache hash size length error:
    WARNING: unusable name cache size:

These warnings are issued when lsof is attempting to read

the kernel's name cache information. They are usually the
result of a mis-match between the addresses for kernel
symbols lsof gets via nlist(2) and the addresses in use by
the kernel.

Lsof usually gets kernel symbol addresses from what it
believes to be the kernel boot file. In FreeBSD, for
example, that's the path returned by getbootfile(3), usually
/kernel. The boot file can have other names in other UNIX
dialects -- /unix, /vmunix, /bsd, /netbsd, /mach, /stand/vmunix,
etc.

Lsof will get incorrect (mismatched) addresses from the
boot file if it has been replaced by a newer one which
hasn't yet been booted -- e.g., if this is done in FreeBSD:

    # mv /kernel /kernel.OLD
    # mv /kernel.NEW /kernel

Until the FreeBSD system is rebooted, the booted kernel is
/kernel.OLD, but getbootfile() says it is /kernel. If
symbol addresses important to lsof in /kernel.OLD and
/kernel don't match, the lsof WARNING messages result.

3.41.2 Why does lsof produce "garbage" output?

Kernel name cache warnings may not be the only sign that
lsof is using incorrect symbol addresses to read kernel
values. If there's no reasonable test lsof can make on
what it reads from the kernel, it may issue other warnings
or even report nonsensical results.

The warnings may appear on STDERR, such as:

    lsof: can't read proc table info

Or the warnings may appear in the NAME column as messages
saying lsof can't read or interpret some kernel structure --
e.g.,

    ... NAME
    ... can't read file struct from 0x12345

One possible work-around is to point lsof's kernel symbol
address gathering at the proper boot file. That can be
done with lsof's -k option -- e.g.,

    $ lsof -k /kernel.OLD

The best work-around is to make sure the standard boot file
is properly sited -- e.g., if you've moved a new /kernel
in place, boot it.

3.42   Why does lsof report open files when run as super user that
it doesn't report when run with lesser privileges?

The most likely cause is that the HASSECURITY option was
selected when the lsof executable was built.

If HASSECURITY is defined when lsof is built, and lsof is
run with the privileges of a non-ROOT user, it will only
list open files belonging to the user. The same lsof
executable, when run with root user privileges, will list
all open files.

However, if HASSECURITY and HASNOSOCKSECURITY are both
defined when lsof is built, lsof will list open files
belonging to the user and will also list anyone else's open
socket files, provided their listing is selected with the
"-i" option.

So first ask yourself if the process whose open files lsof
won't list belong to a user other than the one under which
you're running lsof, and are not open socket files. If
either is true, use lsof's help (-h or -?) option and look
for a line near the bottom of the help panel that says:

    "... can list all files..."

If the leading "..." says "Only root" then HASSECURITY was
defined when lsof was built. If the trailing "..." says
", but anyone can list socket files" then HASNOSOCKSECURITY
was also defined.

Should you want an lsof not built with HASSECURITY defined,
rerun the lsof Configure script. If you let Configure do
customization, make sure you answer 'n' when it asks if
you want to enable HASSECURITY and HASNOSOCKSECURITY. If
you don't need to do customization, you can rebuild lsof
with the "-n" option to Configure. Here's an example of
such a rebuild sequence:

    $ Configure -clean
    $ Configure -n <dialect-abbreviation>
    $ make

More information on the HASSECURITY and HASNOSOCKSECURITY
options may be found in the "Security" section of the
00README file of the lsof distribution.

3.43 Test Suite Problems

3.43.1 Errors all tests can report:

3.43.1.1 Why do tests complain "ERROR!!! can't execute ../lsof"?

All tests in the test suite expect an executable lsof file
to exist in the tests parent directory, ../lsof.

If there's none there, the tests/Makefile has a rule to
make it, but there are probably circumstances where that
rule may fail.

The work-around is to re-Configure and re-make lsof, then
run the test suite.

3.43.1.2 Why do tests complain "ERROR!!! can't find ..." a file?

Many tests create (or use from a supplied environment
variable path) a test file and use lsof to find it. When
lsof can't file the file, the tests report the error with
messages of the form:

    ERROR!!! can't find ... : <some file path>
 or
    ERROR!!! lsof couldn't find ...

These type of error messages mean that the lsof field output
delivered to the test didn't contain a file that the test
could identify as the one it intended lsof to find. It
might also mean that the process information -- command
name, PID or parent PID -- didn't match what the test
expected.

This could imply a bug in the test or a bug in lsof. Try
using lsof to find a known file that is open. For example,
while in the tests sub-directory, do this:

    $ sleep 30 < Makefile
    $ ../lsof Makefile

If lsof doesn't report that Makefile is open, then the
fault may be with lsof. If lsof reports the file is open,
search further in the test code for the failure cause.

3.43.1.3 Why do some tests fail to compile?

If a test suite program fails to compile, it may be because
I've never had an opportunity to compile the test on the
particular UNIX version you are using.

See Appendix B in 00TEST for a list of the UNIX dialects
where the test suite has been validate.

3.43.1.4 Why do some tests always fail?

There are several tests in the optional group that have
conflicting or special requirements:

   LTbigf   needs a dialect and file system that support
  large files.

   LTlock   won't work if the tests/ sub-directory is
  on an NFS file system.

   LTnfs   won't work if the tests/ sub-directory is
  not on an NFS file system.

So for two tests in particular, LTlock and LTnfs, one will
generally fail.

Some failing tests can be run successfully by supplying to
them a path to the appropriate type of file system with
the -p option.

3.43.1.5 Why does the test suite say it hasn't been validated on
 my dialect?

When you use the default rule of the test suite's Makefile,
it may issue this complaint:

  $ cd tests
  $ make
  !!!WARNING!!!

  This dialect or its particular version may not have
  been validated with the lsof test suite. Consequently
  some tests may fail or may not even compile.

  !!!WARNING!!!

You are then given the opportunity to answer 'y' to have

the test suite operation continue.

This message means that the tests/TestDB file in the tests
sub-directory doesn't show that the test suite has been
run with the combination of compiler flags found in
tests/config.cflags. The tests might nor run; they may
encounter compiler failures.

See 00TEST for more information on the UNIX dialects where
the test suite has been validated and on the workings of
TestDB and its supporting scripts.

When the tests/Makefile "auto" rule is used, the message
is more terse and the condition is fatal.

    This suite has not been validated on:

 <dialect_description>

No opportunity to continue is offered.

The tests/Makefile "silent" rule will skip checking for
the validation footprint.

3.43.1.6 Why do the tests complain they can't stat() or open()
 /dev/mem or /dev/kmem?

When the tests detect that lsof for the dialect reads its
information from kernel memory (i.e., the LT_KMEM definition
is present in tests/config.cflags), and when the lsof
executable path is ../lsof, the tests make sure they can
stat() and open() for read access the relevant kernel memory
devices, /dev/kmem and possibly /dev/mem.

If those stat() or open() operations fail, the tests issue
an error message and quit. The message explains why the
system rejected the operation in terms of system "errno"
symbols and messages. More often than not the explanation
will be that the process lacks permission to access the
indicated device node.

One work-around is to give the lsof executable being tested
the necessary permission -- e.g., via chgrp, chmod, etc.
-- and set its path in the LT_LSOF_PATH environment variable.
(See 00TEST.)

Another work-around is to make sure the process that runs
the tests has the necessary permissions -- e.g., run it as

root, or enable the process login to access the resources.
For example, I can run the tests on my personal work-station
because /dev/kmem and /dev/mem are readable by the "kmem"
group and my login is in that group.

3.43.2 LTbigf test issues

3.43.2.1 Why does the LTbigf test say that the dialect doesn't
 support large files?

Large file support is defined dialect by dialect in the
lsof source files and Configure script. If large file
support isn't defined there, it isn't defined in the LTbigf
test.

If you think that's wrong for a particular dialect, contact me
via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the
"Subject:" line so my e-mail filter won't classify your letter
as Spam.

3.43.2.2 Why does LTbigf complain about operations on its config.LTbigf*
 file?

The LTbigf must be able to write a large file test (size
> 32 bits) and seek within it and the process file ulimit
size must permit the operation. If the default location
for the test file, tests/, isn't on a file system enabled
for large file operations or if the process ulimit file
block size is too small, lsof will get file operation
errors, particularly when seeking

There may be a work-around. Specify the path to a file
LTbigf can write in a file system enabled for large file
operations a the -poption. Make sure that the ulimit file
block size permits writing a large file. For example,
presuming /scratch23 is large-file-enabled, and presuming
you have permission to raise the ulimit file block size,
this shell commands will allow the LTbigf test to run on
AIX:

    $ ./LTbigf -p /scratch23/abe/bigfile

(Note: syntax for the ulimit command varies by dialect and
by shell. Discovering the proper variant is left to the
reader.)

More information on this subject can be found in the LTbigf

description in the 00TEST file. If course, the LTbigf.c
source file in tests/ is the ultimate source of information,

3.43.2.3 Why does LTbigf warn that lsof doesn't return file offsets?

On some dialects (e.g., Linux) lsof can't report file
offsets, because the data access method underlying lsof
doesn't provide them. If LTbigf knows that lsof can't
report file offsets for the dialect, it issues this warning:

   LTbigf ... WARNING!!! lsof can't return file offsets
   for this dialect, so offset tests have
   been disabled.

LTbigf then performs the size test and skips the offset
tests.

For more information see 00TEST and the "Why doesn't
/proc-based lsof report file offsets (positions)?" Q&A of
this file.

3.43.3 Why does the LTbasic test complain "ERROR!!! lsof this ..."
and "ERROR!!! lsof that ..."?

The LTbasic test program uses lsof to examine a running
lsof process. It looks for the lsof current working
directory, executable (if possible), and kernel memory file
(if applicable).

Failures to find those things result in the LTbasic error
messages. More information on how LTbasic produces the error
messages may be found in the LTbasic.c source file.

On HP-UX 11.11 and higher, for example, if the test's current
working directory is on a loopback (LOFS) file system, LTbasic
won't be able to find the current working directory of the lsof
process because of a bug in the HP-UX kernel.

The solution for that HP-UX problem is to install an HP-UX
patch. See the answer to the "Why doesn't PSTAT-based lsof
report a CWD that is on a loopback (LOFS) file system?"
question for more information on the patch.

3.43.4 NFS test issues

3.43.4.1 Why does the LTnfs test complain "couldn't find NFS file ..."?

The LTnfs test must work with an NFS test file. After it

opens the file it asks lsof to find it on an NFS file system.
If the file isn't on an NFS file system, lsof won't find it,
and the NFS test script complains and fails.

The work-around is to use -p option to supply a path to a
regular NFS file (not a directory) that is on an NFS file
system that LTnfs can read. Presuming /share/bin/file is
such a file and can be opened for reading by the LTnfs
test, this sample shell command could be used to run the
LTnfs test successfully:

    $ ./LTnfs -p /share/bin/file

(If the NFS file system is enabled for large files, the
NFS test will produce the error message described in the
following Q&A.)

3.43.5 LTnlink test issues

3.43.5.1 Why does the LTnlink test complain that its test file is on
 an NFS file system?

The LTnlink test may complain:

    LTnlink ... WARNING!!! test file <path> is NFS mounted.

and then issue an explanation and a hint about using the
-p option.

The LTnlist test does this because of the way NFS file
links are managed when an NFS file is unlinked and the
unlinking process still has the file open. Unlike with
files on a local file system, when an NFS file that is
still open is unlinked, its link count is not reduced.

The file name is changed to a name of the form .nfsxxxx
and the link count is left unchanged until the process
holding the file open closes it. That's done by NFS so it
can keep proper track of the file on NFS clients and servers.

Since the link count isn't reduced when the LTnlink test
program closes the NFS test file it still has open, lsof
won't find it for LTnlink with a link count of zero.
Consequently, LTnlink disables that test section and issues
its warning.

The warning suggests that the unlink test section can be
run by giving LTnlink a path to a test file with the -p

option. That path must name a file LTnlink can write and
unlink. Presuming /scratch23/abe/nlinkfile is on a local
file system and the LTnlink test can write to it and unlink
it, this sample shell command can be used to run the complete
LTnlink test successfully:

    $ LTnlink -p /scratch23/abe/nlinkfile

3.43.5.2 Why does LTnlink delay and report "waiting for link count
  update: ..."?

On some UNIX dialects and file system combinations the
updating of link count after a file has been unlinked can
be delayed. Consequently, lsof won't be able to report
the updated link count to LTnlink for a while.

When lsof doesn't report the proper link count to LTnlink,
it sleeps and repeats the lsof call, using the "waiting
for link count update: ..." message as a signal that it is
waiting for the expected lsof response. The wait cycle
duration is limited to approximately one minute.

3.43.6 LTdnlc test issues

3.43.6.1 Why won't the LTdnlc test run?

Lsof is unable to access the DNLC cache on AIX, because the
kernel symbols for the DNLC aren't exported. Contact IBM
to learn why that decision was made.

The LTdnlc test won't work on Apple Darwin because lsof
can't obtain reliable DNLC information.

The LTdnlc test may fail on other dialects. Failure causes
include: a busy system with a DNLC that is changing rapidly;
path name components too large for the DNLC; a file system
-- e.g., NFS, /tmp, loopback -- which doesn't fully
participate in the DNLC; or DNLC limitations (Many DNLC
implementations will only store path name components if
they are 31 characters or less.)

If you suspect the file system doesn't fully participate
in kernel DNLC processing, as a work-around rebuild and
test lsof on one that does.

3.43.6.2 What does the LTdnlc test mean by "... <path> found: 100.00%"?

Even when it succeeds the LTdnlc test will report:

LTdnlc ... /export/home/abe/src/lsof4/tests found: 100.00%

This message means that the LTdnlc test asked lsof to find
the file at the indicated path five times and lsof found
the full path name in the indicated percentage of calls.
The LTdnlc test considers it a failure if the percentage
falls below 50.0%

3.43.6.3 Why does the DNLC test fail?

The DNLC test may fail when some component of the lsof
tests/ sub-directory can't be cached by the kernel DNLC.
Some kernels have a limit on the length of individual
components (typically) 32.

3.43.7 Why hasn't the test suite been qualified for 64 bit HP-UX
11 when lsof is compiled with gcc?

When I attempted to qualify lsof for HP-UX 11, compiled
with gcc 3.0, the LTsock test failed. I traced the failure
to a gcc compilation error. Because LTsock is an important
test, I didn't feel that the test suite was qualified if
it failed.

LTsock compiles and runs correctly on 64 bit HP-UX 11 when
compiled with HP's ANSI-C.

3.43.8 LTszoff test issues

3.43.8.1 Why does LTszoff warn that lsof doesn't return file offsets?

On some dialects (e.g., Linux) lsof can't report file
offsets, because the data access method underlying lsof
doesn't provide them. If LTszoff knows that lsof can't
report file offsets for the dialect, it issues this warning:

LTszoff ... WARNING!!! lsof can't return file offsets
for this dialect, so offset tests have
been disabled.

LTszoff then performs the size test and skips the offset
tests.

For more information see 00TEST and the "Why doesn't
/proc-based lsof report file offsets (positions)?" Q&A of
this file.

3.43.9 LTlock test issues

3.44 File descriptor list (the ``-d'' option) problems

3.44.1 Why does lsof reject a ``-d'' FD list?

Lsof rejects ``-d'' FD lists that contain both exclusions
and inclusions with messages like:

    lsof: exclude in an include list: ^1
    lsof: include in an exclude list: 2

That's because ``-d'' FD lists are processed as ORed lists,
so it makes no sense for them to contain both exclusions
and inclusions.

I.e.,, if a ``-d'' FD list were to contain ``^cwd,1'', the
``^cwd'' member is useless, because the ``1'' member
dominates by saying "include only FD 1". That effectively
excludes ``cwd'' FD.

Note that lists may have multiple members of the same type,
exclude or include. They are processed as an ORed set.
If an FD isn't excluded by any member of an exclude list,
it is selected. If an FD is included by any member of an
include list, it is selected.

3.44.2 Why are file descriptors other than those in my FD list
reported?

The FD list that follows ``-d'' excludes or includes file
descriptors, but unless the ``-a'' (AND) option is specified,
the FD list selections are ORed to the other selections.

For example, the following lsof command will cause all file
descriptors to be listed for the lsof command, and all but
the cwd descriptor for all other commands, probably not
what was intended.

    $ lsof -clsof -d^cwd

Hint: use ``-a'' -- e.g.,

    $ lsof -clsof -a -d^cwd

3.45 How can I supply device numbers for inaccessible NFS file
systems?

When lsof can't get device numbers for inaccessible NFS file
systems via stat(2) or lstat(2), it attempts to get them from
the mount table's dev=xxx options. Successes are reported with
a warning message that indicates the source of the device
number and that output might be incomplete as a consequence of
the warnings.

Some system mount tables -- e.g., Linux /proc/mounts -- don't
have a dev=xxx option. In that case, and provided lsof for the
dialect supports them, you can use the +m option to create a
mount table supplement file and the "+m m" option to use it.

First check the lsof -h (help) output to see if the +m and
"+m m" options are supported. If they are, use +m to create a
mount table supplement file when all mounted file systems are
accessible. Use "+m m" later to make the supplement available
when some mounted file systems might not be available.

Here's an example that creates a mount supplement file in
$HOME/mnt-sup and later makes it available to lsof.

```
    $ rm -f $HOME/mnt-sup
    $ lsof +m > $HOME/mnt-sup
    ...
    $ lsof +m $HOME/mnt-sup <other lsof options>
```

If lsof has to get the device number from the supplement, it
will issue an informative warning message. The warning can be
suppressed with lsof's -w option.

Caution! Since the mount table supplement file is static, it
is its supplier's responsibility to update it as file system
mounts change.

For more information, consult the lsof man page. The
"ALTERNATE DEVICE NUMBERS" section has useful information on
how lsof acquires device numbers when stat(2) or lstat(2)
fail.

3.46 Why won't lsof find open files on over-mounted file systems?

When a file system, /xyz for example, is mounted on the same
mount point as another file system, /abc for example, running
lsof with an argument of the path of the first file system's
mount point -- the over-mounted one, /abc -- probably will not
reveal any files open on /abc.

That's because lsof looks for open files on a file system by

looking for files with the file system's device number. The
two file systems usually have different device numbers and lsof
determines the device number search key from the supplied name
of the second file system.

A general work-around exists only for Linux. On that UNIX
dialect, when you know the over-mounted file system's mount
point path, you can ask lsof to report on all open files and
grep that output for the path of the over-mounted file system
mount point.

3.47 What can be done when lsof reports no more space?

Many lsof methods cache information in memory, using the
dialects malloc() library function. When malloc() can't
allocate the requested amount of memory, lsof exits with
warning messages similar to this AIX message:

    lsof: no more dev-ch space at pid 2257750: 0x82a8e600

Lsof then exits immediately and produces no more output.

A possible work-around is to increase the memory foot print
of the shell that runs lsof. That is often done with the
ulimit(1) shell command.

3.48 What if the lsof build encounters ar and ld problems?

The lsof main and library Makefiles use the library archiver,
ar, and the system loader, ld, applications. Improperly
located, installed or configured versions of them may cause the
lsof build to encounter errors with them.

The application producing the error should identify itself in
its error messages.

The first thing to check the path of the application that is
being used. Try `which ar` or `which ld` to see if perhaps the
PATH used during the build might be causing the wrong archiver
or loader to be used.

If the problem is with the use of the wrong archiver, and it's
not possible to correct the PATH to it, try using the LSOF_AR
environment variable to specify the path to and arguments for
the correct archiver. See 00XCONFIG for more information and
note that LSOF_AR must specify the path to the archive
application and the arguments for it, less the terminating
library and module name arguments.

If the problem is with the loader, there is no lsof work-
around. That's because lsof calls the loader via the C
compiler, so the problem must be fixed at the compiler (system)
level.

4.0 AIX Problems

4.1 What is the Stale Segment ID bug and why is -X needed?

Kevin Ruderman reports that he has been informed by IBM
that processes using the AIX 3.2.x, 4.1[.12345]], 4.2[.1],
and 4.3.x kernel's readx() function can cause other AIX
processes to hang because of what appears to be file system
corruption.

This failure, known as the Stale Segment ID bug, is caused
by an error in the AIX kernel's journaled segment memory
handler that causes the kernel's dir_search() function
erroneously to believe directory entries contain zeroes.
The process using the readx() call need not be doing anything
wrong. Usually the system must be under such heavy load
that the segment ID being used in the readx() call has been
freed and then reallocated to another process since it was
obtained from kernel memory.

Lsof uses the readx() function to access library entry
structures, based on the segment ID it finds in the proc
structure of a process. Since IBM probably will never fix
the kernel bug, I've added an AIX-specific option to lsof
that controls its use of the readx() function.

By default lsof readx() use is disabled; specifying the
``-X'' option enables readx() use.

If you want to change the default readx() behavior of AIX
lsof, change the HASXOPT, HASXOPT_ROOT, and HASXOPT_VALUE
definitions in dialects/aix/machine.h. You can also use
these definitions to enable or disable readx() -- consult
the comments in machine.h. You may want to disable readx()
use permanently if you plan to make lsof publicly executable.

When HASXOPT_ROOT is defined, lsof will restrict use of
the -X option to processes whose real UID is root; if
HASXOPT_ROOT isn't defined, any user may specify the -X
option. The Customize script offers the option to change
HASXOPT_ROOT when HASXOPT is defined and HASXOPT_ROOT is

named in any dialect's machine.h header file.

I have never seen lsof cause a problem with its use of readx(), but I believe there is some chance it could, given the right circumstances.

4.1.1 Stale Segment ID APAR

Here are the details of the Stale Segment ID bug and IBM's response, provided by Kevin Ruderman.

```
AIX V3
 APAR=ix49183
    user process hangs forever in kernel due to file
    system corruption
 STAT=closed prs  TID=tx2527 ISEV=2 SEV=2
    (A "closed prs" is one closed with a Permanent
    ReStriction.)
 RCOMP=575603001 aix v3 for rs/6 RREL=r320

AIX V4  (internal defect, no apar #)
 prefix      p
 name        175671
 abstract    KERMP: loop for ever in dir_search()
```

Problem description:

1. Some user application -- e.g., lsof -- gets the segment
   ID (SID) for the process private segment of a target
   process from the process table.

2. The target process exits, deleting the process private
   segment.

3. The SID is reallocated for use as a persistent segment.

4. The user application runs again and tries to read the
   user area structure from /dev/mem, using the SID it read
   from the process table.

5. The loads done by the driver for /dev/mem cause faults
   in the directory; new blocks are allocated; the size
   changed; and zero pages created.

6. The next application that looks for a file in the affected
   directory hangs in the kernel's dir_search() function
   because of the zero pages. This occurs because the
   kernel's dir_search() function loops through the variable

length entries one at a time, moving from one to the
next by adding the length of the current entry to its
address to get the address of the next entry. This
process should end when the current pointer passes the
end of the known directory length.

However, while the directory length has increased, the
entry length data has not, so when dir_search() reaches
the zero pages, it loops forever, adding a length of
zero to the current pointer, never passing the end of
the directory length. The application process is hung;
it can't be killed or stopped.

IBM closed the problem with a PRS code (Permanent ReStriction)
under AIX Version 3 and had targeted a fix for AIX 4.2. They
have recently (I became aware of it September 10, 1996)
cancelled the defect report altogether and have indicated they
are not going to fix the defect.

4.2 Gcc Work-around for AIX 4.1x

When gcc is used to compile lsof for AIX 4.1x, it doesn't
align one element of the user structure correctly. Xlc
sees the U_irss element as a type "long long" and aligns
it on an 8 byte boundary. That's because the default mode
of xlc is -qlonglong; when -qlonglong is enabled, the
_LONG_LONG symbol is also defined.

Gcc sees U_irss as a two element array of type long, because
_LONG_LONG isn't defined. Hence gcc aligns the U_irss
element array on a 4 byte boundary, rather than an 8 byte
one, making the gcc incantation of the user structure 4
bytes shorter than xlc's.

When the length of gcc's user structure is supplied as
argument 4 to the undocumented getuser() function of the
AIX kernel, getuser() rejects it as an incorrect size and
returns EINVAL.

Lsof has a work-around for this problem. It involves a
special test in the Configure script when the "aixgcc"
Configure abbreviation is used -- e.g.,

 $ Configure -n aixgcc

The test is to compile a small program with gcc and check
the alignment of U_irss. If it's not aligned on an 8 byte
boundary, the Configure script makes a special copy of

<sys/user.h> in ./dialects/aix/aix<AIX_version> whose
U_irss will align properly, and generates compile time
options to use it.

While I have tested this work-around only with 4.1.4, it
should work with earlier versions of AIX 4.1. It does not
work for AIX 4.2; a different work-around is employed there.
(See the next section.)

If you want to use this technique to compile other AIX
4.1x programs with gcc for using getuser(), check the
Configure script.

Stuart D. Gathman identified this gcc AIX alignment problem.

4.3 Gcc and AIX 4.2[.1]

Alignment problems with gcc and AIX 4.2[.1] inside the user
structure are more severe, because there are some new 64
bit types in AIX that gcc doesn't yet (as of 2.7.x) support.
The <sys/user.h> U_irss element problem, discussed in 4.3
above, doesn't exist in 4.2[.1].

The AIX lsof machine.h header file has a work-around,
provided by Henry Grebler, that bypasses gcc alignment
problems. Later versions of gcc (e.g., 2.8.x) will probably
bypass the problems as well.

4.4 Why won't lsof's Configure allow the use of gcc for AIX
below 4.1?

Gcc can't reliably be used to compile lsof for AIX versions
below AIX 4.1 because of possible kernel structure element
alignment differences between it and xlc.

4.5 What is an AIX SMT file type?

When you run AIX X clients with the DISPLAY environment
variable set to ``:0.0'' they communicate with the AIX X
server via files whose kernel file structure has an undefined
type (f_type == 0xf) -- at least there's no definition for
it in <sys/file.h>.

These are Shared Memory Transport (SMT) sockets, an artifact
of AIXWindows, designed for more efficient data transfers
between the X server and its clients.

Henry Grebler and David J. Wilson alerted me to the existence

of these files. Mike Feldman and others helped me identify
them as SMT sockets.

The curious reader can find more about SMT sockets in
/usr/lpp/X11/README.SMT.

4.6 Why does AIX lsof start so slowly?

When AIX lsof starts it compares the running kernel's
identity to the one for which it was built, using
/usr/bin/oslevel. That comparison can sometimes take a
long time to complete, depending on the system's maintenance
level and how recently it was examined with oslevel.

AIX revisions 4.67 and above for AIX 5 and above don't use
oslevel to determine the kernel identity. They use uname(2)
instead, and it is much faster.

You can skip the oslevel test by suppressing warning messages
with lsof's -w option. Doing that carries with it the risk
of missing other warning messages, however.

You can also disable the kernel identity check by disabling
the definition of the HASKERNIDCK symbol by editing AIX
machine.h header file or by using the Customize script to
disable it.

See the "Why does lsof warn "compiled for x ... y; this is
z.?" section for more information.

4.7 Why does exec complain it can't find libc.a[shr.o]?

When you try to execute lsof you may get this complaint:

    exec(): 0509-036 Cannot load program ./lsof because of
        the following errors:
     0509-022 Cannot load library libc.a[shr.o].
     0509-026 System error: A file or directory in
   the path name does not exist.

This is probably the result of making lsof when the LIBPATH
environment variable contained a directory path that doesn't
contain libc.a. You can see what LIBPATH contained when
lsof was made by using the dump application on lsof. For
example, if LIBPATH contained /foo/bar when lsof was made,
you will see this (partial) dump output:

    $ dump -H lsof

```
   ...
 ***Import File Strings***
   INDEX  PATH                 BASE      ...
   0     /foo/bar
```

To correct the problem, revisit the lsof source directory
and remake lsof this way:

```
   $ unset LIBPATH; make  (sh or ksh)
or
   % unsetenv LIBPATH; make  (csh or tcsh)
```

4.8 What does lsof mean when it says, "no PCB, CANTSENDMORE,
CANTRCVMORE" in a socket file's NAME column?

When an AIX application calls shutdown(2) on an open socket
file, but hasn't called close(2) on the file, the file will
remain visible to lsof as an open socket file without any
extended protocol information.

Lsof reports that state in the NAME column by saying that
there is "no PCB" (Protocol Control Block) for the protocol
(e.g., TCP in the NODE column). If the open socket file
has the state variables SO_CANTSENDMORE and SO_CANTRCVMORE
set -- i.e., from the shutdown(2) call -- lsof reports them
with the CANTSENDMORE and CANTRCVMORE notes in the NAME
column.

4.9 When the -X option is used on AIX 4.3.3, why does lsof disable
it, saying "WARNING: user struct mismatch; -X option disabled?"

The -X option causes lsof to read the loader information
of the user structure from virtual memory via the readx()
system call. It does that with the user structure definition
from <sys/user.h> that was compiled into the lsof executable.

On AIX 4.3.3 there are two different user structure
definitions in two separate <sys/user.h> header files,
distributed at different times by IBM. If lsof was compiled
with one and the kernel on which lsof is being run was
compiled with the other, lsof normally won't get correct
loader information when it calls readx().

In an attempt to compensate for that difference, lsof makes
an independent check of the loader information by getting
the user structure's open file count via readx() and
comparing it to the open file count obtained independently
via getprocs(). When the two counts don't match, lsof

tries to read the count (and re-read the loader information)
with two offsets, based on observed differences between
the two user structures.

When one of the three attempts produces a correct open file
count, lsof uses its corresponding offset on subsequent
readings of the loader information.

When none of the three attempts produces a correct open
file count, lsof issues the WARNING message and disables
-X processing.

To eliminate this problem, obtain an lsof binary that
matches the kernel of the AIX 4.3.3 system where you want
to run lsof. Compiling lsof on the target system is the
preferred way to get a matching binary.

4.10 Why doesn't the -X option work on my AIX 5L or 5.[123] system?

If your AIX 5L or 5.[123] system uses the ia64 architecture,
lsof needs setuid-root permission to be able to do the
processing that -X requires.

Check the output of `uname -a` to determine the architecture
type.

The work-around is to give lsof setuid-root permission.

4.11 Why doesn't /usr/bin/oslevel report the correct AIX version?

The oslevel man page says, "The oslevel command reports
the level of the operating system using a subset of all
filesets installed on your system."

You can see which fileset is below the expected level with
oslevel's -l option. For example, if you believe your
system is at AIX level 4.3.3, but oslevel reports 4.3.2,
use this oslevel command to find the filesets below 4.3.3:

    $ /usr/bin/oslevel -l 4.3.3.0

If you don't know what level argument to supply to oslevel's
-l option, use oslevel's -q option first.

4.11.1 Why doesn't /usr/bin/oslevel report the correct AIX version
on AIX 5.1?

The subset list for oslevel on AIX 5.1 seems to include at

least two filesets, xlsmp.msg.en_US.rte and xlsmp.rte, that
do not install from AIX 5.1 media with a 5.1.0.0 level.
Hence, oslevel reports 5.0.0.0 instead of the expected
5.1.0.0.

If either xlsmp.msg.en_US.rte or xlsmp.rte is installed,
lsof's Configure script and run-time tests will identify
the AIX version incorrectly. The run-time test will
issue a complaint message of this form:

   lsof: WARNING: compiled for AIX version xxx; this is yyy.

You can correct the Configure test by pre-defining the
oslevel value, setting the correct value in the LSOF_VSTR
environment variable before running the Configure script
-- e.g., to pre-define AIX 5.1 when using ksh, do this:

   $ LSOF_VSTR=5.1.0.0 Configure -n aix

You can't affect oslevel output without uninstalling
xlsmp.msg.en_US.rte and xlsmp.rte. If you can't do that,
you'll have to put up with the run-time complaint.

4.12   Why does lsof for AIX 5.1 or above Power architecture
complain about kernel bit size?

When you run an lsof binary on an AIX 5.1 or above Power
system, it might complain:

   lsof: FATAL: compiled for a 32 bit kernel.
    The bit size of this kernel is 64.
or
    exec: 0509-036 Cannot load program ./lsof because of
     the following errors:
       0509-032 Cannot run a 64-bit program on a 32-bit
     machine.

Starting at lsof revision 4.61, lsof binaries for Power
architecture systems running AIX 5.1 or above are closely
tied to the kernel bit size. Lsof must do that so it can
read and understand kernel structures.

Lsof's Configure script tunes the lsof configuration so
that the binary built in the make(1) step is adjusted to
the kernel bit size.

An lsof binary knows the bit size for which it was constructed,
tests the bit size of the kernel under which it is running,

and objects if the two sizes don't match. To see the bit
size for which lsof was constructed, run it with its -v
option and look for these lines in the output:

    configuration info: 32 bit kernel
  or
    configuration info: 64 bit kernel

(Note: these lines will appear only in -v output for AIX
5.1 and above lsof binaries, built for Power architecture.)

You can see the kernel bit size test method in the aix
stanza of the lsof Configure script and in the get_kernel_access()
function of the lsof .../dialects/aix/dproc.c source file.

There is more information on pre-defining the kernel bit
size when building lsof in Configure, 00PORTING, and
00XCONFIG.

The only work-around is to use an lsof binary built to
match the running kernel bit size.

4.13 What can't gcc be used to compile lsof on the ia64 architecture
  for AIX 5 and above?

Gcc can't be used to compile lsof on the ia64 architecture
for AIX 5 and above because I haven't had access to a system
that has a working gcc compiler. The gcc compiler on my
one and only ia64 AIX 5.1 test system, provided by IBM,
didn't work at all.

4.14 Why does lsof get a segmentation fault when compiled with gcc
  for a 64 bit Power architecture AIX 5.1 kernel?

When lsof is configured with the lsof "aixgcc" Configure
abbreviation, the resulting lsof executable may cause a
segmentation violation when it is run. I've observed this
with gcc version 2.9-aix43-010414-7.

As far as I have been able to tell, the segmentation fault
is the result of a gcc compilation, loading, or library
error. Watching lsof run with gcc's companion debugger,
gdb, shows no error in the lsof source code that might
explain the fault.

The only work-around I know is to use the IBM C compiler
in place of gcc -- i.e., use the "aix" lsof Configure
abbreviation.

4.15 Why does lsof ignore AFS on my AIX system?

The lsof Configure script quits on AIX when AFS is present,
the AIX version is greater than 4.3.3.0 or the AFS version
is greater than 3.5. That's because I have no test systems
available for those AIX and AFS version combinations.

When the lsof Configure script detects an AIX and AFS
version combination that is unsupported, it will report:

  !!!FATAL: Lsof does not support AFS on this combination of
    AIX and AFS versions. To disable AFS, set the
    value of the AIX_HAS_AFS environment variable to
    "no".

The only work-around is to set the AIX_HAS_AFS environment
variable as explained in the error message:

  $ AIX_HAS_NSF=no; export AIX_HAS_NFS
  $ ./Configure -n aix

4.16 Why does lsof report "system paging space is low" and exit?

When AIX paging space runs low, the AIX kernel sends a SIGDANGER
signal to processes, warning them that they should reduce their
memory usage.

When lsof receives that signal, it issues the following fatal
error message and exits:

  lsof: FATAL: system paging space is low.

A possible work-around is to limit the amount of information
lsof must cache in its process memory with the "-c", "-g", "-l"
and "-p" options.

Also see the answer to the "What can be done when lsof reports
no more space?" question.

4.17   Why does lsof have a compilation problem on AIX 5.3 above
maintenance level 1?

On some AIX 5.3 systems with maintenance levels 2 and higher
installed, lsof 4.77 and below may not compile properly. The
compiler complains the snapshotObject structure definition,
needed by <j2/j2_inode.h>, is missing.

That problem is fixed in the 4.78 revision.

5.0 Apple Darwin Problems

5.1 What do /dev/kmem-based and libproc-based mean?

Lsof for Apple Darwin currently uses /dev/kmem to read kernel
data structures from which it gathers and reports open file
information. That version of lsof is called /dev/kmem-based
lsof.

At an upcoming release lsof will use a library called libproc
to obtain information about open files. That version of lsof
wil be called libproc-based lsof.

The /dev/kmem-based lsof sources may be found in the kmem
subdirectory of the dialects/darwin branch of the lsof source
tree. When the supporting version of Apple Darwin is released,
the libproc-based lsof sources will be found in
.../dialects/darwin/libproc.

5.2 /dev/kmem-based Apple Darwin Questions

5.2.1 Why does Configure ask for a path to the Darwin XNU kernel
header files?

When lsof was ported to Apple Darwin by Allan Nathanson at
revision 4.53, some kernel header files needed by lsof
weren't being exported by the developers. (That's still
true at lsof revision 4.76.)

At first a shell script that Allan provided would get the
missing header files by checking them out from the CVS
root. Although the script was updated from time to time,
eventually the re-organization of Darwin sources has made
it impossible to update the script to do an automatic
download of the missing header files.

At lsof revision 4.69 and above it is necessary for the Darwin
lsof builder to download the Darwin XNU kernel headers before
attempting to build lsof. The download my be done via a web
browser, starting at this URL:

   http://www.opensource.apple.com/darwinsource/index.html

Once there, select the link to the Mac OS X version that
matches the one on the system where lsof is to be built.

Follow that link's "[Source]" link. Once there, select the
tar.gz link of the xnu* entry near the bottom of the page.
That entry should have a name that matches the xnu* name shown
by `uname -a` -- e.g., if uname reports:

    $ uname -a
    ... root:xnu/xnu-517.7.21 ...

Then the appropriate xnu* entry is xnu-517.7.21. Clicking
its link should lead to an "Apple Open Source" page requesting
an Apple ID and password.

Enter them if they're available. If an Apple ID and password
are not available, get them by following the instructions on
the page -- i.e., follow the signin.apple.com link.

Once a valid Apple ID and its password have been entered,
the download will begin. Select the saving of the downloaded
xnu*.tar.gz file in an appropriate place on the Mac OS X
system.

Once the download completes, install it. Use gunzip to
decompress the download and tar to extract the archive -- e.g.,

    $ gunzip -c xnu-517.7.21.tar.gz | tar xf -

Remember the absolute path to the extracted archive. That is
its installed place. E.g., if the xnu-517.7.21.tar archive was
extracted to the lsof builder's home directory, its full
installation path will be something like:

    ~/xnu-517.7.21

Now run the lsof Configure script. When it asks for the path
to the installed Darwin XNU kernel header files, supply the
path to the gunzip'd and extracted xnu* archive -- e.g.,
~/xnu-517.7.21.

The path to the Darwin XNU kernel headers may also be
supplied to the Configure script in the DARWIN_XNUDIR
environment variable, eliminating the need to enter it
interactively -- e.g.,

    $ DARWIN_XNUDIR=~/xnu-344.49 ./Configure -n darwin

5.2.1.1 Why does Configure complain that Darwin XNU kernel header
 files are missing?

These are some reasons why the lsof Configure script might claim that Darwin XNU header files are missing:

   * The wrong path to them was specified.

   * The files and directories in the path are not readable
     and searchable -- i.e., check the modes and ownerships.

   * The downloaded archive doesn't match the Mac OS X
     version of the system.

If in doubt, revisit the Darwin XNU kernel header file download instructions in the answer to the question "Why does Configure ask for a path to the Darwin XNU kernel header files?"

If Configure still can't find Darwin XNU kernel header files, contact me via e-mail at <abe@purdue.edu> for help. Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

5.2.2 Why doesn't Apple Darwin lsof report text file information?

At the first port of lsof to Apple Darwin, revision 4.53, insufficient information was available -- logic and header files -- to permit the installation of VM space scanning for text files. As of lsof 4.70 it is sill not available.

Text file support will be added to Apple Darwin lsof after the necessary information becomes available.

5.2.3 Why doesn't Apple Darwin lsof support IPv6?

At the first port of lsof to Apple Darwin, revision 4.53, Apple Darwin lacked IPv6 support. IPv6 became available in Apple Darwin version 1.5 and support for it was added to lsof then.

5.2.4 Why does lsof complain about a mismatch between the release for which lsof was compiled and the booted Mac OS X release?

When lsof is started on the "Gold Master" Darwin release (aka Mac OS X), it complains:

   lsof: compiled for 1.0 release; this is 1.3.2.

This happens because the lsof binary released with Mac OS

X was built on a system whose release number (1.0) doesn't match that of the released system -- usually 1.3.x Lsof makes this check because UNIX dialect OS changes are often accompanied by header file changes that affect lsof.

In this specific case, this error can be ignored. If you don't want to do that, get the lsof distribution and build lsof so its built-on and running-on Mac OS X release numbers match.

5.2.5 Why does lsof for Apple Darwin 8 and higher report "stat(...): ..." in the NAME column?

Lsof for Apple Darwin 8 may report messages like these in the NAME column:

    stat(/private/var/run/asl_prune): No such file or directory
 or
    stat(/private/var/db/netinfo/local.nidb/Config): Permission denied

Those messages indicate that lsof was unable to collect open file information for the paths enclosed in "stat(...)" with the stat(2) function, because the function encountered the reported error.

A work-around for the "Permission denied" error is to run lsof with elevated privileges -- e.g., when logged on as the super user.

If the stat(2) error message is "No such file or directory", the file probably has been unlinked (removed) and there is no lsof work-around.

5.2.6 What are the limitations of Apple Darwin lsof link count reporting?

Lsof for Apple Darwin cannot report link count information reliably.

For Apple Darwin below 8 link count information is not always available in the kernel node structures available to lsof. When link count information is available, however, it includes link counts of zero. Thus, using lsof's +L1 option may result in the finding of some files whose link counts are zero.

Lsof can report only some link count information for Apple Darwin 8 and above. Link count information is only available for files where lsof can assemble the full file path and has

permission to apply stat(2) to it. (See the answer to the "Why
does lsof for Apple Darwin 8 and higher report "stat(...): ..."
in the NAME column?" question for more information on stat(2)
failures.)

Apple Darwin 8 and above files that have been unlinked and thus
have a link count of zero cannot be found by stat(2) -- i.e.,
stat(2) returns a "No such file or directory" error. As a
result lsof never displays link counts of zero and the use of
lsof's +L1 option to find them always fails.

5.3 Libproc-based Apple Darwin Questions

6.0 BSD/OS BSDI Problems

6.0.5 Statement of deprecation

 As of lsof revision 4.76 support for BSDI BSD/OS has been
 dropped. The 4.76 distribution of lsof for BSDI BSD/OS may be
 found on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

7.0 DEC OSF/1, Digital UNIX, and Tru64 UNIX Problems

7.1 Why does lsof complain about non-existent /dev/fd entries?

 When you run lsof for Digital UNIX 3.2, lsof may complain:

   lsof: can't lstat /dev/fd/xxx: No such file or directory
   lsof: can't lstat /dev/fd/yyy: No such file or directory

(Or it may warn about other missing /dev/fd paths.) When
you do an ``ls /dev/fd'' none of the missing paths are listed.

This is caused by a bug in the DEC library function
getdirentries(). For some reason, when /dev/fd is a file
system mount point, getdirentries() returns an incorrect
size for it to readdir(). (Lsof calls readdir() in its
ddev.c readdev() function.) Because of the incorrect size,
readdir() goes past the end of the /dev/fd directory buffer,
encounters random paths and returns them to lsof. Lsof
then attempts to lstat(2) the random paths, gets error
replies from lstat(2), and complains about the paths.

Duncan McEwan discovered this error and has reported it to
DEC. Duncan also supplied an alternate readdir() function
as a work-around. I've incorporated his readdir() in

dialects/osf/ddev.c (as the static ReadDir() function) with
some slight modifications, and enabled its use when the
USELOCALREADDIR symbol is defined.

The Configure script defines USELOCALREADDIR for Digital
UNIX version and 3.2. If you don't want to use Duncan's
local readdir() function, edit the Makefile and remove
-DUSELOCALREADDIR from the CFGF string. When DEC releases
a corrected getdirentries() function, I'll modify the
Configure script to stop defining USELOCALREADDIR.

7.2 Why does the Digital UNIX V3.2 ld complain about Ots* symbols?

When you compile lsof on your Digital UNIX V3.2 system, ld
may complain:

    ld:
    Unresolved:
    knlist
    _OtsRemainder32Unsigned
    _OtsDivide64Unsigned
    _OtsRemainder64Unsigned
    _OtsDivide32Unsigned
    _OtsMove
    _OtsDivide32
    _OtsRemainder32
    *** Exit 1

Chris Eleveld reports this happens on Digital UNIX V3.2
systems after the Fortran compiler has been installed.

The best work-around seems to be to remove -lmld from the
CFGL string in the Makefile produced by Configure -- i.e.,
change:

    CFGL=   -lmld
to
    CFGL=

According to the V3.2 man page for nlist(3), this shouldn't
work, but my testing shows that it does. Although I haven't
been able to test this second work-around, you might try
adding -lots to CFGL, rather than removing -lmld -- i.e.,
change:

    CFGL=   -lmld
to
    CFGL=   -lmld -lots

WARNING: my testing also shows that the V2.0 nlist(3) man
page means what it says when it calls for -lmld -- lsof
loaded without -mld under V2.0 can't locate the proc
(process) table address.

   DON'T REMOVE -lmld FROM THE DIGITAL UNIX V2.0 MAKEFILE.

If you run into this problem, please let me know what
problem you encountered and how you solved it.

7.3 Why can't lsof locate named pipes (FIFOs) under V3.2?

While lsof for V3.2 can report on named pipes (FIFOs), it
can't find them by name. That appears to happen because
of the way the V3.2 kernel lstat(2) function reports named
pipe device numbers.

The V3.2 kernel reports the device number as 0xfffffff,
while the kernel structures for named pipes that lsof
examines contain the device number of the file system on
which the named pipe resides.

Consequently, lsof can't match the device and inode number
pair it receives from applying lstat(2) to the named pipe
with any device and inode number pair it finds when scanning
kernel structures.

I don't have a work-around. You can, of course, ask for
full lsof output and use a post-processing filer (e.g.,
grep) to locate the named pipe of interest.

This problem doesn't exist under V2.0.

7.4 Why does lsof use the wrong configuration header files?
For example, why can't the lsof compilation find cpus.h?

DEC OSF/1, Digital UNIX, and Tru64 UNIX configuration header
files describe the hardware and software environment for
which your kernel boot file was constructed. For example,
/sys/<name>/cpus.h defines the number of CPUs in its NCPUS
#define.

Lsof searches for the configuration header file subdirectory
in /sys (/usr/sys for Digital UNIX version 4.0 and Tru64
UNIX) by converting the first host name component to capital
letters -- e.g., TOMIS is derived from tomis.bio.purdue.edu.
If that subdirectory exists, lsof uses header files from

it. (Configure reports what subdirectory is being used.)

If Configure doesn't find a host-name derived subdirectory,
it prompts you for the entry of a subdirectory name. If
you can't find one, quit Configure and run the kernel
generation process to create a proper configuration sub-
directory. If you don't identify a proper configuration
subdirectory and you try to compile lsof, the compiler will
complain about missing header files -- e.g., a missing
cpus.h.

Once you have located or generated a proper configuration
subdirectory, rerun Configure. If you have generated a
configuration subdirectory whose name is derived from the
host name, Configure will find and use it. If not, you
will have to specify its name to Configure.

7.5 Why does lsof indicate incomplete paths with " -- " for Tru64
UNIX 5.1 files?

When lsof can't find a component of a path in the kernel's
name cache (aka DNLC), or can't determine that the left-most
component has as its parent the file system root, it uses
an "incomplete path" notation. That notation begins with
the file system root name, followed by " -- ", followed by
the consecutive path name components lsof was able to find
in the DNLC -- e.g., "/ -- init".

Because the DNLC was significantly redesigned in Tru64 UNIX
5.1, lsof's handling of the cache had to be completely
redone. As part of the DNLC redesign a name cache entry
parameter lsof formerly used to locate the file system root
of a path was removed. With help from Chang Song I've been
able to implement an alternate method for detecting the
root of these file system types: AdvFS (MSFS), CDFS, DVDFS,
FDFS, NFS, NFS3, and UFS.

When lsof doesn't know how to identify the root for a file
system type, it will resort to the " -- " incomplete path
notation.

7.6 Why doesn't lsof report link count, node number, and size
for some Tru64 5.x CFS files?

Lsof reports link count, node number, and size for open
CFS files as recorded in their kernel node structure's
cached attributes. Sometimes not all attributes are cached
on the system where lsof runs, so lsof cannot report them.

7.7   Why does lsof say it can't read the kernel name list or
proc table on Digital UNIX 4.x or Tru64 UNIX?

By default on Digital UNIX 4 and Tru64 UNIX lsof reads the
addresses for kernel symbols with the knlist(3) function.
That function can fail, for example, when the kloadsrv
daemon isn't running or is malfunctioning. When that
happens, lsof may abort with one of these error messages:

    lsof: can't read kernel name list from knlist(3): ...
  or
    lsof: can't read proc table info

The first message suggests a complete knlist(3) or kloadsrv
failure; the second, a partial one.

If you know the name of the file from which the running
system was booted, e.g., /vmunix, you can use lsof's -k
option to direct it to read kernel symbol addresses from
the name list of that file --

    $ lsof -k /vmunix ...

If that works, then knlist(3) is malfunctioning and you
need to fix it.

8.0 FreeBSD Problems

8.1 Why doesn't lsof report on open kernfs files?

Lsof doesn't report on open FreeBSD kernfs files because
the structures lsof needs aren't defined in the kernfs.h
header file in /sys/misc/kernfs.

8.2 Why doesn't lsof work on my FreeBSD system?

If lsof doesn't work on your FreeBSD system, first make
sure you have the latest lsof revision. See the answer to
the "Where do I get lsof?" question for information on how
to get the latest lsof revision.

Once you have gotten the latest lsof revision, Configure
and make it. If Configure fails -- e.g., it complains
about an unknown FreeBSD version -- then lsof probably
hasn't been ported to your FreeBSD version yet, and there's
no need to go any further. Follow the answer to the "How

do I report an lsof bug" to report the Configure complaint
to me.

If you are able to Configure and make lsof, run its test
suite. (See the answer to the "Is there a test suite?"
question for more information on how to use lsof's test
suite.)

If lsof still fails, make sure your kernel sources, kernel
header files, kernel boot file, standard header files and
libraries are synchronized. They should all be built from the
same CVS refresh. (Don't forget to do a "make buildworld"
followed by a "make installworld".) If they aren't, then the
KVM library or lsof may be using kernel structure definitions
that don't match the booted kernel; or lsof may fail to compile
properly because of header files in /usr/src/sys/sys and
/usr/include/sys that don't match.

If you have synchronized your kernel, header files and
libraries, and still can't get lsof to work, follow the
steps in the answer to the "How do I report an lsof bug"
question to report the problem to me.

8.3 Why doesn't lsof work on the RELEASE version of CURRENT?

Lsof tracks the CURRENT release of the current leading edge
FreeBSD version, because my access to leading edge FreeBSD is
limited to FreeBDSD.org reference systems, all running the
CURRENT release.

Sometimes that tracking leads to changes in lsof that won't
work on an earlier RELEASE version of the current leading edge
version.

When that happens, please send e-mail to me <abe@purdue.edu>.
Make sure "lsof" appears in the "Subject:" line so my e-mail
filter won't classify your letter as Spam.

8.4 Why does kvm_open() complain it can't find some file?

If lsof issues this complaint:

    lsof: kvm_open(execfile=/boot/kernel/kernel,
    corefile=/dev/mem: No such file or directory

Your FreeBSD system might not have a /dev/mem device. If
not, create one -- e.g., as root do:

```
# mknod /dev/mem c <major> 0
# chmod 440 /dev/mem
# chgrp kmem /dev/mem
```

For <major> use /dev/kmem's major device number.

You may have to run kldload, too -- again as root do:

```
# kldload mem
```

8.5 FreeBSD ZFS Problems

8.5.1 Why does FreeBSD lsof report "WARNING: no ZFS support has been defined."?

Lsof issues that message when it detects a file on a ZFS file system, but has not been built with support for ZFS. Lsof's Configure script detects support can be added for ZFS when it finds this file:

/usr/src/sys/contrib/opensolaris/uts/common/fs/zfs/sys/zfs_znode.h

That header file and others in the OpenSolaris files in /usr/src enable lsof to extract information about ZFS files from the kernel structures associated with them.

8.6 Why can't Configure create lsof_owner.h for FreeBSD 6 and above?

Lsof may report:

```
Creating ./lockf_owner.h from /usr/src/sys/kern/kern_lockf.c
FATAL ERROR: can't read /usr/src/sys/kern/kern_lockf.c
FATAL ERROR: ./lockf_owner.h creation failed (see 00FAQ)
```
or
```
Creating ./lockf_owner.h from /usr/src/sys/kern/kern_lockf.c
FATAL ERROR: ./lockf_owner.h creation failed (see 00FAQ)
```

Those messages mean that lsof's Configure script failed to create a local header file, ./lockf_owner.h, needed to use the new kernel file locking code of some versions of FreeBSD 6 and above.

The changes that implement that new locking code alter the lockf structure in <sys/lockf.h> and introduce a new structure, lockf_entry, to that header file. When Configure detects the presence of the lockf_entry definition in <sys/lockf.h>, it tries to construct the local header file, ./lockf_owner.h.

Configure has to do that because an unfortunate side effect of
the new kernel file locking code is that <sys/lockf.h> doesn't
contain the lockf_owner structure definition referenced in its
own lockf structure. Lsof needs to access elements of that
lockf_owner structure to determine if a lock belongs to the
process that has a file open.

The missing lockf_owner structure definition is in the kernel
source file, typically /usr/src/sys/kern/kern_lockf.c.
Configure tries to extract the lockf_owner structure definition
from kern_lockf.c into lsof's local header file, ./lockf_owner.h.
If Configure can't do that, it reports:

   FATAL ERROR: ./lockf_owner.h creation failed

If Configure can't even read kern_lockf.c, it first reports:

   FATAL ERROR: can't read /usr/src/sys/kern/kern_lockf.c

The work-around for this problem is to update the FreeBSD
kernel /usr/src tree (e.g., do a CVSup or csup) on the system
where lsof is to be built and then do a "make buildworld"
followed by a "make installworld".

8.6.1 Why are there lockf structure compiler errors for FreeBSD 6.0
and higher lsof?

If, when compiling lsof, the compiler complains with error
messages like:

   dnode.c: In function 'get_lock_state':
   dnode.c:113: error: 'struct lockf' has no member named 'lf_flags'
   dnode.c:115: error: 'struct lockf' has no member named 'lf_id'
   ...

Then lsof is being built on a system that has new kernel file
locking code and lsof's Configure script failed to build a
local lockf_owner.h header file with a structure definition
lsof needs.

See the "Why can't Configure create lsof_owner.h for FreeBSD 6
and above?" section for more information and a work-around.

8.6.2 Why don't /usr/src/sys/sys/lockf.h and /usr/include/sys/lockf.h
match?

This mismatch can cause the errors explained in the answer to
the "Why are there lockf structure compiler errors for FreeBSD

6.0 and higher lsof?" question.

If /usr/src/sys/sys/lockf.h has been updated with a CVSup or
csup, the new lockf.h won't be propagated to /usr/include/sys
until the "make buildworld" and "make installworld" steps have
been completed.

9.0 HP-UX Problems

9.1 What do /dev/kmem-based and PSTAT-based mean?

Lsof for HP-UX 11.0 and below uses /dev/kmem to read kernel
data structures from which it gathers and reports open file
information. That version of lsof is called /dev/kmem-based
lsof.

Starting with HP-UX 10.10, finding definitions for the
necessary kernel structures became more difficult as HP no
longer distributed header files in /usr/include that defined
all kernel structures. So I started "inventing" structure
definitions by using Q4 to display them.

By HP-UX 11, the process of invention became extremely
intensive to support. Following a patch to the ipc_s
structure in early 1999, my invented definition of that
structure became incorrect. Although I was able to devise
a work-around test for the patch with Q4, it was clear that
my inventions were bound to cause more problems.

Discussion with HP about the patch led to my proposing that
an lsof API in the HP-UX kernel was the proper solution.
Much to my surprise, HP agreed. I believe Carl Davidson
was the prime mover behind that decision, but I know others
participated, among them Louis Huemiller, Rich Rauenzahn,
and Sailu Yallapragada. I am indebted to these folks and
HP for their willingness to do this work.

The API was added to the PSTAT interface in a project named
PEGL, Pstat Enhancements for Glance and Lsof. Louis and
Sailu did the bulk of the design and implementation work
and testing began in March, 2000

HP-UX 11.11 is the first version that provides PSTAT support
for lsof. HP-UX versions in between 11.0 and 11.11 -- all
Beta versions as far as I can determine -- have no lsof
support.

See the "PSTAT-based HP-UX lsof Questions" section for
questions and answers specific to PSTAT-based HP-UX lsof.
The next section, "Why doesn't a /dev/kmem-based HP-UX lsof
compilation use -O?" covers /dev/kmem-based HP-UX lsof.

The /dev/kmem-based lsof sources may be found in the kmem
subdirectory of the dialects/hpux branch of the lsof source
tree. The PSTAT-based lsof sources may be found in
.../dialects/hpux/pstat.

9.2 /dev/kmem-based HP-UX lsof Questions

The sources for /dev/kmem-based lsof for HP-UX may be found
in lsof_<revision>/dialects/hpux/kmem.

Lsof's Configure shell script decides to use these sources
when it finds that the /usr/include/sys/pstat subdirectory
doesn't exist.

Lsof can be forced to use the /dev/kmem sources by setting
"/dev/kmem" in the HPUX_BASE environment variable. Consult
the Configure shell script and 00XPORTING for more information.

9.2.1 Why doesn't a /dev/kmem-based HP-UX lsof compilation use -O?

If you only have the standard (bundled) HP-UX C compiler
and haven't purchased and installed the optional one, then
you can't use cc's -O option. The HP-UX cc(1) man page
says this:

  "Options
      Note that in the following list, the cc and c89 options
      -A , -G , -g , -O , -p , -v , -y , +z , and +Z are
      not supported by the C compiler provided as part of
      the standard HP-UX operating system. They are supported
      by the C compiler sold as an optional separate product."

Lsof's Configure script tries to detect what C compiler
product you have installed by examining your compiler. If
that examination reveals a standard (bundled) compiler,
lsof avoids using -O.

If the Configure compiler test fails, the C compiler will
complain that it doesn't support -O. You can suppress that
complaint with this make invocation:

    $ make DEBUG=""

9.2.2 Why doesn't the /dev/kmem-based CCITT support work under 10.x?

 Pasi Kaara, who originally provided the HP-UX CCITT support,
 reports that it no longer works under HP-UX 10.x.
 Consequently, at lsof revision 4.02 it has been disabled.

9.2.3 Why can't /dev/kmem-based lsof be compiled with `cc -Aa` or
 `gcc -ansi` under HP-UX 10.x?

 Some HP-UX 10.x header files, needed by lsof, can't be
 compiled properly in ANSI_C mode; structure element definition
 and alignment problems result. The f_offset member of the
 file structure, for example, is incorrect.

 This ANSI-C obstacle extends to using the -Aa option of
 the HP C compiler and the -ansi option of gcc.

9.2.4 Why does /dev/kmem-based lsof complain about no C compiler?

 Lsof's Configure script looks in /bin and /usr/ccs/bin for
 an HP C compiler, because it needs to know if the compiler
 is the standard (bundled) one or the optional separate
 product. If it finds no compiler in either place, Configure
 quits after complaining:

   No executable cc in /bin or /usr/ccs/bin

 If you don't have a C compiler in either of these standard
 places, you should consider installing it. If you have
 gcc installed, you can use it by declaring the ``hpuxgcc''
 abbreviation to lsof's Configure script.

 If you have a C compiler in a non-standard location, you
 can use the HPUX_CCDIR[12] environment variables to name
 the path to it. Consult the 00XCONFIG file of the lsof
 distribution for more information.

9.2.5 Why does Configure complain about q4 for /dev/kmem-based lsof
 for HP-UX 11?

 When you run Configure on an HP-UX 11 system, it may complain:

  !!!ERROR!!!   !!!ERROR!!!   !!!ERROR!!!   !!!ERROR!!!
  Configure can't use /usr/contrib/bin/q4 to examine the ipis_s
  structure. You must do that yourself, report the result in
  the HPUX_IPC_S_PATCH environment variable, then repeat the
  Configure step. Consult the Configure script's use of
  /usr/contrib/bin/q4 and the 00XCONFIG file for information

on ipis_s testing and the setting of HPUX_IPC_S_PATCH.
!!!ERROR!!!   !!!ERROR!!!   !!!ERROR!!!   !!!ERROR!!!

This message states that Configure cannot use q4 from
/usr/contrib/bin to examine the kernel's boot image for
the ipis_s structure. Maybe q4 hasn't been installed, or
perhaps Configure can't execute it.

Lsof needs to gather information about ipis_s to determine
if the ipis_s structure is defined in the kernel boot image,
if the ipis_s structure of the kernel boot image has an
ipis_msgsqueued member, and if the ipc_s structure of the
kernel boot image uses has an ipc_ipis member.

The ipis_s structure isn't described in any header file
HP-UX releases with HP-UX 11. It appears in the private
lsof header file .../dialects/hpux/kmem/hpux11/ipc_s.h.
Lsof gets local and remote connection addresses (IP and
port numbers) from ipc_s, so an incorrect ipc_s definition
may cause incorrect reporting of TCP/IP connection addresses.
It definitely will cause incorrect reporting on 32 bit
kernels. In any case lsof should be compiled with a correct
ipc_s definition no matter the kernel bit size, so the
Configure script always tests for it when the HP-UX version
is 11.

For lsof's Configure script to gather the necessary ipis_s
information q4 needs to be installed in /usr/contrib/bin
and the kernel boot image, /stand/vmunix, needs to have
been processed with pxdb. If either is untrue, lsof issues
the above error message, perhaps preceded by q4 messages.
(Note: lsof's use of q4 may also fail if q4 can't execute
nm -- e.g., it can't find /usr/bin/nm, or there is a
conflicting, private version of nm earlier in the path.)

If /stand/vmunix hasn't been processed by pxdb, the q4
messages will include:

    q4: (error) vmunix not pxdb'd
or
    q4: (warning) /stand/vmunix has not been processed by pxdb.

It's possible to make a suitable private copy of /stand/vmunix
for configuring lsof. That requires /opt/langtools/bin/pxdb
or the q4 version of pxdb from /usr/contrib/bin/q4pxdb.
The path to the result is supplied to the lsof Configure
script in the HPUX_BOOTFILE environment variable. Configure
still requires /usr/contrib/bin/q4.

The following sample Bourne shell commands make a private copy of /stand/vmunix in /tmp, process it with pxdb or q4pxdb, and supply its path to lsof's Configure script in HPUX_BOOTFILE.

```
$ cp /stand/vmunix /tmp/vmunix.lsof

$ /opt/langtools/bin/pxdb /tmp/vmunix.lsof
or
$ /usr/contrib/bin/q4pxdb /tmp/vmunix.lsof

... pxdb messages ...
$ HPUX_BOOTFILE=/tmp/vmunix.lsof Configure -n hpux
```

It may also be necessary to use q4 outside the lsof Configure script. In that case q4 can be to determine the state of ipis_s and ipc_s with these q4 commands:

```
$ /usr/contrib/bin/q4 /stand/vmunix
...
q4> fields -c struct ipc_s
...
q4> fields -c struct ipis_s
```

Look in the q4 output for the ipc_ipis member of the ipc_s structure, and look in the q4 output for the ipis_s structure for the ipis_msgsqueued member. If ipc_s has ipc_ipis but ipis_s lacks ipis_msgsqueued, set HPUX_IPC_S_PATCH environment variable to "1". If ipc_s has ipc_ipis and ipis_s has ipis_msgsqueued, set HPUX_IPC_S_PATCH to "2" -- e.g.,

```
$ HPUX_IPC_S_PATCH=1 Configure -n hpux
or
$ HPUX_IPC_S_PATCH=2 Configure -n hpux
```

If ipc_s has no ipc_ipis member, set HPUX_IPC_S_PATCH to "N" -- e.g., use this Configure step:

```
$ HPUX_IPC_S_PATCH=N Configure -n hpux
```

9.2.6 When compiling /dev/kmem-based lsof for HP-UX 11 what do the "aCC runtime: ERROR..." messages mean?

When the lsof Makefile asks the HP-UX unbundled compiler to load lsof, it may complain:

```
/bin/cc -o lsof  -DHPUXV=1100 -DHASVXFS -DHPUXKERNBITS=64 \
```

```
-I/home/abe/src/lsof4/dialects/hpux/kmem/hpux11 +DD64 \
-DHAS_IPC_S_PATCH=2 -I/home/abe/src/lsof4/dialects/hpux/kmem \
-DLSOF_VSTR=\"B.11.00\"  -g dfile.o dmnt.o dnode.o dnode1.o \
dnode2.o dproc.o dsock.o  dstore.o  arg.o main.o misc.o \
node.o print.o proc.o store.o usage.o -L./lib -llsof  -lelf \
-lnsl
   aCC runtime: ERROR: Unexpected use of shared libraries
   aCC runtime: ERROR: Read aCC manpage, +A option
   /usr/lib/nls/loc/locales.1//is_IS.iso88591
```

This is a bug in the HP-UX national language support.
(Notice the last message with "locales" in it?) Complain
to HP -- then use this work-around before executing make:

```
$ unset LANG
$ make
```

9.2.7 Why doesn't /dev/kmem-based lsof for HP-UX 11 report VxFS file
link counts, node numbers, and sizes correctly?

This is usually the result of running an lsof binary whose
revision number is less than 4.57 on a system that has
OnlineJFS support installed. It can also happen with lsof
4.57 binaries when the OnlineJFS support with which they
were built doesn't match the OnlineJFS status of the system
on which they are run.

The OnlineJFS status of lsof 4.57 and higher binaries can
be determined by running:

```
$ lsof -v 2>&1 | grep HASONLINEJFS
```

If that shell pipe produces output, lsof was compiled with
OnlineJFS support enabled; no output, disabled.

If OnlineJFS is installed on an HP-UX 11 system the
/sbin/fs/vxfs/subtype executable exists and outputs "vxfs3.3"
when run.

The problem occurs because the optional OnlineJFS support
installation doesn't update <sys/fs/vx_inode.h>. Consequently
lsof can be compiled with an incorrect definition of the
vx_inode structure and look for for link counts, node
numbers, and sizes in the wrong places in the structure.

The current response I have gotten from HP is that no
<sys/fs/vx_inode.h> update will be provided for OnlineJFS.

I've addressed this problem temporarily with a work-around
(hack) in lsof revision 4.57.

9.2.8 Why can't /dev/kmem-based lsof be built with gcc for 64 bit
HP-UX 11?

When Configure is given the "hpuxgcc" abbreviation, the
HP-UX version is 11, and the kernel bit size is 64, the
lsof Configure script may abort with the messages:

   !!!!!!!!!!!!!!!!!! FATAL ERROR !!!!!!!!!!!!!!!!!!!

   APPARENTLY GCC CANNOT BUILD 64 BIT EXECUTABLES.
   A COMPILER MUST BE USED THAT CAN. SEE 00FAQ
   FOR MORE INFORMATION.

(This is the "more information" in 00FAQ.)

This means the Configure script compiled a test program
with gcc the result wasn't an ELF-64 binary. Lsof tries
two gcc modes, one with no options and another with the
-mlp64 option, before it concludes gcc can't be used.

See the "How can I acquire a gcc for building lsof for 64
bit HP-UX 11?" answer for information on where you might
be able to get a gcc for HP-UX 11 that can produce ELF-64
executables.

9.2.8.1 How can I acquire a gcc for building lsof for 64 bit HP-UX 11?

Check this HP URL:

  http://h21007.www2.hp.com/dspp/tech/tech_TechSoftwareDetailPage_IDX/1,1703,547,00.html

(That's one very long link; be careful you cut 'n paste it
all.)

In November 2001 that URL led to a web page whose title
was "gcc for hp-ux 11." The page offered a link for
downloading a 64 bit gcc 3.0 compiler for HP-UX 11.0 and
11i. Rich Rauenzahn of HP installed that compiler on an
HP test system he allows me to use and I successfully built
a 64 bit lsof with it.

The HP package may install the 64 bit capable gcc in
/usr/local/pa20_64/bin/gcc, so you may have to adjust your
path or set the LSOF_CC environment variable to compensate.

9.2.9   Why does /dev/kmem-based lsof for HP-UX 11 report "unknown file
system type" for some open files?

The lsof binary being used probably doesn't have support for
the VxFS file system.

To confirm that, check `lsof -v` output for "-DHASVXFS". If
it's not present, lsof doesn't have VxFS support.

You also need to establish that lsof really is complaining
about VxFS files by checking the kernel boot file for the
symbol associated with the hexadecimal address reported in the
"unknown file system type" message -- e.g., "v_op: 0x8711c8."
Use nm(1) to do that:

    $ nm -x /stand/vmunix | grep 8711c8

If nm reports the symbol associated with the address is
vx_vnodeops, then lsof is complaining about an open VxFS file.

The solution in that case is to build lsof yourself (The
bundled C compiler will do it.), making sure that lsof's
Configure script detects the presence of VxFS. Configure does
that by finding these two header files:

    /usr/include/sys/fs/vx_hpux.h
    /usr/include/sys/fs/vx_inode.h

If the system where you are building lsof doesn't have those
header files, but does have VxFS, you might be able to install
the header files by installing the HP JournalFS package from
the CoreOS CD -- in particular the file set JournalFS.VXFS-PRG
and its associated patch, PHKL_18543. (My thanks to Steve
Bonds for that information.)

Finally, if you find that lsof isn't complaining about VxFS
when it complains about an unknown file system type, send
e-mail to me <abe@purdue.edu> for further assistance. Make
sure "lsof" appears in the "Subject:" line so my e-mail filter
won't classify your letter as Spam.

9.2.10 Why does the ANSI-C compiler complain about comments in HP-UX
11 header files?

When compiling lsof on HP-UX 11, the HP ANSI-C compiler's
pre-processor, cpp, may complain about comments in HP-UX header
files -- e.g.,

```
        cpp: "/usr/include/sys/cdfs.h", line 232: warning 2028:
    Found comment inside comment started on line 232.
        cpp: "/usr/include/sys/cdnode.h", line 196: warning 2028:
    Found comment inside comment started on line 196.
        cpp: "/usr/include/nfs/snode.h", line 30: warning 2028:
    Found comment inside comment started on line 30
```

This is not a problem with lsof. It is a problem with the
HP-UX header files; they have non-compliant ANSI-C comment
sequences in them -- e.g.,

```
    <sys/cdfs.h>: 232
 /* struct  cdfs *cdfs_link;  /* linked list of file systems */
```

The initial "/*" is not terminated by an ending "*/" before the
appearance of a second "/*".

9.2.11 Why does dnode1.c cause the HP-UX 11 compiler to complain that
<sys/fs/vx_inode.h> is missing or incorrect?

If CFLAGS in the lsof Makefile for an HP-UX 11 compilation
includes HASONLINEJFS, indicating the system has OnlineJFS
support, lsof needs the <sys/fs/vx_inode.h> header file.
Sometimes it is missing from /usr/include/sys/fs.

<sys/fs/vx_inode.h> is a header file that must be obtained from
Veritas. If that proves impossible, please contact me via
e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the
"Subject:" line so my e-mail filter won't classify your letter
as Spam.

9.3 PSTAT-based HP-UX lsof Questions

The sources for PSTAT-based lsof for HP-UX may be found in
lsof_<revision>/dialects/hpux/pstat.

Lsof's Configure shell script decides to use these sources
when it finds that the /usr/include/sys/pstat subdirectory
exists.

Lsof can be forced to use the PSTAT-based sources by setting
"pstat" in the HPUX_BASE environment variable. Consult
the Configure shell script and 00XPORTING for more information.

9.3.1 Why does PSTAT-based lsof complain about pst_static and
other PSTAT structures?

When lsof starts it may issue one of these fatal error
messages:

    lsof: FATAL: can't determine PSTAT static size
    lsof: FATAL: can't read <n> bytes of pst_static
    lsof: FATAL: pst_static doesn't contain <name>_size
    lsof: FATAL: <name>_size should be <n>

These messages indicate that lsof's tests for the proper
level of PSTAT support have failed. The structure names,
given in <name>, and sizes, given in <n>, identify the
support deficiency more precisely.

You may need to upgrade the PSTAT support in your kernel
to be able to use PSTAT-based lsof.

9.3.2 Why does PSTAT-based lsof complain it can't read pst_*
structures?

Lsof may put messages like the following in the NAME
column of its output.

    can't read cwd pst_filedetails: Permission denied
    can't read mem pst_filedetails: Permission denied
    can't read rtd pst_filedetails: Permission denied
    can't read txt pst_filedetails: Permission denied
    can't read pst_filedetails: Permission denied
    can't read 3 stream structures: Permission denied
    can't read pst_socket: Permission denied

These messages indicate that the lsof binary lacks the
authority to read the name structures for processes other
than ones belonging to the UID under which lsof is running.
Authority to read the structures of other processes is
limited to root processes -- i.e., lsof must have setuid-root
permission if it is to list open files for arbitrary
processes.

If you want to eliminate these errors, you must run lsof
as root or install it with setuid-root permission.

9.3.3 Why does PSTAT-based lsof rebuild the device cache file
after each reboot?

After each HP-UX rebuild, the first time a user runs lsof it
will report:

    lsof: WARNING: device cache mismatch: /dev/tun...

lsof: WARNING: created device cache file: /<user_path>

This happens because the device numbers on /dev/tun* device
nodes are recalculated at each reboot. When lsof detects
a change in the device number of a /dev/tun* file, it rebuilds
its local device cache file.

9.3.4 Why doesn't PSTAT-based lsof report TCP addresses for
telnetd's open socket files?

When lsof can't report TCP addresses for telnetd's open
socket files it is because an unpatched PSTAT kernel
interface doesn't report the addresses to lsof.

This has been addressed in PSTAT kernel patch PHKL_24047.
It is available from the HP IT Resource Center at:

  http://itrc.hp.com

In the page's "maintenance / support" box select the
"individual patches" link. Once at its page, select the
"hp-ux" link. On that page select the "Series 800" or
"Series 700" radio button and select "11.11" from the
pull-down list to the right of the button. Under "search
or browse the path list" select "Search by Patch IDs" from
the pull down list, enter PHKL_24047 in the following text
box, and select search. That should lead to information
about PHKL_24047 and a link for downloading it. (You may
have to log in first and you may have to create a login
identity by registering before you can log in.)

Some time in March 2006 the PHKL_24047 patch was "lost"
by the HP-UX networking lab. It has been "found" again
in August 2006 and will be re-released as a GRO patch
"some time." I don't yet know when that will be. You
must contact HP to learn about the availability of the
GRO patch.

9.3.5 Why does PSTAT-based lsof cause an HP-UX 11.11 kernel panic?

When PSTAT-based lsof runs on some HP-UX 11.11 kernels,
the kernel may panic. Symptoms include:

 Console message:
   0xFBE000301100EF00 00000000 0000EF00 -
   type 31 = legacy PA HEX chassis-code

 /var/adm/syslog:

... vmunix: Trap Type 15 (Data page fault)
... vmunix: Instruction Address (pcsq.pcoq) = 0x...

The panic is caused by a bug in the way PSTAT's pstat_getstream()
function obtains module names from streams managed by the
otsam stream driver (part of OSI Transport Services). Lsof
calls pstat_getstream() when it encounters an open otsam
stream file. An HP-UX 11.11 system uses otsam if otsam
appears in /stand/system.

HP-UX 11.11 patch PHKL_24507 (available some time after
July 15, 2001) fixes the pstat_getstream() bug. See the
information in the answer to the "Why doesn't PSTAT-based
lsof report TCP addresses for telnetd's open socket files?"
question for information on how to obtain the patch.

9.3.6 Why doesn't PSTAT-based lsof report a CWD that is on a loopback
(LOFS) file system?

When PSTAT-based lsof reports on processes whose current
working directory (CWD) is on a loopback file system, lsof
can't report the open CWD file. The reason is that the HP-UX
11.11 and above kernel's loopback file system code is not
passing the CWD file ID to the kernel's pstat(2) code. Hence
lsof is given no information on the lofs CWD.

The problem was first reported to me by Ermin Borovac and an
internal bug report was filed with the HP-UX file system group
on October 26, 2004. That report has now been answered by the
patch PHKL_33200 -- s700_800 11.11 lofs cumulative patch. The
HP IT Resource Center (http://itrc.hp.com) is a source for the
patch.

9.3.7 Why do some swinstall packages for PSTAT-based HP-UX 11.11
packages complain about setgid and setuid bits?

First, let me explain that I do not provide lsof swinstall
packages for lsof. Others provide them and they should be
contacted about problems with their packages.

However, I have become aware of a problem with one package
about which I have some information I can share. The problem
shows up in these swinstall messages:

    ERROR: Unknown owner and/or group for file
     "/usr/local/bin/lsof". SUID and/or SGID bit was
     not set.
    ERROR: Failed installing fileset "lsof.lsof-RUN,r=4.73".

Check the above output for details.

The swpackage SUID/SGID functionality was restricted by changes
for POSIX compliance, breaking backward compatibility. The
patch PHCO_27671 allows SUID/SGID for uid/gid of 0 only, as a
compromise between backward compatibility and POSIX conformance.

If the setuid bit is to be set on the executable, the UID and
GID of the executable must be 0 (zero).

9.3.8 Why won't the bundled C compiler build PSTAT-based lsof for
PA-RISC HP-UX 11.23?

A PA-RISC HP-UX 11.23 bundled C compiler dated May 2005 or
later will not build PSTAT-based lsof. It will deliver error
messages related to the system's <gssapi/gssapi.h> header
file.

There is nothing wrong with that header file or lsof. The
problem is that the bundled C compiler can't cope with the
gssapi.h header file.

The work-around is to use the HP ANSI C compiler.   Using gcc
is not a satisfactory work-around. See the answer to the "Why
won't gcc build PSTAT-based lsof for PA-RISC HP-UX 11.23?"
question for more information.

9.3.9 Why won't gcc build PSTAT-based lsof for PA-RISC HP-UX 11.23?

Gcc will not even compile PSTAT-based lsof revisions below 4.77
for PA-RISC HP-UX 11.23 dated May 2005 or later. It reports
errors in lsof's print.c fill_portmap() function about missing
members of the rpcent structure. That happens because gcc
defines _XOPEN_SOURCE_EXTENDED which disables the definition of
the rpcent structure in <netdb.h>.

Using the HP bundled C compiler is not a viable work-around.
That is explained in the answer to the "Why won't the bundled C
compiler build PSTAT-based lsof for PA-RISC HP-UX 11.23?"

While an lsof revision 4.77 or higher can be compiled with gcc,
the results are unreliable. Lsof will compile, but it
occasionally produces segment faults when it runs. I have not
been able to reproduce the failure reliably or locate a
debugger that will work with the gcc-compiled lsof.

The only reliable work-around is to use the HP ANSI C
compiler.

9.3.10 Why does PSTAT-based lsof complain, "FATAL: pst_stream_size
should be: 672; is 72" on HP-UX 11.11 and above?

This message indicates a mismatch between the PSTAT header
files used to build lsof (<sys/pstat.h> and those in the
/usr/include/sys/pstat subdirectory), and those that built the
running kernel.

Unfortunately the June 2008 patch set for HP-UX 11.23 creates
this inconsistency, because it does not contain all the patches
needed to match the kernel with the PSTAT header files. Even
more serious is that the missing patches update the kernel's
PSTAT support to provide TCP/UDP endpoint information to lsof
from TCP/TLI streams.

The patch inconsistency comes about because, while the following
patch is installed,

    PHKL_36577 1.0 PM-PSTAT section 2 manpage changes

other kernel patches are not.

The PHKL_36577 patch updates the PSTAT header files and manual
pages to match kernel changes that other patches with the
following numbers (or patches that contain or supersede them)
contain:

    PHNE_36575 1.0 Cumulative STREAMS Patch
    PHNE_37670 1.0 cumulative ARPA Transport patch
    PHNE_37851 1.0 NFS cumulative patch

Those patches implement the kernel changes that support the
delivery of information promised in patch PHKL_36577.

The work-around is to install the missing patches.

9.4 Why won't the HP-UX depot install?

I don't distribute lsof depts, so I can't support them.

From time to time depots prepared by various sites -- e.g.,
usually HP-UX software collection sites -- will contain errors
that cause installation of the depot to fail.

Do not contact me when this happens. Instead, contact the
administrator of the site that prepared the depot.

As should be clear from the bulk of the lsof documentation, I
do not recommend you use pre-built lsof binaries in any form.
Instead, I recommend you obtain the lsof source distribution
and build lsof yourself.

10.0 Linux

10.1 What do /dev/kmem-based and /proc-based lsof mean?

At approximately Linux 2.1.72 and exactly at lsof revision
4.23 support for Linux forks. The first fork, containing
the oldest lsof form is based on access to kernel memory
structures, and is called /dev/kmem-based lsof. A
/dev/kmem-based lsof is heavily intertwined with the Linux
kernel version, its header files, and its system map file.
Typically a /dev/kmem-based lsof needs only setgid permission
to local all open file information.

After approximately Linux 2.1.72 and at revision 4.23 lsof
obtains all its information from the /proc file system.
That lsof is called the /proc-based lsof. A /proc-based
lsof does not read kernel memory, needs neither kernel
header files nor the system map file, and is less likely
to be affected by Linux kernel changes. However, it does
require setuid-root permission to list all open files, and
it can't report file offsets (positions).

After revision 4.52 the /dev/kmem-based Linux sources for
lsof are no longer distributed. Information about them
may be found in the 00INDEX and README files at:

    ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD/src

10.2 /proc-based Linux lsof Questions

10.2.1 Why doesn't /proc-based lsof report file offsets (positions)?

/proc-based lsof revisions 4.79 and above can only report file
offsets (positions) for the files of Linux kernels 2.6.22 and
above.

During its initialization /proc-based lsof tests to see if
offset information can be obtained. If it cannot, lsof
disables offset reporting. If the -o option was selected, lsof
also issues this warning:

    lsof: WARNING: can't report offset; disregarding -o.

10.2.2 Why does /proc-based lsof report "can't identify protocol" for
some socket files?

/proc-based lsof may report:

```
COMMAND PID ... TYPE ... NODE NAME
pump    226 ... sock ...  309 can't identify protocol
```

This means that it can't identify the protocol (i.e., the
AF_* designation) being used by the open socket file. Lsof
identifies protocols by matching the node number associated
with the /proc/<PID>/fd entry to the node numbers found in
selected files of the /proc/net sub-directory. Currently
/proc-based lsof examines these protocol files:

```
/proc/net/ax25  (untested)
/proc/net/ipx  (needs kernel patch)
/proc/net/raw
/proc/net/raw6
/proc/net/tcp
/proc/net/tcp6
/proc/net/udp
/proc/net/udp6
/proc/net/unix
```

If /proc-based lsof says it can't identify the protocol
for an open socket file, you may be able to identify the
protocol yourself by using grep to look for the specific
node number in the files of /proc/net -- e.g.,

```
$ grep <node_number> /proc/net/*
```

You may not be able to find the desired node number, because
not all kernel protocol modules fully support /proc/net
information.

If you find a matching node number in a /proc/net file that is
not currently being processed by lsof, contact me via e-mail at
<abe@purdue.edu>. I'll discuss adding support to /proc-based
lsof for the protocol of the /proc/net file with you. Make
sure "lsof" appears in the "Subject:" line so my e-mail filter
won't classify your letter as Spam.

The code that matches node numbers of open IPX protocol
socket files to those in /proc/net/ipx requires Jonathan
Sergent's Linux 2.1.79 patch to /usr/src/linux/net/ipx/af_ipx.c.

The patch, suitable for input to Larry Wall's patch program,
may be found in the lsof distribution file:

    .../dialects/linux/proc/patches/net_ipx_af_ipx.c.patch

10.2.3 Why does /proc-based lsof warn about unsupported formats?

Lsof may issue the following warning:

    lsof: WARNING: unsupported format: /proc/net/<file>

if the header line of the indicated <file> in /proc/net --
ax25, ipx, raw, tcp, udp, or unix -- doesn't match what
lsof expects to find.

When the header line of a /proc/net file isn't what lsof
expects, lsof probably can't parse the rest of the file
correctly and doesn't try. As a result, lsof can't report
any NAME column information (e.g., local and remote addresses)
for socket files bound to the indicated network protocol.

If you get this warning, please send me e-mail at <abe@purdue.edu>.
Include the contents of the file lsof claims has an unsupported
format. Make sure "lsof" appears in the "Subject:" line so my
e-mail filter won't classify your letter as Spam.

10.2.4   Why does /proc-based lsof report "(deleted)" after a path name?

The "(deleted)" notation following a path name in /proc-based
lsof's NAME column comes from the /proc/<PID>/fd/<FD> entry
for the open file. It's the Linux kernel's way of indicating
the file is open but has been unlinked (rm'd).

10.2.5 Why doesn't /proc-based lsof report full open file information
for all processes?

/proc-based lsof can only report on processes whose /proc
files it has permission to read. /proc normally grants
permission to read all its files only to root or to the
owning user ID.

Without permission to read most /proc files, lsof can only
report full information for processes belonging to the user
who is running lsof. /proc-based lsof may be able to report
some information for all processes, depending on the
permissions of their associated /proc files, but usually
/proc-based lsof won't be able to access the files in
/proc/<PID>/fd/ that describe regular open files.

If you want /proc-based lsof to report on all processes, you
must install it with setuid-root permission.

10.2.6 Why won't Customize offer to change HASDCACHE or WARNDEVACCESS
for /proc-based lsof?

/proc-based lsof doesn't read device information from /dev
or the device cache file, so it makes no sense to change
the state of device cache processing or /dev node accessibility
warnings.

10.2.7 /proc-based lsof Linux NFS questions

10.2.7.1 Why can't lsof find files on an accessible NFS file system?

On occasion lsof may be unable to identify that an open
file is on an NFS file system. This is most likely the
result of a bug in the way the Linux kernel supplies
information to the reader of /proc/mounts (lsof) -- sometimes
that pseudo-file is truncated by the kernel.

One way to see if this is the case is to search for the
NFS file system in /proc/mounts -- e.g.,

    $ grep <NFS_file_system_mount_point> /proc/mounts

If you get no output or the third word of the output isn't
"nfs", then lsof won't consider the file system an NFS file
system.

A second test is to look at the end of /proc/mounts --
e.g.,

    $ tail /proc/mounts

If tail reports "# truncated" then /proc/mounts is incomplete
because of a Linux kernel bug. The bug is documented at:

    http://www.xss.co.at/sysinfo/mounts.html

The bug is fixed in Linux kernel 2.4.18, and possibly in
some earlier Linux kernel versions.

10.2.7.2 Why can't lsof find files on an inaccessible NFS file system?

If lsof issues this message about a Linux file system,
mounted from an NFS server:

lsof: WARNING: can't stat() nfs file system /xxx/yyy

Then lsof won't be able to find any open files on the file system.

That's because of an inadequacy in the Linux /proc file system. Its /proc/mounts file doesn't give the device doublet (major and minor numbers) of the file system as do many UNIX systems (e.g., Solaris). The only way lsof can get the device doublet for a Linux file system is to call stat(2) on the file system path, which fails if the NFS server isn't accessible.

When lsof doesn't know the device doublet of a file system, it can't find open files on the inaccessible file system, because it can't match the doublets of open files to the doublet of the inaccessible file system.

This topic is covered extensively in lsof(8) it its ALTERNATE DEVICE NUMBERS and BLOCKS AND TIMEOUTS sections.

10.2.8 Why doesn't /proc-based Linux lsof report socket options and values, socket state flags, and TCP options and values?

The Linux /proc file system doesn't report socket options and values, socket states, and TCP options and values to lsof.

10.2.9 Does /proc-based Linux lsof use a device cache?

No. The Linux /proc/<PID>/fd/* entries provide device names to lsof via readlink(2). It is not necessary to enable device cache processing for /proc-based Linux lsof via the Customize script or modifications to the Linux machine.h header file.

10.2.10 Why doesn't /proc-based Linux lsof report any or all file structure values for its +fcfgGn option?

/proc-based lsof revisions 4.79 and above can only report some file structure values for Linux kernels below 2.6.22.

When running on Linux kernels at 2.6.22 and above lsof 4.79 can report some file flag values -- i.e., in response to the +fg or +fG options. The flag values are obtained from the /proc/<PID>/fdinfo/ files introduced at Linux kernel 2.6.22.

/proc-based Linux lsof tests its availability to obtain file

flag values at initialization. If values are not available,
lsof disables file flag reporting. If the flags were requested
with +fg or +fG, lsof displays this warning:

    lsof: WARNING: can't report file flags; disregarding +f.

As a special note, when Linux lsof can report flag bits, it
will not report 'R' for a read-only file. There is no
read-only flag bit O_* symbol in <fcntl.h> (or <bits/fcntl.h>)
and lsof reports only bits that are set. The absence of O_RDWR
and O_WRONLY flag bits implies the file is read-only.

10.3 Special Linux file types

10.3.1 Why is ``DEL'' reported as a Linux file type?

Lsof usually reports entries from the Linux /proc/<PID>/maps
file with ``mem'' in the TYPE column. However, when lsof can't
stat(2) a path in the process' ``maps'' file and the ``maps''
file entry contains ``(deleted)'', indicating the file was
deleted after it had been opened, lsof reports the file type as
``DEL''.

10.3.2 Why is ``unknown'' reported as a Linux file type?

Lsof may report a Linux file's type as ``unknown'' in the TYPE
column when lsof can't obtain complete stat(2) results for the
file.

Usually the NAME column will contain a ``(stat: xxx)'' error
message, but that could have been suppressed with the lsof
``-w'' option.

10.4 Linux ``mem'' Entry Problems

10.4.1 What do ``path dev=xxx'' and ``path inode=yyy'' mean in the
NAME column of Linux ``mem'' file types?

When the device or inode number in the process' ``maps'' file
entry doesn't match the stat(2) results from the file path,
lsof reports the inconsistent information from the stat(2) of
the path parenthetically after the path in the NAME column
in one of these forms:

    (path dev=xxx)   only the device number,
    ``xxx'', from a stat(2) of the
    ``maps'' file entry path
    differs from the ``maps'' file

entry value reported in the
DEVICE column.

(path inode=yyy) only the inode number,
``yyy'', from a stat(2) of the
``maps'' file entry path
differs from the ``maps'' file
entry value reported in the
NODE column.

(path dev=xxx inode=yyy)   Both device and inode numbers
differ.

Lsof reports the ``maps'' file device number in the DEVICE
column and the inode number in the NODE column.

When device and inode mismatches occur, lsof suppresses the
reporting of link count and size. See the answer to the "Why
is neither link count nor size reported for some Linux ``DEL''
and ``mem'' file types?" question for more information.

Device and inode inconsistencies can occur when a file at a
``maps'' path is replaced after the process has started, or
when a different file system with similar path names is mounted
on top of the original file system.

The device inconsistency parenthetical messages can be
suppressed with lsof's ``-w'' option.

10.4.2 Why is neither link count nor size reported for some Linux
``DEL'' and ``mem'' file types?

Link count and size are not reported for some entries from the
process' ``maps'' file because a stat(2) of the entry file path
failed or stat(2) delivered device or inode numbers that don't
match the ones in the ``maps'' entry.

When the stat(2) device or inode numbers don't match those in
the ``maps'' file entry, it is likely that the stat(2) results
don't apply to the file that was originally mapped by the
process and whose path appears in the ``maps'' file entry, so
lsof tries to avoid reporting possibly incorrect information.

See the answer to the "What do ``path dev=xxx'' and ``path
inode=yyy'' mean in the NAME column of Linux ``mem'' file
types?" for more information on how mismatched stat(2) device
and inode numbers are reported.

10.5 Special Linux NAME column messages

10.5.1 What does ``(stat: xxx)'' mean in the NAME column of Linux
files?

When lsof tried to stat(2) the path in the NAME column, the
stat(2) system call failed and produced an error message of
``xxx''.

This situation usually occurs if the lsof process lacks
permission to stat(2) the path -- e.g., the lsof executable
lacks root permission, or lsof is attempting to stat(2) a path
on an NFS device mounted with the root_squash option.

The message can be suppressed with lsof's ``-w'' option.

10.5.2 What does ``(readlink: xxx)'' mean in the NAME column of
Linux files?

When lsof tried to convert the /proc/<PID>/fd path, reported in
the NAME column, to its full and more meaningful path, the
readlink(2) system call used to do the conversion failed. The
readlink(2) failure message is ``xxx''.

This situation usually occurs if the lsof process lacks
permission to readlink(2) some part of the path -- e.g., the
lsof executable lacks root permission, or lsof is attempting to
stat(2) a path on an NFS device mounted with the root_squash
option.

The message can be suppressed with lsof's ``-w'' option.

10.6 Why is ``NOFD'' reported as a Linux file type?

When lsof lacks permission to use opendir() on the fd/
subdirectory of a process' /proc/<PID> directory, it reports a
single file of the type ``NOFD'' (for no file descriptors).

Lsof reports the the /proc/<PID>/path in the NAME column,
followed by "(opendir: xxx)", where ``xxx'' is the error
message returned by opendir().

The ``NOFD'' entry can be suppressed with lsof's ``-w'' option.

10.7   Why does Linux lsof report a NAME column value that begins with
``/proc''?

When lsof has problems processing a ``/proc/<PID>'' entry --

e.g., it can't convert the entry to a full and more meaningful
path name, or it can't access the /proc/<PID>/fd subdirectory
with opendir() -- it will report the /proc/<PID> path in the
NAME column.

10.8 Linux /proc/net/tcp* and /proc/net/udp* issues

10.8.1 Why use the Linux -X option?

If you're not interested in TCP/IP socket information for a
particular use of lsof, adding the -X option will make lsof run
more quickly, because -X inhibits the reading of the
/proc/net/tcp* and /proc/net/udp* files. For example, you may
only be interested in knowing what process has a particular
file open.

When the Linux system has a large number of open TCP/IP socket
files, the time savings provided by -X can be significant.

10.8.2 Why does lsof say ``-i is useless when -X is specified''?

If -X is specified, lsof can't report much information on open
TCP/IP socket files. However, lsof's -i option requests that
information. Hence, the two options conflict and can't be used
together.

10.8.3 Why does lsof say ``can't identify protocol (-X specified)''?

If the Linux lsof -X option is specified and an open socket
file can't be identified without accessing the /proc/net/tcp*
and /proc/net/udp* files, lsof will report that it can't
identify the socket's protocol and that the failure may be
caused by the -X specification

11.0 NetBSD Problems

11.1 Why doesn't lsof report on open kernfs files?

Lsof doesn't report on open NetBSD kernfs files because the
structures lsof needs aren't defined in the kernfs.h header
file in /sys/misc/kernfs.

11.2 Why doesn't lsof report on open files on: file descriptor
file systems; /proc file systems; 9660 (CD-ROM) file systems;
MS-DOS (floppy disk) file systems; or kernel file systems?

Lsof is not able to report on open files on certain file

system if /usr/src/sys/msdosfs didn't exist when the lsof
Configure script ran and lsof was made. /usr/src/sys/msdosfs
contains header files lsof needs for collecting data on
certain file system files.

You can tell if an lsof executable above) lacks support
for a file system if the following test of `lsof -v` produces
nothing:

    $ lsof -v 2>&1 | grep <support_enabled_definition>

The <support-enabled_definition> will be:

    File System Type Definition Note
    ---------------- ---------- ----
    File descriptor HASFDESCFS
    /proc HASPROCFS
    9660 HAS9660FS
    MS-DOS HASMSDOSFS (lsof 4.61 and above)
    Kernel HASKERNFS

The work-around is to install /usr/src/sys, rerun the lsof
Configure script, and remake lsof.

11.3   Why does lsof produce confusing results for nullfs file
systems?

Consider this report from /sbin/mount:

    /usr/home on /home type null (local)

(According to /sbin/mount /usr/home is the mounted-on device
and /home is the mounted-on directory.)

When lsof is asked to report on open files on /home, it
will report them as files on /usr/home instead. That's an
artifact of the NetBSD kernel's dynamic name lookup cache
(DNLC) and the way the kernel handles nullfs mounted-on
directories.

While lsof will report all open files on /home when given
/home as a file system directory argument, even though
reporting them as located on /usr/home, lsof will not find
the same files when asked to report on all open files on
/usr/home when given /usr/home as a file system device
argument. That's because from the mount perspective
/usr/home is equivalent to a device, but from the device
perspective it is still a directory.

So, what this lsof command reports:

    $ lsof /home
    ... NAME
    ... /usr/home/...

Won't be duplicated by this lsof command:

    $ lsof /usr/home

Another way to look at this confusing /home and /usr/home
example is to consider what stat(2) reports. For /home
stat(2) reports a device doublet that matches what lsof
finds in open file node structures, while the device doublet
stat(2) reports for /usr/home won't match what lsof finds.
Nor does the mode reported by stat(2) indicate a block
devices, as is the expected case.

There is no simple answer to this confusion, nor is there
even a simple explanation. Simply be aware that when
supplying file system arguments to lsof on NetBSD, use the
mounted-on directory name for a nullfs as the lsof argument,
and don't be surprised when the NAME column reports the
mounted-on device name.

11.4 NetBSD header file problems

11.4.1 Why can't the compiler find some NetBSD header files?

If the compiler's pre-processor complains it can't find some
header files when it compiles lsof source files, /usr/include
and /usr/src may not have all the header files lsof needs.

As a work-around use the NETBSD_SYS environment variable
to specify to lsof the location of the additional header
files -- e.g.,

    % setenv NETBSD_SYS /my_source
    % ./Configure -n netbsd

 or
     $ NETBSD_SYS=/mys_source ./Configure -n netbsd

Caution: using this work-around may cause the lsof Configure
script to activate or omit different features, depending
on where it finds the header files that determine the state
of the features.

11.4.2 Why does NetBSD lsof produce incorrect output?

If the NetBSD system's kernel was built from header files that
don't match those in /usr/include -- e.g., //usr/src has the
ones from which the kernel was built -- lsof may build, but
won't produce correct output.

As a possible work-around, try directing the C compiler to
select header files from /usr/src before it selects them from
/usr/include. That can be done with the DEBUG make string --
e.g.,

   $ make DEBUG="-I/usr/src -I/usr/include"

If that work-around fails, try using the LSOF_INCLUDE and
NETBSD_SYS environment variables to swap /usr/include and
/usr/src when running the Configure script, then use the make
DEBUG string when running make -- e.g.,

   $ LSOF_INCLUDE=/usr/src; export LSOF_INCLUDE
   $ NETBSD_SYS=/usr/include; export NETBSD_SYS
   $ ./Configure -n netbsd
   $ make DEBUG="-I/usr/src -I/usr/include"

11.5 Why isn't lsof feature xxx enabled for NetBSD?

Lsof's Configure script enables NetBSD features by locating
and examining header files associated with the features,
and based on what it finds, setting compile-time definitions
in Makefiles. (See 00PORTING for a list of the definitions.)

When Configure doesn't find header files or doesn't find
appropriate values in header files, that may mean the header
file tree lsof is searching is incomplete or out of date.

Lsof normally looks for NetBSD header files in /usr/include.
It can also be directed to look in other directories --
e.g., /sys -- if told to do so with the contents of the
LSOF_INCLUDE and NETBSD_SYS environment variables.

To determine what header file enables a missing feature,
check the NetBSD stanza in the Configure script. Then
check the locations it checks for the indicated header
files and contents.

See 00XCONFIG for more information on LSOF_INCLUDE and
and NETBSD_SYS.

12.0 NEXTSTEP and OPENSTEP Problems

12.1 Why can't lsof report on 3.1 lockf() or fcntl(F_SETLK)
locks?

Lsof has code to test for locks defined with lockf() or
fcntl(F_SETLK) under NEXTSTEP 3.1, but that code has never
been tested. I couldn't test it, because my NEXTSTEP 3.1
lockf() and fcntl(F_SETLK) functions return "Invalid
argument" every way I have tried to invoke them.

If your NEXTSTEP 3.1 system does allow you to use lockf()
and fcntl(F_SETLK) and lsof doesn't report locks set with
them, then the code in .../dialects/next/dnode.c probably
isn't correct. Please contact me via e-mail at <abe@purdue.edu>
and tell me how you got your lockf() and fcntl(F_SETLK) system
calls to work. Make sure "lsof" appears in the "Subject:" line
so my e-mail filter won't classify your letter as Spam.

12.2 Why doesn't lsof compile for NEXTSTEP with AFS?

I no longer have a NEXTSTEP test system that has AFS.
Changes to lsof since I once had a test system have caused
me to change the AFS code in NEXTSTEP without being able
to test the changes.

If you need AFS support for NEXTSTEP and can't get it to
compile, please contact me. Perhaps we can jointly fix
the problems.

13.0 OpenBSD Problems

13.1 Why doesn't lsof support kernfs on my OpenBSD system?

Lsof supports the kernel file system on OpenBSD versions
whose /sys/miscfs/kernfs/kernfs.h (or <miscfs/kernfs/kernfs.h>
header file correctly defines the kern_target structure.
The lsof Configure script's openbsd stanza checks for the
presence of the structure's kt_name element and activates
kernfs support for the CFLAGS -DHASKERNFS definition only
when it finds kt_name.

The kernfs.h header file is scheduled to be updated in the
OpenBSD 2.1 release, according to Kenneth Stailey, who
authored its changes.

13.2 Will lsof work on OpenBSD on non-x86-based architectures?

I've not tested lsof on an OpenBSD system that uses a
non-x86-based architecture, but I've had one report that
lsof 4.33 compiles and works on OpenBSD for the pmax
architecture (decstation 3100).

13.3 <sys/pipe.h> problems

13.3.1 Why does the compiler claim nbpg isn't defined?

When compiling lsof on some (older) OpenBSD SPARC versions,
the compiler may complain:

    In file included from ../dlsof.h:191,
        from ../lsof.h:166,
        from fino.c:52:
    /usr/include/sys/pipe.h:83: `nbpg' undeclared here
    (not in a function)
    /usr/include/sys/pipe.h:83: size of array `ms' has
    non-integer type

This happens because <sys/pipe.h> uses NBPG from
<machine/param.h> to size the `ms' array, and some OpenBSD
systems define NBPG in terms of a kernel integer variable,
nbpg.

Lsof revisions 4.46 and above have a hack to dlsof.h,
developed by Volker Borchert that avoids the compiler
problem for SPARC OpenBSD 2.3. The hack might work for
other OpenBSD SPARC versions, but hasn't been tested there.

If you want to enable the hack for your OpenBSD SPARC
version, modify this code in ../dialects/n+obsd/dlsof.h:

    # if   defined(OPENBSDV)
    # if   OPENBSDV==2030 && defined(__sparc__)
    # if defined(nbpg)
    #undef nbpg
    # endif   /* defined(nbpg) */
    #define nbpg   4096   /* WARNING!!! ... */
    # endif   /* OPENBSDV==2030 && defined(__sparc__) */
    #include <sys/pipe.h>
    #endif /* defined(OPENBSDV) */

You will probably want to change the second #if test to
match your OpenBSD version. You may also want to change

what value is assigned to nbpg. See the next section,
"What value should I assign to nbpg?"

13.3.2 What value should I assign to nbpg?

If you need to enable the nbpg hack, described in "Why does
the compiler claim nbpg isn't defined?", you may also need
to assign a value other than 4096 to nbpg. 4096 works for
the sun4c processor and should work for sun4m, but 8192
may be needed for sun4.

Check <machine/param.h> and other OpenBSD documentation to
determine the correct nbpg assignment.

13.4 Why doesn't lsof report on open MS-DOS file system (floppy
disk) files?

Lsof is not able to report on open MS-DOS file system files
if /usr/src/sys/msdosfs didn't exist when the lsof Configure
script ran and lsof was made. /usr/src/sys/msdosfs contains
header files lsof needs for collecting data on MS-DOS file
system files.

You can tell if an lsof executable (revisions 4.61 and
above) lacks MS-DOS file system support if the following
command reports nothing:

   $ lsof -v 2>&1 | grep HASMSDOSFS

The work-around is to install /usr/src/sys, rerun the lsof
Configure script, and remake lsof.

13.5 Why isn't lsof feature xxx enabled for OpenBSD?

Lsof's Configure script enables OpenBSD features by locating
and examining header files associated with the features,
and based on what if finds, setting compile-time definitions
in Makefiles. (See 00PORTING for a list of the definitions.)

When Configure doesn't find header files or doesn't find
appropriate values in header files, that may mean the header
file tree lsof is searching is incomplete or out of date.

Lsof normally looks for OpenBSD header files in /usr/include
and /sys. It can also be directed to look in other
directories if told to do so with the contents of the
LSOF_INCLUDE and NETBSD_SYS environment variables.

To determine what header file enables a missing feature,
check the OpenBSD stanza in the Configure script. Then
check the locations it checks for the indicated header
files and contents.

See 00XCONFIG for more information on LSOF_INCLUDE and
and NETBSD_SYS.

14.0 Output Problems

14.1 Why do the lsof column sizes change?

Lsof dynamically sizes its output columns each time it runs
to make sure that each column takes the minimum space.
Column parsing -- e.g., with awk -- is possible, because
each column is guaranteed to be separated from the preceding
one by at lease one space, and no column except the last
(NAME) contains embedded spaces.

14.2 Why does the offset have ``0t' and ``0x" prefixes?

The offset value that appears in the SIZE/OFF column has
``0t' and ``0x" prefixes to distinguish it from size values
that may appear in the same column.

Normally if the offset value is less than 100,000,000 (8
digits), it appears in decimal with a ``0t' prefix; over
99,999,999, in hexadecimal with a ``0x" prefix.

A decimal offset is handy, for example, when tracking the
progress of an outbound ftp transfer. When lsof reports
on the ftp process, it will report the size of the file
being sent with its open descriptor; it will report the
progress of the transfer via the offset of the outbound
open ftp data socket descriptor.

The ``-o [n]" option may be used to specify the maximum
number of decimal digits to be printed after ``0t" before
lsof switches to the hexadecimal digits after `0x". As
already noted, the default decimal digit count is 8.

14.3 What are the values printed in the FILE_FLAG column
and why is 0x<value> sometimes included?

The two comma separated lists, separated by a semicolon,
printed in the FILE-FLAG column (when the "+fg" option is
specified), are short-hand names or hexadecimal values for

the bits lsof finds in the f_flag or f_flags member of file
structures for files (the first list, the one before the
semicolon), and process open files flags found in various
kernel structures, often named "pofile" (the second list,
the one after the semicolon).

Lsof determines the short-hand names from symbols in the
<fcntl.h>, <linux/fs.h>, <sys/fcntl.h>, <sys/fcntlcom.h>,
o<sys/file.h>, and <sys/user.h> header files.

See the discussion of FILE-FLAG in the OUTPUT section of
the lsof man page, and the FF_* and POF_* symbols in lsof.h
for a list of the names.

Bits with no names defined for them are represented by an
0x<value> member of the comma-separated list -- a hexadecimal
integer. When "+fG" is specified (instead of "+fg"), lsof
will list all flag values as two hexadecimal integers,
separated by a semicolon.

When "-FG" is specified to get the flags in an output field,
the format defaults to hexadecimal. You can get names
instead by following "-FG" with "+fg" -- e.g.,

    $ lsof -FG +fg ...

However, when you precede "-FG" with "+fg" -- e.g.,

    $ lsof +fg -FG

the format will be hexadecimal; order is important.

14.3.1 Why doesn't lsof display FILE_FLAG values for my dialect?

All versions of lsof except the /proc-based Linux lsof
report FILE-FLAG values. Lsof can't obtain FILE-FLAG
information from the Linux /proc interface.

14.4 Network Addresses

14.4.1 Why does lsof's -n option cause IPv4 addresses, mapped to
IPv6, to be displayed in IPv6 notation?

When you use the -n option to tell lsof to display numeric
network addresses, and an IPv4 address has been mapped to
IPv6, lsof displays the address in IPv6 format and puts
"ipv4" in the TYPE column. That combination indicates the
IPv4 address has been mapped to IPv6.

For example, the IPv4 address 1.2.3.4, when mapped to an
IPv6 address, will be displayed by lsof as:

   [::ffff:1.2.3.4]

The enclosing brackets are lsof's signal that this is an
IPv6 address. Inside the brackets is a standard IPv6
address, reported by inet_ntop(). The first two colons,
signifying zeroes in the first 64 bits of the IPv6 address,
and the hexadecimal ffff in the next 32 bits, indicate that
the last 32 bits contains a mapped IPv4 address, which is
then displayed in IPv4 dot notation.

14.5 Why does lsof output \x, ^x, or \xnn for characters
sometimes?

Lsof displays only printable ASCII characters. Lsof
considers a character printable if isprint(3) says it
is. If isprint(3) says a character isn't printable,
the lsof may page explains:

   "... Non-printable characters are printed in one of
    three forms: the C ``\[bfrnt]'' form; the control
    character `^' form (e.g., ``^@''); or hexadecimal
    leading ``\x'' form (e.g., ``\xab''). Space is
    non-printable in the COMMAND column (``\x20'') and
    printable elsewhere."

14.5.1 Why is space considered a non-printable character in command
names?

Space is considered an unprintable character in command
names because it is sometimes possible to hide the full
command name from scripts that parse ps(1) output by
embedding a space in the name.

14.6 Why doesn't lsof print all the characters of a command name?

By default lsof prints the first nine characters of the
names of commands associated with processes. If more
characters are required, the "w" value of the "+c w" option
may be used to specify a larger width.

If "w" is zero ('0') lsof will print all characters of all
command names up to the limit of the number of characters
supplied by the particular UNIX dialect. When reporting
command names, lsof replaces non-printable characters as

discussed in the answer to " Why does lsof output \x, ^x, or \xnn for characters sometimes?"

See the answer to the "Why is space considered a non-printable character in command names?" question for an explanation of why spaces are replaced by the ``\x20'' representation in command names.

The number of command name characters supplied to lsof by UNIX dialects in files and structures varies by dialect. For example, Linux 2.4.27 supplies lsof the first 15 characters of command names and Solaris 9 supplies 16. Thus, even if "w" is zero ('0'), lsof can't report more characters for command names on those two UNIX dialects than they provide lsof.

14.7 Why does lsof reject some -c command names, saying their lengths are "> what system provides (nn)"?

The command name length that a specific system provides varies from dialect to dialect. As noted in the answer to the "Why doesn't lsof print all the characters of a command name?" question, Linux and Solaris provide a limited number of command name characters.

When more characters are specified in the parameter to the -c option, lsof considers it an error and issues a fatal error message -- e.g.,

    lsof: "-c xxxxyyyy" length (8) > what system provides (7)

The only work-around is to specify no more characters to -c that the system provides to lsof.

14.8 Why does lsof sometimes print TYPE numbers instead of names?

When lsof can't convert a type number to a name for printing in the TYPE column, it will report the number as four octets.

14.9 Marker line format problems

14.9.1 Why won't lsof accept a marker line format?

Lsof's Configure script must find the localtime(3) and strftime(3) functions in the dialect's C library in order to enable support for marker line formats.

Check the output of lsof's -v option for the presence of -DHAS_STRFTIME in the compiler flags. If it isn't there,

Configure didn't find the necessary two C library functions.

If you think lsof should have found the functions, make a copy
of the C test program in the Configure script that it uses to
find the functions. Then use the copy, or a more informative
modification of it, to learn why Configure can't find the
functions. You can find that program by searching for
strftime.

14.9.2 Why does lsof reject the NL (%n) marker line format?

When repeat mode and field output (with -F) have both been
specified, lsof won't allow new line (NL) formats to be
specified with ``%n''. That's because the marker line is
always guaranteed to be a single line.

There is no work-around to this restriction.

14.10 How are protocol state name exclusion and inclusion used?

Protocol state name inclusion and exclusion with the ``-s p:s''
option and its arguments have some issues to consider.

First, there is the problem of determining what state names, if
any, the dialect produces. Try running this lsof command to
find them:

    $ lsof -i

Knowing the state names of interest, the next problem is to
decide on the lsof options and their parameters that will
produce the desired output. Here some examples are probably
the most useful.

To list only TCP socket files in LISTEN and CLOSE_WAIT states,
use:

    $ lsof -itcp -stcp:listen,close_wait
or
    $ lsof -iTCP -sTCP:LISTEN,CLOSE_WAIT

Case isn't important to lsof in protocol and state names.

To exclude TCP socket files in CLOSE_WAIT state, use:

    $ lsof -itcp -stcp:^close_wait

Note the `^' preceding close_wait; it selects exclusion. You

can mix included and excluded names in a comma separated list,
but you may not include and exclude the same name for the same
protocol.

To list TCP files in LISTEN state and UDP files in Idle state,
use:

    $ lsof -i -stcp:listen -sudp:idle

Note: if you don't accompany the ``-s p:s'' list option and
argguments with the -i option, lsof will list all other regular
files, while applying the specified inclusion and exclusion
specifications to network files. Generally, then, you want to
use -i with -s.

14.10.1 Why doesn't my dialect support state name exclusion and inclusion?

When state name inclusion and exclusion was added, I had access
to test systems for AIX, Darwin, FreeBSD, Linux, PSTAT-based
HP-UX and Solaris.

Therefore, I was unable to add and test the support to any other
UNIX dialects.

If a dialect has the support, then the HASTCPUDPSTATE definition
in its machine.h header file will be active; if not, it will be
absent or commented out.

If your dialect doesn't have the support and you want it added,
you will have to provide me Internet access to a test host, where
I can compile lsof and have the credentials to test the changes
the support requires. If that's possible for you, please contact
me via e-mail at <abe@purdue.edu>. Make sure "lsof" appears in
the "Subject:" line so my e-mail filter won't classify your letter
as Spam.

15.0 Pyramid Version Problems

15.0.5 Statement of deprecation

As of lsof revision 4.52 support for all Pyramid versions has
been dropped. Contact me via e-mail at <abe@purdue.edu> if you
are interested in obtaining the last lsof Pyramid distribution.
Make sure "lsof" appears in the "Subject:" line so my e-mail
filter won't classify your letter as Spam.

16.0 SCO Problems

16.1 SCO OpenServer Problems

16.1.1 How can I avoid segmentation faults when compiling lsof?

If you have an older SCO OpenServer compiler, it may get
a segmentation fault when compiling some lsof modules.
That appears to happen because of the -Ox optimization
action requested in the lsof Makefile.

Try changing -Ox to -O with this make invocation:

    $ make DEBUG=-O

Bela Lubkin supplied this tip and Steve Williams verified
it.

16.1.2 Where is libsocket.a?

If you compile lsof and the loader says it can't find the
socket library, libsocket.a, called by the -lsocket option
in the lsof compile flags, you probably are running an SCO
OpenServer release earlier than 5.0 and don't have the
TCP/IP Development System package installed.

You may have the necessary header files, because you have
the TCP/IP run-time package installed, but if you don't
have the TCP/IP Development System package installed, you
won't have libsocket.a.

Your choices are to install the TCP/IP Development System
package or upgrade to OpenServer Release 5.0. You will
find libsocket.a in 5.0 -- you'll find all the libraries
and header files there, in fact -- and you can use gcc to
compile lsof if you don't want to install the 5.0 Development
System package.

16.1.3 Why do I get "warning C4200" messages when I compile lsof?

When you compile lsof under OSR 3.2v4.2 (and perhaps under
earlier versions as well), you may get many compiler warning
messages of the form:

    node.c(183) : warning C4200: previous declarator is not
    compatible with default argument promotion

In my opinion this is a bug in the OSR compiler. Because

the compiler cannot handle full ANSI-C prototypes, it
assumes default types for function parameters as it encounters
untyped in a function prototype -- e.g., in this function
declaration from node.c,

```
   readrnode(ra, r)
 KA_T ra;
 struct rnode *r;
   {
   ...
```

the compiler assigns default int types to the ra and r
arguments.

Then, when the compiler encounters the fully typed parameters
after the function skeleton and sees parameters with types
that don't match the assumptions it previously made, it
whines about its own assumptions.

You can ignore these messages.

16.2 SCO|Caldera UnixWare Problems

16.2.1 Why doesn't lsof compile on my UnixWare 7.1.1 or above
system?

When you Configure lsof with the "uw" abbreviation and try
to compile it for UnixWare 7.1.1, you may get compiler
error messages like this:

```
   UX:acomp: ERROR: "dproc.c", line 98:
 undefined struct/union member: p_pgidp
```

This suggest that you probably have a non-stop cluster
UnixWare 7.1.1 system. Its <sys/proc.h> header file differs
from the one on the system where I did the lsof port to
UnixWare 7.1.1. I currently don't have access to a non-stop
cluster system to be able to develop changes to lsof that
would make it compile and work there.

If you have a non-stop cluster UnixWare 7.1.1 system, want lsof
for it, and can offer me a test account on the system, please
contact me via e-mail at <abe@purdue.edu>. Make sure "lsof"
appears in the "Subject:" line so my e-mail filter won't
classify your letter as Spam.

If you have a system with nsc_cfs and can offer me a test
account on it, please contact me via e-mail at <abe@purdue.edu>.

Make sure "lsof" appears in the "Subject:" line so my e-mail filter won't classify your letter as Spam.

16.2.2 Why does lsof complain about node_self() on my UnixWare 7.1.1 or above system?

If lsof exits immediately after issuing this message:

    can't identify process NSC node; node_self(): <message>

It means that lsof has been built to run on a NonStop Cluster (NSC) UnixWare 7.1.1 or higher system and can't get the number of the node on which it is running. Lsof uses the node number to determine the path to the kernel boot file.

You can tell if lsof has been built for NSC by looking for "-DHAS_UW_NSC" in lsof's "-v" option output.

If the system on which you're trying to run lsof isn't running an NSC kernel, you will need to build a non-NSC lsof.

16.2.3 Why does UnixWare 7.1.1 or above complain about -lcluster, node_self(), or libcluster.so?

When you build, compile, and load lsof for UnixWare 7.1.1 and above, ld may complain that it can't find the -lcluster library or that the node_self symbol is undefined. When you try to run an existing lsof binary it may complain that libcluster.so can't be found.

These messages mean the tests made by Configure on your system led it to believe your system is running a NonStop Cluster (NSC) kernel, or the lsof binary you're trying to use was built on a NonStop Cluster system. If an lsof binary was built for NSC, this shell command produces output:

    $ strings <lsof_binary> | grep HAS_UW_NSC

If that's not the case, and you can rebuild lsof, set the UW_HAS_NSC environment variable to "N" and do this:

    $ Configure -n clean
    $ UW_HAS_NSC=N
    $ export UW_HAS_NSC
    $ Configure -n uw

$ make

You can also edit Makefile and lib/Makefile. Remove
-DHAS_UW_NSC from the CFGF strings. Remove -lcluster from
the CFGL strings. Then run make again.

If you have an existing NSC lsof binary and you want one
for a non-NSC system, you will have to build lsof yourself
on the system where you want to use it. (That's always a
good idea anyway.)

16.2.4 Why does UnixWare 7.1.1 or above lsof complain it can't
read the kernel name list?

If lsof complains:

    can't read kernel name list from <path>

It means that lsof can't find the booted kernel image file
at <path>. On NonStop Cluster (NSC) UnixWare 7.1.1 or
higher systems lsof determines the booted file path by
examining this file:

    /stand/`node_self`/boot

If examining that file doesn't lead to an NSC path, lsof
uses:

    /stand/1/unix

On non-NSC systems lsof expects the booted kernel image to
be in /stand/unix.

If your booted kernel image is in a different place, use
lsof's "-k <path>" option to specify its path.

16.2.5 Why doesn't lsof report link count, node number, and size
for some UnixWare 7.1.1 or above CFS files?

Lsof reports link count, node number, and size for open
CFS files as recorded in their kernel node structure's
cached attributes. Sometimes not all attributes are cached
on the node where lsof runs, so lsof cannot report them.

16.2.6 Why doesn't lsof report open files on all UnixWare 7.1.1
NonStop Cluster (NSC) nodes?

Lsof can only report on files open on the node on which it
runs, because the information lsof reports comes from the
private kernel memory of the node. This may mean that
asking lsof to find a specific open file, or use of a
specific Internet address or port, may not report all open
instances on nodes other than the one used to run lsof.

You can use the NSC onnode(1) command to run lsof on specific
nodes, or the onall(1) command to run lsof on all nodes --
e.g.,

    $ onall lsof [options] 2>&1 | less
 or
    $ onnode node-number lsof [options] 2>&1 | less

Note that, when lsof is run all nodes, the path name
component assembly results it reports in its NAME column
may vary, because the dynamic name cache from which lsof
gets the components is private to the kernel of each node.

Also note the use of shell redirection in the examples to
merge the standard error file information from onnode and
onall with lsof's standard output file output. That will
put the onnode and onall node announcements in proper
sequence with lsof's output.

16.2.7 Why doesn't lsof report the UnixWare 7.1.1 NonStop Cluster
(NSC) node a process is using?

To induce lsof to report the node on which a process runs
would be a significant, non-standard modification to lsof.
It has much wider implications than merely the printing of
a number in an output column. I'm not currently (April
2001) prepared to undertake such a modification.

If you want node-specific NSC information about open files,
run lsof under the control of onall(1) or onnode(1).

    $ onall lsof [options] 2>&1 | less
 or
    $ onnode node-number lsof [options] 2>&1 | less

16.2.8 Why does the compiler complain about missing UnixWare 2.1[.x]
header files?

SCO|Caldera didn't ship the following header files with
UnixWare 2.1 through 2.1.3:

```
<fs/proc/prdata.h>
<fs/procfs/prdata.h>
<sys/fs/fifonode.h>
<sys/fs/namenode.h>
```

Lsof needs those header files for its compilation. Contact
SCO|Caldera to get copies of those header files.

If you can't get the header files from SCO|Caldera, please
contact me via e-mail at <abe@purdue.edu>. Make sure "lsof"
appears in the "Subject:" line so my e-mail filter won't
classify your letter as Spam.

17.0 Sun Problems

17.0.5 Statement of deprecation

Lsof support for SunOS 4.1.x was last tested at revision 4.51.
Contact me via e-mail at <abe@purdue.edu> if you're interested in
obtaining it. Make sure "lsof" appears in the "Subject:" line so
my e-mail filter won't classify your letter as Spam.

17.1 My Sun gcc-compiled lsof doesn't work -- why?

Gcc can be used to build lsof successfully. However, an
improperly installed Sun gcc compiler will usually not
produce a working lsof.

If your Sun gcc-compiled lsof doesn't report anything, or
reports ``can't read proc table,'' or gcc refuses to compile
lsof without error, check that the gcc step that "fixes"
Sun header files was run on the system where you're using
gcc to compile lsof. As an alternative, if you have the
SunPro C 5.0 compiler or later available, use it to compile
lsof -- e.g., use the solariscc Configure abbreviations.

17.2 How can I make lsof compile with gcc under Solaris 2.[456],
2.5.1, 7, 8 or 9?

Presuming your gcc-specific header files are wrong for
Solaris, edit the lsof Configure-generated Makefile and
lib/Makefile and make this change:

```
 CFGF=   -Dsolaris=20400 ...
to
 CFGF=   -Dsolaris=20400 -D__STDC__=0 -I/usr/include ...
```

or change:

```
 CFGF=  -Dsolaris=20500 ...
to
 CFGF=  -Dsolaris=20500 -D__STDC__=0 -I/usr/include ...
```

or change:

```
 CFGF=  -Dsolaris=20501 ...
to
 CFGF=  -Dsolaris=20501 -D__STDC__=0 -I/usr/include ...
```

This is only a temporary work-around. You really should
instruct gcc to to update your gcc-specific header files
or install a recent gcc (e.g., 3.2), which has no need for
private copies of Solaris include files.

17.3 Why does Solaris Sun C complain about system header files?

You're probably trying to use /usr/ucb/cc if you get compiler
complaints like:

```
    cc -O -Dsun -Dsolaris=20300 ...
    "/usr/include/sys/machsig.h", line 81: macro BUS_OBJERR
    redefines previous macro at "/usr/ucbinclude/sys/signal.h",
    line 444
```

Note the reference to "/usr/ucbinclude/sys/signal.h". It
reveals that the BSD Compatibility Package C compiler is
in use. Lsof requires the ANSI C version of the Solaris
C compiler, usually found in /usr/opt/bin/cc or
/opt/SUNWspro/bin/cc.

Try adding a CC string to the lsof Makefile that points to
the Sun ANSI C version of the Sun C compiler -- e.g.,

```
    CC= /usr/opt/bin/cc
or
    CC= /opt/SUNWspro/bin/cc.
```

17.4 Why doesn't lsof work under my Solaris 2.4 system?

If lsof doesn't work under your Solaris 2.4 system -- e.g.,
it produces no output, little output, or the output is
missing command names or file descriptors -- you may have
a pair of conflicting Sun patches installed.

Solaris patch 101945-32 installs a kernel that was built

with a <sys/auxv.h> header file whose NUM_*_VECTORS
definitions don't match the ones in the <sys/auxv.h> updated
by Solaris patch 102303-02.

NUM_*_VECTORS in the kernel of patch 101945-32 are smaller
than the ones in the <sys/auxv.h> of patch 102303-02. The
consequence is that when lsof is compiled with the <sys/auxv.h>
whose NUM_*_VECTORS definitions are larger than the ones
used to compile the patched kernel, lsof's user structure
does not align with the one that the kernel employs.

If you have these two patches installed, contact Sun and
complain about the mis-match.

You may be able to work around the problem by editing
/usr/include/sys/auxv.h to have the following NUM_*_VECTORS
definitions:

    #define NUM_GEN_VECTORS 4
    #define NUM_SUN_VECTORS 8

The Configure script issues a prominent WARNING that you should
try the work-around.

I thank Leif Hedstrom for identifying the offending patches.

17.5 Where are the Solaris header files?

 If you try to compile lsof under Solaris and get a compiler
 complaint that it can't find system header files, perhaps
 you forgot to add the header file package, SUNWhea.

17.6 Where is the Solaris /usr/src/uts/<architecture>/sys/machparam.h?

 When you try to Configure lsof for Solaris 2.[23456], 2.5.1,
 and 7 -- e.g., on a `uname -m` == sun4m system -- Configure
 complains:

    grep: /usr/src/uts/sun4m/sys/machparam.h:
  No such file or directory
    grep: /usr/src/uts/sun4m/sys/machparam.h:
  No such file or directory

And when you try to compile the configured lsof, cc or gcc
complains:

    dproc.c:530: `KERNELBASE' undeclared (first use this function)

The explanation is that somehow your Solaris system doesn't have the header files in /usr/src/uts it should have. Perhaps someone removed the directory to save space. Perhaps you're using a gcc installation, copied from another system. In any event, you will have to load the header files from the SUNWhea package of your Solaris distribution.

KERNELBASE is an important symbol to lsof -- it keeps lsof from sending an illegal kernel value to kvm_read() where a segmentation violation might result (a bug in the kvm library). Lsof can get illegal kernel values because it reads kernel values slowly with kvm_read() calls that the kernel is changing rapidly.

Lsof doesn't need KERNELBASE at Solaris 2.5 and above, because it has a KERNELBASE value whose address lsof can find with /dev/ksyms and whose value it can read with kvm_read(). Under Solaris 2.5 /usr/src/uts has moved to /usr/platform.

17.7 Why does Solaris lsof say ``can't read proc table''?

When lsof collects data on processes, using the kvm_*() functions to scan the kernel's proc structure table, it checks to make sure it has identified a reasonable number of them -- a minimum of three. When lsof can't identify three processes during a scan, it repeats the scan.

When five scans fail to yield three processes, lsof issues the fatal message:

 lsof: can't read proc table

and exits.

Usually lsof fails to identify three processes during a scan because its idea of the form of the proc structure differs from that being used by the kernel. Since the proc structure is defined in <sys/proc.h> and other /usr/include header files, the root cause of a proc structure discrepancy usually can be found in the composition of /usr/include.

One common way that /usr/include header files can be incorrect is that gcc was used to compile lsof, gcc used its special (i.e., "fixed") header files instead of the ones in /usr/include, and the special gcc header files weren't updated when Solaris was. Answers to these questions:

My Sun gcc-compiled lsof doesn't work -- why?

How can I make lsof compile with gcc under Solaris 2.[456], 2.5.1, 7, 8 or 9?

Why does Solaris Sun C complain about system header files?

discuss the gcc header file problem and offer suggestions on how to fix it or work around it.

It may also be that you are trying to run a version of lsof that was compiled on an older version of Solaris. For example, an lsof executable, compiled for Solaris 2.4, will produce the ``can't read proc table'' message if you try to run it under Solaris 2.5. If you have compiled lsof under Solaris 2.5 and it still won't work, see if the header files in /usr/include have been updated to 2.5, or still represent a previous version of Solaris.

Another source of header file discrepancies to consider is the Solaris patch level and whether a binary kernel patch was not matched with a corresponding header file update. See the "Why doesn't lsof work under my Solaris 2.4 system?" question for an example of one in Solaris 2.4 -- there may be other such patch conflicts I don't know about.

17.8   Why does Solaris lsof complain about a bad cached clone device?

When lsof revisions below 4.04 have been run on a Solaris system and have been allowed to create a device cache file, the running of revisions 4.04 and above on the same systems may produce this complaint:

   lsof: bad cached clone device: ...
   lsof: WARNING: created device cache file: ...

This is the result of a change in the device cache file that took place at lsof revision 4.04. The change introduced a node number into the clone device lines of the device cache file and was done in such a way that lsof could detect device cache files whose clone lines don't have node numbers (lines created by previous lsof revisions) and recognize the need to regenerate the device cache file.

17.9 Why doesn't Solaris make generate .o files?

Solaris /usr/ccs/bin/make won't generate .o files from .c files if /usr/share/lib/make/make.rules is missing. It

may be found in and installed from the SUNWsport package.

17.10 Why does lsof report some Solaris 2.3 and 2.4 lock types as `N'?

For Solaris 2.3 with patch P101318 installed at level 45
or above, and for all versions of Solaris 2.4, NFS locks
are represented by a NFS-specific kernel lock structure
that sometimes lacks a read or write lock type indicator.
When lsof encounters such a lock structure, it reports the
lock type as `N'.

17.11 Why does lsof Configure say "WARNING: no cc in ..."?

When lsof's Configure script is executed with the solariscc
abbreviation it tries to make sure it's using the Sun C
compiler and not the UCB substitute from /usr/ucb/cc.
Thus, it looks for cc in the "standard" Sun compiler
location, /opt/SUNWspro/bin.

If Configure can't find cc there, it issues the warning:

    lsof: WARNING: no cc in /opt/SUNWspro/bin;
    using cc without path.

and uses cc for the compiler name, letting the shell find
cc with its PATH environment variable.

You can tell Configure where to find your cc with the
SOLARIS_CCDIR cross-configuration environment variable.
(See 00XCONFIG for more information on SOLARIS_CCDIR).
For example, use this Configure shell command:

    SOLARIS_CCDIR=/usr/special/bin Configure -n solariscc

(SOLARIS_CCDIR should be the full path to the directory
containing your cc.)

17.12 Solaris 7, 8 and 9 Problems

17.12.1 Why does lsof say the compiler isn't adequate for Solaris
7, 8 or 9?

Solaris 7, 8 and 9 kernels come in two flavors, 32 and 64
bit. 64 bit kernels run on machines that support the SPARC
v9 instruction set architecture. Separate executables for
some programs, -- e.g., ones using libkvm like lsof -- must
be built for 32 and 64 bit kernels.

Previous Sun (e.g., SC4.0) and earlier gcc compilers will
build lsof for 32 bit kernels, but they won't build it for
64 bit kernels. Compilers that will build lsof for 64 bit
Solaris 7, 8 and 9 kernels are the Sun WorkShop Compilers
C 5.0 and above, and recent gcc versions, e.g., 3.2.

When given the ``-xarch=v9'' flag, the C 5.0 compiler and
above, and associated loader and 64 bit libraries will
build a 64 bit lsof executable; when given the "-m64" or
"-mcpu=v9" (deprecated) flags, an appropriate gcc compiler
will build a 64 bit lsof executable.

When the lsof Configure script detects a 64 bit kernel is
in use (e.g., by executing `/bin/isainfo -kv`), and when
it finds that the specified compiler is inappropriate,
it complains with these messages:

For gcc:

```
   "!!!WARNING!!!=========!!!WARNING!!!=========!!!WARNING!!!"
   "!                                             !"
   "! LSOF NEEDS TO BE CONFIGURED FOR A 64 BIT KERNEL, BUT  !"
   "! THIS GCC DOESN'T SUPPORT THE BUILDING OF 64 BIT      !"
   "! SOLARIS EXECUTABLES.  LSOF WILL BE CONFIGURED FOR A   !"
   "! 32 BIT echo KERNEL.                         !"
   "!                                             !"
   "!!!WARNING!!!=========!!!WARNING!!!=========!!!WARNING!!!"
```

For Sun C:

```
   !!!WARNING!!!=========!!!WARNING!!!=========!!!WARNING!!!
   !                                             !
   ! LSOF NEEDS TO BE CONFIGURED FOR A 64 BIT KERNEL, BUT    |
   ! THE VERSION OF SUN C AVAILABLE DOESN'T SUPPORT THE     !
   ! -xarch=v9 FLAG.  LSOF WILL BE CONFIGURED FOR A 32 BIT   !
   ! KERNEL.                              !
   !                                             !
   !!!WARNING!!!=========!!!WARNING!!!=========!!!WARNING!!!
```

17.12.2 Why does Solaris 7, 8 or 9 lsof say "FATAL: lsof was compiled
for..."?

Solaris 7, 8 or 9 lsof may say:

```
   lsof: FATAL: lsof was compiled for a xx bit kernel,
   but this machine has booted a yy bit kernel.

   Where: xx = 32 or 64
```

yy = 64 or 32

(xx and yy won't match.)

This message indicates that lsof was compiled for one size
kernel and is being asked to execute on a different size
one. That's not possible for programs like lsof that use
libkvm.

Depending on the instruction sets for which you need Solaris
7, 8 or 9 lsof, you may need two or more versions of lsof,
compiled for each kernel size, installed for use with
/usr/lib/isaexec. See the "How do I install lsof for
Solaris 7, 8 or 9?" section of this document for more
information on that.

17.12.3 How do I build lsof for a 64 bit Solaris kernel under a 32
bit Solaris kernel?

If your Solaris system has an appropriate compiler (e.g.,
WorkShop Compilers C 5.0 and above, or a recent gcc like
3.2) and the 64 bit libraries have been installed, you can
force lsof's Configure script to build a 64 bit version of
lsof with:

    $ SOLARIS_KERNBITS=64 Configure -n solariscc

The SOLARIS_KERNBITS environment variable is part of the
lsof cross-configuration support, described in the 00XCONFIG
file of the lsof distribution.

17.12.4 How do I install lsof for Solaris 7, 8 or 9?

If you are installing lsof where it will be used only under
the bit size kernel for which it was built, no special
installation is required.

If, however, you are installing different versions of lsof
for different bit sizes -- e.g., for use on a 64 bit NFS
server and from its 32 bit clients -- you should read the
man page for isaexec(3C) and install lsof according to its
instructions.

The executable at the directory where lsof is to be found
should be a hard link to /usr/lib/isaexec or a copy of it.
In the directory there must be instruction architecture
subdirectories -- e.g., .../sparc/ and .../sparcv9/. The
lsof for 64 bit size kernels is installed in the .../sparcv9/

subdirectory; the one for 32 bit size kernels, in .../sparc/.

For example, if you're installing 32 and 64 bit lsof
executables in /usr/local/etc, you would:

```
# cd /usr/local/etc
# ln /usr/lib/isaexec lsof
# mkdir sparc sparcv9
# install the 32 bit lsof as sparc/lsof
# install the 64 bit lsof as sparcv9/lsof
# chmod, chown, and chgrp sparc/lsof and
  sparcv9/lsof appropriately
```

Lsof permissions and ownerships are the same whether one
or more lsof executables are being installed, with or
without the /usr/lib/isaexec hard link.

17.12.5 Why does my Solaris 7, 8 or 9 system say it cannot execute
lsof?

When you attempt to execute lsof, your Solaris 7, 8 or 9
shell may complain:

```
ksh: ./lsof: cannot execute
```

If the lsof executable exists and has the proper execution
permissions, this error may be the result of trying to
execute an lsof, built for a 64 bit kernel, on a 32 bit
kernel.

This will tell you about the lsof executable:

```
$ file lsof
lsof: ELF 64-bit MSB executable SPARCV9 Version 1,
dynamically linked, not stripped
```

The "64-bit" notation indicates the binary was built for
a 64 bit kernel. To see the running kernel bit size, use
this command:

```
$ isainfo -kv
32-bit sparc kernel modules
```

The "32-bit" notation indicates a 32 bit kernel has been
booted.

The only work-around is to obtain, or Configure and make,
an lsof for the appropriate kernel bit size. If you

Configure and make lsof on the kernel where you wish to
run it the proper compiler, the lsof Configure step will
generate Makefiles that can be used with make to build an
appropriate lsof executable.

To compile a 64 bit lsof, you must have an appropriate
compiler -- i.e., Sun WorkShop Compilers C 5.0 or higher
or a recent gcc like 3.2.

17.12.6 What gcc will produce 64 bit Solaris 7, 8 and 9 executables?
8 and 9 executables?

Properly built and installed recent gcc versions -- e.g.,
3.2 -- will build lsof for 64 bit Solaris kernels.

If you update your gcc version to 3.2 or later, make sure
the private gcc header files become current -- i.e., clear
out any private header files from a previous gcc or Solaris
installation before installing the new ones, or build to
a new --prefix root and replace the old root with it after
the build and installation are complete.

17.12.7 Why does lsof on my Solaris 7, 8 or 9 system say, "can't
read namelist from /dev/ksyms?"

You're probably trying to use an lsof executable built for
an earlier Solaris release on a 64 bit Solaris 7, 8 or 9
kernel. The output from `lsof -v` will tell you the build
environment of your lsof executable. You should also have
gotten a warning message that lsof is compiled for a
different Solaris version than the one under which it is
running -- something like this:

    lsof: WARNING: compiled for Solaris release X; this is Y

You need to build lsof on the system where you want to use
it. For 64 bit Solaris 7, 8 and 9 you need a compiler that
can generate 64 bit Solaris executables -- e.g., the Sun
Workshop 5 C compiler or later, or a recent gcc version
like 3.2. See the "Why does lsof say the compiler isn't
adequate for Solaris 7, 8 or 9?" section and the ones
following it for a discussion of building lsof for 64 bit
Solaris 7, 8 or 9.

17.13 Solaris and COMMON

17.13.1 What does COMMON mean in the NAME column for a Solaris VCHR
file?

When lsof puts COMMON or (COMMON) in the NAME column of a
Solaris VCHR file, it means that the file is handled by
the special file system functions of the kernel through a
common vnode.

17.13.2 Why does a COMMON Solaris VCHR file sometimes seem to have an
incorrect minor device number?

When lsof reports on an open file in a Solaris special file
system that uses a COMMON vnode, and the file is a VCHR
file, lsof tries to locate the associated device node by
looking for matches on the major and minor device numbers
first.

If no major and minor match results, lsof then looks for
a match on pseudo and clone device files. (See /devices/pseudo.)
Those device nodes are matched specially by either their
major or minor device numbers, but not both. Hence, when
lsof finds a match under those special conditions, it may
report a value in its output DEVICE column that differs
from one of the major and minor numbers of the device node.

Here's an example from a sun4m Solaris 7 system:

    $ ls -li /devices/pseudo/pm@0:pm
    151261 crw-rw-rw- 1 root   sys   117, 0 ...
    $ lsof /devices/pseudo/pm@0:pm
    COMMAND ... DEVICE ...   NODE NAME
    powerd   117,1 ... 151261 /devices/pseudo/pm@0:pm (COMMON)
    Xsun   ... 117,0 ... 151261 /devices/pseudo/pm@0:pm

Note that the DEVICE value for the file with (COMMON) in
its name field has a different minor device number (1) from
what ls reports (0), while the DEVICE value for the file
without (COMMON) matches the ls output exactly. Both match
on the major device number, 117. The minor device number
mis-match is a result of the way the Solaris kernel handles
special file system common vnodes, and it's the reason lsof
puts (COMMON) after the name to signal that a mis-match is
possible.

17.14 Why don't lsof and Solaris pfiles reports always match?

/usr/proc/bin/pfiles for Solaris 2.6, 7, 8, and 9 also
reports information on open files for processes. Sometimes
the information it reports differs from what lsof reports.

There are several reasons why this might be true. First,
because pfiles is a Sun product, based on Sun kernel
features, its developers have a better chance of knowing
exactly how open file information is organized. I sometimes
have to guess at how kernel file structure linkages are
constructed by gleaning hints from header files.

Second, lsof is aimed at providing information, specifically
device and node numbers, that can be used to identify named
file system objects -- i.e., path names. Thus, lsof tries
to make sure its device and node numbers match those reported
by stat(2). Pfiles doesn't always report numbers that
match stat(2) -- e.g., for files using clone and pseudo
devices via common vnodes like the nlist() /dev/ksyms usage.

Here's the Solaris 7 COMMON VCHR example again with additional
pfiles output:

```
$ ls -li /devices/pseudo/pm@0:pm
151261 crw-rw-rw-  1 root    sys     117,  0 ...
$ lsof /devices/pseudo/pm@0:pm
vic1: 10 = lsof /dev/pm
COMMAND ... DEVICE ...   NODE NAME
powerd  ...  117,1 ... 151261 /devices/pseudo/pm@0:pm (COMMON)
Xsun    ...  117,0 ... 151261 /devices/pseudo/pm@0:pm
$ pfiles ...
0: S_IFCHR ... dev:32,24 ino:61945 ... rdev:117,1
...
14: S_IFCHR ... dev:32,24 ino:151261 ... rdev:117,0
```

Note that the NODE number, reported by lsof, matches what
ls(1) and stat(2) report, while the ino value pfiles reports
doesn't.   Lsof also indicates with the (COMMON) notation
that the DEVICE number is a pseudo one, derived from the
character device's value. The lsof DEVICE value matches
the pfiles rdev value, correct behavior for a character
device, but pfiles gives no sign that it's not possible to
find that character device number in /devices with ls(1)
or stat(2).

17.15 Why does lsof say, "kvm_open(namelist=default, core=default):
Permission denied?"

Lsof needs permission to read from the /dev/kmem and /dev/mem
memory devices. Access to them is opened via a call to
the kvm_open() library function and it reports the indicated
message.

You must give lsof permission to read the memory devices. The super user can almost always do that, but other lsof users can do it if some group -- e.g., sys -- has permission to read the memory devices, and the lsof binary is installed with the group's ownership and with the setgid permission bit enabled.

17.16 Why is lsof slow on my busy Solaris UFS file system?

Lsof may be slow on a busy Solaris UFS file system when UFS logging has been enabled with the "logging" mount option. That option can significantly increase disk operations under certain conditions -- e.g., when a lot of files are accessed quickly.

When only the "logging" option is specified to mount, all file accesses (atime updates) are logged to the UFS logging queue. Each atime update requires two writes to the disk to complete it.

If you want to do UFS logging -- and there are reliability advantages to it -- consider using the "logging,noatime" mount options instead. That will shift atime updates from the logging queue to fewer and independent asynchronous operations, consequently making the UFS logging queue a smaller bottleneck.

Consult mount_ufs(1M) for more information on the logging and noatime options.

(My thanks to Casper Dik for this tip on improving the performance of UFS logging.)

17.17 Why is lsof so slow on my Solaris 8 or 9 system?

Solaris 8 has a post-release feature upgrade modifying kernel name cache (DNLC) handling that can slow lsof throughput dramatically. The feature, sometimes called negative DNLC caching, is standard in Solaris 9.

As best I can tell, when you install the Solaris 8 MU1 package, you get negative DNLC caching. If this pipe produces any output, your system has negative DNLC caching.

    $ nm /dev/ksyms | grep negative_cache_vnode

The reason negative DNLC caching perturbs lsof is that a single vnode address (found in the negative_cache_vnode

kernel variable) is used to mark entries in the DNLC that
are not (the negative part) found on disk.

Since a single vnode address (the DNLC key lsof uses) can
represent many (I've seen upwards of 30,000.) DNLC entries,
their presence overloads lsof's internal DNLC hashing
function. An overloaded hash function is a slow hash
function, and lsof's slows to a crawl when it encounters
thousands of keys that produce the same value when the lsof
DNLC hash function is applied to them.

The solution is simple -- ignore negative DNLC cache keys.
They don't represent path name components lsof can use.
Lsof revisions 4.50 and above have an addition that ignores
them and the performance of those lsof revisions improves
significantly when presented with negative DNLC cache keys.

If you don't have an lsof revision at 4.51 or later, there's
a work-around. Use lsof's ``-C'' option. It disables
lsof's DNLC caching. Of course, that also inhibits the
reporting of any path name components from the kernel DNLC.
When ``-c'' is used, lsof will continue to report file
system and character device paths.

17.18 Solaris and VxFS

17.18.1 Why doesn't lsof support VxFS 3.4 on Solaris 2.6, and above?

Lsof will not support VxFS version 3.4 on Solaris 2.6 and above
unless some files from VxFS Update 2 have been installed. VxFS
3.4 FCS and VxFS 3.4 update 1 lack the header files lsof
normally uses to obtain information from the VxFS 3.4 kernel
node structure, vx_inode. VxFS 3.4 Update 2 provides a method
whereby lsof can obtain the necessary vx_inode information from
the vxfsu_get_ioffsets() function in Veritas utility
libraries.

The utility libraries (32 bit and 64 bit versions) may be
found in /opt/VRTSvxfs/lib. An ancillary header file may
be found in /opt/VRTSvxfs/include/sys/fs/vx_libutil.h.
Documentation of the vxfsu_get_ioffsets(3) function may be
found in /opt/VRTS/man/man3/vxfsu_get_ioffsets.3.

Those files of VxFS 3.4 Update 2 may be downloaded from:

   ftp://ftp.veritas.com/pub/support/vxfs_34.i64243.tar

The vxfs_34.i64243.tar archive will unpack into an i64243

directory containing these files:

```
$ ls i64243
README
libvxfsutil.sol26.sums
libvxfsutil.sol26.tar.Z
libvxfsutil.sol27.sums
libvxfsutil.sol27.tar.Z
libvxfsutil.sol28.sums
libvxfsutil.sol28.tar.Z
```

Read README. Select the *.tar.Z file appropriate for your
Solaris version. Its contents will unpack into /opt/VRTS
and /opt/VRTSvxfs, so you will need sufficient permission
-- e.g., do it as root -- to unpack the uncompressed archive.
Once you've done that, it's a good idea to compare the
checksums of the archive you unpacked with the ones recorded
in the appropriate *.sums file. Use `sum -r` to verify
the checksums.

For example, if you want the Solaris 8 version, uncompress
and unpack libvxfsutil.sol28.tar.Z -- e.g.,

```
$ su
...
# cd i6423
# zcat libvxfsutil.sol28.tar.Z | tar xf -
```

That should create these new files and subdirectories with
the indicated checksums:

```
File or subdirectory   sum -r

/opt/VRTSvxfs/include/vxfsutil.h  03938
/opt/VRTSvxfs/lib/libvxfsutil.a  51794
/opt/VRTSvxfs/lib/sparcv9/
/opt/VRTSvxfs/lib/sparcv9/libvxfsutil.a 07420
/opt/VRTS/man/man3/
/opt/VRTS/man/man3/vxfsu_get_ioffsets.3 62480
```

Once these files are in place, run lsof's Configure script
for the solaris or solariscc abbreviation. Configure will
locate the appropriate VxFS 3.4 Update 2 files and set up
for the making of an lsof that will properly display open
VxFS 3.4 file information.

17.18.2 Why does lsof report "vx_inode: vxfsu_get_ioffsets error"
for open Solaris 2.6 and above VxFS 3.4 and above files?

Even when lsof supports VxFS 3.4 and above on Solaris 2.6 and
above, it may report "vx_inode: vxfsu_get_ioffsets error" in
the NAME column for all VxFS files.

The usual cause is that lsof doesn't have permission to
read the file at the end of the /dev/vxportal symbolic
link. If, for example, lsof has been installed setgid(sys),
then the /dev/vxportal symbolic link destination should be
owned by the sys group and readable by it.

Update 2 for VxFS 3.4 sets the modes of the /dev/vxportal
symbolic link destination to 0640 and the group ownership
to sys. But I have had a report that the modes are wrong
in a VxFS 4.0 installation.

Another cause may be that the system has more than one version
of VxFS installed (Only one can be active.), and lsof's
Configure script did not choose the header files and libraries
for the active VxFS version. Configure opts for VxFS 4.0 and
above header files and libraries (in /opt/VRTS) in preference
to those for VxFS below 4.0 (in /opt/VRTSvxfs).

Look for the directories /opt/VRTS and /opt/VRTSvxfs. If you
have /opt/VRTS, make sure its header and library symbolic links
point to those of the active VxFS version.

If you have both directories, look at the CFLAGS that Configure
constructed for making lsof and see which directory path
follows a -I option. If that doesn't match the directory path
of the active VxFS version, try pointing Configure at the
correct directory with the SOLARIS_VXFSINCL environment
variable -- e.g.,

   $ SOLARIS_VXFSINCL=/opt/.../include ./Configure -n solaris

17.18.3 Why does Solaris Configure claim there is no VxFS library?

The lsof Configure script, when configuring for Solaris, may
report:

   FATAL: no VxFS .../libvxfsutil.a

That fatal error message indicates lsof has found the VxFS
utility library's header files, but can't find the library
itself in the expected location adjacent to the header files.

One possible cause is an incorrect symbolic link from

/opt/VRTS/lib/sparcv9/libvxfsutil.a to the library's real
location. (Some VxFS distributions declared the link
incorrectly.) Use `ls -lL` on that path to see if it exists.
If it doesn't exist, the link may be missing an additional
leading "../" component.

If the problem is a missing "../" from the library's link, you
can correct the link or check with Veritas/Symantec for the
patch that corrects it.

If the problem is not a missing "../", and you know the
libvxfsutil.a location, you can define its path in the
SOLARIS_VXFSLIB environment variable before running the lsof
Configure script. (See 00XCONFIG for information about using
the SOLARIS_VXFSLIB environment variable.)

If you have no libvxfsutil.a, you must obtain it from
Veritas/Symantec or find it in your VxFS installation package.

17.18.4 Why doesn't Solaris lsof report VxFS path name components?

Solaris lsof will report path name components for VxFS versions
that use the common Solaris Dynamic Name Lookup Cache (DNLC) or
on some file systems of VxFS versions that support the VxFS
Reverse Name Lookup (RNL) facility.

VxFS versions 3.3 (approximately) and below use the common
Solaris DNLC. (I haven't been able to determine exactly when
VxFS stopped using the DNLC.) For versions above that boundary,
but below 4.0, lsof can't report path name components.

At VxFS 4.0 and above, lsof can be compiled to use the VxFS RNL
facility for reporting path names. If "-DHASVXFSRNL" appears
in the compiler flags section of lsof "-v" option output, then
the lsof Configure script detected the VxFS RNL facility and
lsof has been compiled to use it.

Lsof's use of the RNL facility can fail when the VxFS file
system disk layout version is below 6. In that case, lsof can
report no path name components. For more information, see the
vxfs_inotopath(3) manual page. any of the following commands
will show the disk layout version for a VxFS file system, when
supplied the block device or mount point on which the file
system is mounted.

    fstyp -v <block_device>
  or
    mkfs -m <block_device>

or

    vxupgrade <mount_point>

You must have permission to read the block device -- e.g., be
the root user.

You may also be able to upgrade an older disk layout to one
that will work with the RNL. See the vxupgrade(1M) man page
for more information on that.

When lsof can't report VxFS path name components, it reports
the file system mount point and the path name of device on
which it is mounted. The device path name is enclosed in
parentheses.

17.18.5 Why does Solaris 10 lsof report scrambled VxFS paths?

Solaris 10 lsof may report a bogus, scrambled path for an open
VxFS file, when lsof obtains the path from a vnode's cached
path. Veritas/Symantec reports that their Solaris 10
implementation has bugs in the way it handles the Solaris 10
vnode cached path and those bugs will be fixed in an upcoming
patch some time after August 15, 2005.

When Solaris 10 lsof reports a path for an open VxFs file
obtained via the VxFS Reverse Name Lookup facility, the path
will be correct.

Also see the answers to the questions "Why does Solaris 10 lsof
sometimes report the wrong path name?" and "Why doesn't Solaris
lsof report VxFS path name components?"

17.19 Large file problems

17.19.1 Why does lsof complain it can't stat(2) a Solaris 2.5.1
large file?

When given an argument that is the path to a Solaris 2.5.1
file, enable for large file operations with the O_LARGEFILE
open(2) option, lsof complains that it can't stat(2) the
file. That's because lsof isn't using a stat(2) call and
associated structure enabled for large files.

This error has been fixed, starting at lsof revision 4.58
for Solaris 2.6 and above. That fix won't work on Solaris
2.5.1 and I no longer have access to a Solaris 2.5.1 test
system to develop a separate fix.

The work-around is to avoid specifying a O_LARGEFILE path
as an argument to lsof on Solaris 2.5.1. Instead use a
combination of lsof and grep to achieve the same results,
albeit more clumsily.

17.20   Why does lsof get a segmentation fault on 64 bit Solaris
8 using NIS+?

I have received a report from Gary Craig that lsof produces
a segmentation fault on his 64 bit Solaris 8 system using
NIS+. Via an independent test program we have exonerated
lsof and tracked the fault to the NIS+ __nis_server_name()
function in the C name server library, -lnsl.

Lsof causes the __nis_server_name() NIS+ function to be
called by calling getservent() to read entries of the port
number to service name map.

The only Sun bug ID that appears to describe the problem
is 4304244, although its text is unclear enough to leave
room for doubt.

Until Sun eliminates the __nis_server_name() segmentation
fault cause, a work-around for lsof is to use its "-P"
option, causing lsof to avoid port to service name lookups.

17.21 Will lsof crash the Solaris kernel?

I've received and investigated one report that it has when
the Sun hardware (a QME interface) was faulty. Today (May
23, 2002) I've learned that Sun has reports of kernel
crashes caused by adb, lsof, and mdb.

The Sun investigation pinpointed a problem in the /dev/kmem
kernel driver and there is a Sun bug report, 4344513, about
the problem. There is a fix in Solaris 9, and patches for
Solaris 7 and 8 (SPARC and x86).

To see if your Solaris system is fixed, look for a
/devices/pseudo/*allkmem node.

Extensive address filtering was added to lsof revision 4.50
to forestall what I then (July 2001) believed to be only
the possibility that lsof might crash Solaris. However,
the filtering isn't perfect, since a filtered address might
become invalid after lsof has filtered it but before lsof
has delivered it to /dev/kmem. That filtering work is
described in .../dialects/sun/solaris_kaddr_filters, also

available at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/solaris_kaddr_filters

The best and safest work-around is to upgrade to Solaris
9 or install an appropriate patch or its equivalent from
this list:

```
   Solaris SPARC   x86
   Version Patch  Patch
   ======= ===== =====
      7 106541-20 106542-20
      8 108528-14 108529-14
```

17.22   Why does lsof on Solaris 7, 8, or 9 report a kvm_open()
failure?

When lsof is started on some Solaris 7, 8, and 9 systems
it may report:

```
   lsof: kvm_open(namelist=default, corefile=default): \
   No such file or directory
```

Lsof revisions 4.65 and later will first report:

```
   lsof: cannot stat /dev/allkmem
```

The second message, not delivered in lsof revisions below
4.65, explains the cause of the kvm_open() failure; it
can't find /dev/allkmem.

/dev/allkmem is a device added to Solaris 7 and 8 in patches
and in the Solaris 9 FCS. See the preceding "Will lsof
crash the Solaris kernel?" section for more information on
/dev/allkmem and the patches.

The kvm_open(3KVM) function in the KVM library of patched
Solaris 7 and 8 systems and in Solaris 9 expects to find
/dev/allkmem and exits on error when it does not.

If you have installed the patch that updated your KVM
library to a version that expects /dev/allkmem to be present
and it is not, you may need to reconfigure your system's
devices with devfsadm(1M) or enter "boot -r" to the OpenBoot
monitor's prompt (usually "ok").

17.23 Solaris and SAM-FS

17.23.1 Why does Solaris lsof report "(limited SAM-FS info)"?

Lsof 4.68 and above report "(limited SAM-FS info)" on
Solaris in the NAME column after the path or file system
name for all files it finds on SAM-FS file systems.

That's because no more information is known about the
composition of the nodes that follow SAM-FS vnodes. If
you can provide that information, please contact me via
e-mail at <abe@purdue.edu>. Make sure "lsof" appears in the
"Subject:" line so my e-mail filter won't classify your letter
as Spam.

17.23.2 Why can't lsof locate named SAM-GS files?

Solaris lsof 4.68 and above can't locate files on SAM-FS
file systems when the files are named as lsof arguments
because lsof doesn't know how to locate open SAM-FS file
device and node number information. (See also 'Why does
Solaris lsof report "(limited SAM-FS info)?')

17.24 Lsof and Solaris 10 zones

17.24.1 How can I make lsof list the Solaris zone?

Use the lsof "-z [z]" option.

17.24.2 Why doesn't lsof work in a Solaris 10 zone?

When run from within a Solaris 10 zone, lsof will usually
report:

    lsof: can't stat(/devices): No such file or directory

That's because a Solaris zone usually has no /devices
subdirectory, a restriction of the zone implementation intended
to limit the ability of zone processes to control global system
resources, including physical devices.

While a zone may have a /dev subdirectory, that subdirectory
usually lacks the /dev/allkmem, /dev/mem and /dev/kmem devices
lsof and the KVM library it uses require.

The work-around is to run lsof in the global zone. When it is
run in a global zone lsof will be able to report on processes
running in any zone, including the global zone.

17.24.3 Why does lsof complain it can't stat() Solaris 10 zone file

systems?

When run from the global zone on Solaris 10 lsof may complain:

    lsof: WARNING: can't stat() 15 zone file systems;
     using dev= options

The warning message means lsof found the reported number of
file system entries in the mount table for which it didn't have
permission to get stat(2) results, but which had "zone=" and
"dev=" mount table options.

That is a normal restriction of Solaris 10 zones. Since the
lsof warning message indicates it was able to find "dev="
options for the file systems, lsof will probably work
correctly.

One work-around is to relax the restrictions on zone mount
points, so that lsof can stat() them. While that may be
possible by changing directory modes or group ownerships, it is
probably not a good idea, because it weakens the restrictions
zones are intended to provide.

Another work-around is to suppress the warning message with
lsof's "-w" option. The down side of that is that it causes
the suppression of all warning messages, leading to the
possibility that some non-stat() warning messages will be
suppressed.

17.25 Solaris 10 problems

17.25.1 Why does Solaris 10 lsof sometimes report the wrong path name?

When a path name component is renamed -- e.g., with mv(1) --
Solaris 10 lsof may report the old component for an open file
that used the component in its path before the rename. That's
because Solaris 10 lsof reports the path name cached in the
open file's vnode and the Solaris 10 kernel doesn't update the
open vnode's cached path name when a component of it is changed.

When an open file is deleted -- e.g., with rm(1) -- the path
name by which it was opened remains cached in the vnode. Lsof
can be instructed to display that path name with the -X option.
The path name might be incorrect because of the rename problem
described above. See the answer to the 'What does "(deleted)"
mean in the NAME column of a Solaris 10 open file?' question
for more information.

Lsof is sometimes able to detect that cached path name is
incorrect. In that case lsof may report only the mounted-on
directory and device of the file system or it may report that
the path name is of questionable accuracy by appending a
trailing "(?)" to it in the NAME column.

See the answer to the "Why does Solaris 10 lsof sometimes
report only the mounted-on directory and device?" and 'What
does "(?)" mean in the NAME column of a Solaris 10 open file?'
questions for more information.

17.25.2 Why does Solaris 10 lsof sometimes report only the mounted-on
directory and device?

For some regular open files lsof may report only the mounted-on
directory and device of the file system on which the file
resides. That's because lsof was able to determine that the
path name cached in the open file's vnode is incorrect.

Lsof detects the cached path name is incorrect by applying
stat(2) to it, provided that no error was detected when stat(2)
was applied to the file system mounted-on directory during lsof
setup. If a mounted-on directory stat(2) error was detected
during setup, lsof does no cached path name analysis and simply
reports it.

When the application of stat(2) to the cached path name returns
a no-entry reply (the ENOENT error number), lsof concludes the
path no longer exists (i.e., has been unlinked) and reports the
mounted-on directory and device of the file system. That
behavior can be modified with the -X option in lsof revisions
4.77 and above. See the answer to the 'What does "(deleted)"
mean in the NAME column of a Solaris 10 open file?' for more
information.

When the application of stat(2) to the cached path name returns
a permission error reply (the EACCES or EPERM error numbers),
lsof reports the cached path name and adds a trailing "(?)" to
indicate the reported path name is of questionable accuracy.
See the answer to the question 'What does "(?)" mean in the
NAME column of a Solaris 10 open file?' for more information.

If the application of stat(2) to the cached path name yields
any other error reply, lsof reports the mounted-on directory
and device of the file system.

When the application of stat(2) to the cached path name
succeeds, lsof compares the reported device and node numbers to

what it has obtained for the open file from kernel structures.
If they match, lsof reports the cached path name. If they
don't match, lsof instead reports the mounted-on directory and
device of the file system.

A work-around that allows lsof to apply stat(2) successfully to
cached path names is to give lsof sufficient permission to do
it -- i.e., run lsof as the root user.

17.25.3 What does "(deleted)" mean in the NAME column of a Solaris 10
open file?

When the -X option is specified to Solaris 10 lsof, it will
report in its NAME column the path name cached for a deleted
file in its vnode. The path name will be followed by
"(deleted)".

Note that the path name cached in a file's vnode is the path
name by which the file was opened. It is not updated by the
Solaris kernel when any path name component is changed. Hence,
it may not represent the final path name the open file had.

See the answer to the "Why does Solaris 10 lsof sometimes
report the wrong path name?" question for more information on
how changing a path name component affects the correctness of a
what lsof reports.

17.25.4 What does "(?)" mean in the NAME column of a Solaris 10 open
file?

When lsof encounters a path name cached in the open file's
vnode that stat(2) reports lsof lacks permission to access,
lsof adds "(?)" to the path name reported in the NAME column to
indicate the path name is of questionable accuracy.

See the answers to the "Why does Solaris 10 lsof sometimes
report the wrong path name?" and "Why does Solaris 10 lsof
sometimes report only the mounted-on directory and device?"
questions for more information on why lsof may report a path
name of questionable accuracy.

A work-around that allows lsof to apply stat(2) successfully to
cached path names is to give lsof sufficient permission to do
it -- i.e., run lsof as the root user.

17.26 Solaris contract file problems

17.26.1 Why doesn't lsof report size, link count and node number for

Solaris 10 contract files?

Lsof doesn't report size, link count or node number for Solaris
10 contract files because I don't know how to obtain them from
contract file kernel structures.

17.26.2 Why can't lsof locate a Solaris 10 contract file by path name?

Because lsof can't find the node number of Solaris contract
files, it can't match the device and node numbers it gets from
applying stat(2) to the contract file path name with what it
finds in kernel data.

17.27 Solaris 10 ZFS probblems

17.27.1 Why does Configure ask for the location of ZFS header files?

To provide ZFS support when lsof is compiled it needs to have
access to the definitions of ZFS structures used by the kernel.
Those definitions are contained in header files that Sun does
not distribute with Solaris 10.

When the Configure script detects the system might support ZFS
by finding the <sys/fs/zfs.h> header file, it checks for the
required ZFS kernel structure definition header files. When
they are not found, it asks if ZFS support should be included
and if so, with what definitions.

Two sources can be declared for definitions: 1) lsof's internal
ones; or 2) the necessary header files at some location other
than /usr/include/sys.

The necessary header files are:

    dmu.h zfs_acl.h   zfs_debug.h zfs_rlock.h   zil.h
    spa.h zfs_context.h zfs_dir.h   zfs_vfsops.h zio.h
    txg.h zfs_ctldir.h zfs_ioctl.h zfs_znode.h   zio_impl.h

The necessary header files might have been obtained, for
example, from the http://src.opensolaris.org Open Solaris
source site. However, the Open Solaris header files might not
be adequate -- see the answer to the "Why don't the Open
Solaris ZFS header files provide correct ZFS kernel structure
definitions?' question for information on why the Open Solaris
ZFS header files might not provide correct ZFS kernel structure
definitions.

The supplied header file path must point to a directory that

contains a sys/ subdirectory where the matching header files
are located -- e.g., if the supplied path is /tmp/zfs, then
/tmp/zfs/sys must contain the necessary header files.

See the answer to the "Why do -h and -v output warn about
possibly inaccurate ZFS kernel structure definitions?" question
for information on the risks associated with using lsof's
internal definitions.

17.27.2 Why do -h and -v output warn about possibly inaccurate ZFS
kernel structure definitions?

When lsof is configured to use its internal ZFS kernel
structure definitions, there is the chance that the definitions
may be out of date. Hence, an lsof built with them may report
incorrect device numbers, file sizes, node numbers and link
counts.

Please contact me via e-mail at <abe@purdue.edu> for work-around
suggestions. Make sure "lsof" appears in the "Subject:" line so
my e-mail filter won't classify your letter as Spam.

17.27.3 Why don't the Open Solaris ZFS header files provide correct
ZFS kernel structure definitions?

The Open Solaris ZFS header files may not provide correct ZFS
kernel definitions. An lsof built with them may report
incorrect device numbers, file sizes, node numbers and link
counts.

The definitions may be incorrect because the Open Solaris
header files are not synchronized with any particular Solaris
10 release. Consequently they might contain modifications to
the structures not in the structure definitions used to build
the running kernel. It may be that only Sun has header files
that match the kernel structures of the running Solaris 10
kernel.

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18.0 Lsof Features

18.1 Why doesn't lsof doesn't report on /proc entries on my
system?

/proc file system support is generally available only for
BSD, SYSV R4 dialects, and Tru64 UNIX (Digital UNIX, DEC
OSF/1). It's also available for Linux, and Pyramid DC/OSx
and Reliant UNIX.

Even on some SYSV R4 dialects I encountered many problems
while trying to incorporate /proc file system support.
The chief problem is that some vendors don't distribute
the header file that describes the /proc file system node
-- usually called prdata.h.

18.2 How do I disable the device cache file feature or alter
it's behavior?

To disable the device cache file feature for a dialect,
remove the HASDCACHE definition from the machine.h file of
the dialect's machine.h header file. You can also use
HASDCACHE to change the default prefix (``.lsof'') of the
device cache file.

Be sure you consider disabling the device cache file feature
carefully. Having a device cache file significantly reduces
lsof startup overhead by eliminating a full scan of /dev
(or /devices) once the device cache file has been created.
That full scan also overloads the kernel's name cache with
the names of the /dev (or /devices) nodes, reducing the
opportunity for lsof to find path name components of open
files.

If you're worried about the presence of mode 0600 device
cache files in the home directories of the real user IDs
that execute lsof, consider these checks that lsof makes
on the file before using it:

   1. To read the device cache file, lsof must gain
  permission from access(2).

   2. The device cache file's modes must be 0600 (0644
  if lsof is reading a system-wide device cache file)
  and its size non-zero.

   3. There must be a correctly formatted section count
  line at the beginning of the file.

   4. Each section must have a header line with a count
       that properly numbers the lines in the section.
  Legal sections are device, clone, pseudo-device,
  and CRC.

5. The lines of a section must have the proper format.

6. All lines are included in a 16 bit CRC, and it is
recorded in a non-checksummed section line at the
end of the file.

7. The checksum computed when the file is read must
match the checksum recorded when the file was
written.

8. The checksum section line must be followed by
end-of-information.

9. Lsof must be able to get matching results from
stat(2) on a randomly chosen entry of the device
section.

For more information on the device cache file, read the
00DCACHE file of the lsof distribution.

18.2.1 What's the risk with a perverted device cache file?

Even with the checks that lsof makes on the device cache
file, it's conceivable that an intruder could modify it so
it would pass lsof's tests.

The only serious consequence I know of this change is the
removal of a file whose major device number identifies a
socket from some user ID's device cache file. When such
a device has been removed from the device cache file, and
when lsof doesn't detect the removal, lsof may not be able
to identify socket files when executed by the affected user
ID. Only certain dialects are at risk to this attack --
e.g., SCO OpenServer and Solaris 2.x, 7, 8, and 9.

If you're tracking a network intruder with lsof, that could
be important to you. If you suspect that someone has
corrupted the device cache file you're using, I recommend
you use lsof's -Di option to tell it to ignore it and use
the contents of /dev (or /devices) instead; or remove the
device cache file (usually .lsof_hostname, where hostname
is the first component of the host's name returned by
gethostname(2)) from the user ID's home directory and let
lsof create a new one for you.

18.2.2 How do I put the full host name in a personal device cache file
path?

Lsof constructs the personal device cache file path name
from a format specified in the HASPERSDC #define in the
dialect's machine.h header file. As distributed HASPERSDC
declares the path to be ``.lsof_'' plus the first component
of the host name with the format ``.lsof_%L''.

If you want to change the way lsof constructs the personal
device cache file path name, you can change the HASPERSDC
#define and recompile lsof. If, for example, you #define
HASPERSDC to be ``.lsof_%l'' (note the lower case `l'),
Configure and remake lsof, then the personal device cache
file path will be ``.lsof_'' plus the host name returned
by gethostname(2).

See the 00DCACHE file of the lsof distribution for more
information on the formation of the personal device cache
file path and the use of the HASPERSDC #define.

18.2.3 How do I put the personal device cache file in /tmp?

Change the HASPERSDC definition in your dialect's machine.h
header file.

When you redefine HASPERSDC, make sure you put at least
one user identification conversion in it to keep separate
the device cache files for each user of lsof. Also give
some thought to including the ``%0'' conversion to define
an alternate path for setuid-root and root processes.

Here's a definition that puts a personal device cache file
in /tmp with the name ``.lsof_login_hostname_pers''.

    #define HASPERSDC "/tmp/.lsof_%u_%l_pers"

Thus the /tmp personal device cache file path for login
"abe" on host "lsof.itap.purdue.edu" would be:

    /tmp/.lsof_abe_lsof.itap.purdue.edu_pers

You can add the User ID (UID) with the "%U" conversion and
the first host name component with the ``%L'' conversion.

CAUTION: be careful using absolute paths like /tmp lest
lsof processes that are setuid-root or whose real UID is
root be used to exploit some security weakness via /tmp.
Elect instead to add an alternate path for those processes
with the ``%0'' conversion. Here's an extension of the

previous HASPERSDC format for /tmp that declares an alternate
path:

    #define HASPERSDC "/tmp/.lsof_%u_%l_pers%0%h/.lsof_%L"

When the lsof process is setuid-root or its real UID is
root, presuming root's home directory is `/' and the host's
name is ``lsof.itap.purdue.edu'', the extended format yields:

    /.lsof_vic

18.3 Why doesn't lsof know about AFS files on my favorite dialect?

Lsof currently supports AFS for these dialects:

    AIX 4.1.4 (AFS 3.4a)
    Linux 1.2.13 (AFS 3.3)
    NEXTSTEP 3.2 (AFS 3.3)
    Solaris 2.[56] (AFS 3.4a)

It may recognize AFS files on other versions of these
dialects, but I have no way to test that. Lsof may report
correct information for AFS files on other dialects, but
I can't test that either.

AFS support must be custom crafted for each UNIX dialect
and then tested. If lsof supports your favorite dialect,
but doesn't recognize its AFS files, probably I don't have
access to a test system. If you want AFS support badly
for your dialect, consider helping me do the development
and testing.

18.3.1 Why doesn't lsof report node numbers for all AFS volume files,
or how do I reveal dynamic module addresses to lsof?

When AFS is implemented via dynamic kernel modules -- e.g.,
in NEXTSTEP -- lsof can't obtain the addresses of AFS
variables in the kernel that it uses to identify AFS vnodes.
It can guess that a vnode is assigned to an AFS file and
it can obtain other information about AFS files, but it
has trouble computing AFS volume node numbers.

To determine node numbers for AFS volumes other than the
root volume, /afs, lsof needs access to a hashed volume
structure pointer table. When it can't find the address
of that table, because AFS support is implemented via
dynamic kernel modules, lsof will return blanks in the
INODE column for AFS volume files. Lsof can identify the

root volume's node number (0), and can compute the node
numbers for all other AFS files.

If you have a name list file that contains the addresses
of the AFS dynamic modules -- e.g., you saved module symbols
when you created a loadable module kernel with modload(8)
by specifying -sym -- lsof may be able to find the kernel
addresses it needs in that file.

Lsof looks up AFS dynamic kernel addresses for these dialects
at these default paths:

   NEXTSTEP 3.2 /usr/vice/etc/afs_loadable

A different path to a name list file with AFS dynamic kernel
addresses may be specified with the -A option, when the -A
option description appears in lsof's -h or -? (help) output.

If any addresses appear in the -A name list file that also
appear in the regular kernel name list file -- e.g., /vmunix
-- they must match, or lsof will silently ignore the -A
addresses on the presumption that they are out of date.

Found in path(s):
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/00FAQ
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/00FAQ
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 *
 * @(#)netdb.h 5.15 (Berkeley) 4/3/91
 */
```

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/osr/include/netdb.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/uw/dnode3.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/lib/ckkv.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/lib/ckkv.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/uw/dnode3.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/usage.c

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
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```
/*
 * If this is a regular file with a non-numeric FD, it may be the
 * executable.
 */
```

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/tests/LTbasic.c
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 */
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   (Implements POSIX draft P1003.2/D11.2, except for some of the
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src/lib/regex.c
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tar/lsof_4.83_src/proto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/hpux/kmem/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/darwin/kmem/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+obsd/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/sun/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+obsd/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+obsd/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+os/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/darwin/kmem/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/node.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/sun/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/store.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/du/dfile.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/du/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/kmem/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+obsd/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+os/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/arg.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/darwin/kmem/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/freebsd/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/lsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/sun/ddev.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/darwin/kmem/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/du/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-

gz/lsof_4.83_src/dialects/darwin/kmem/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/hpux/kmem/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/freebsd/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/freebsd/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/sun/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+os/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/kmem/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/aix/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/du/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/du/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/aix/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/aix/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/kmem/dfile.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/aix/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/sun/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/hpux/kmem/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/lsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/sun/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+obsd/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/freebsd/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/store.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/aix/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+os/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/sun/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/sun/dfile.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/hpux/kmem/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/kmem/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-

tar/lsof_4.83_src/dialects/darwin/kmem/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+os/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/du/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+obsd/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/dfile.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/darwin/kmem/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/freebsd/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/proc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/du/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+obsd/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+os/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+os/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/proto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/darwin/kmem/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/du/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/freebsd/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/darwin/kmem/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+obsd/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/ddev.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/darwin/kmem/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/lsof_fields.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/aix/dfile.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/du/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/kmem/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/sun/dfile.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/du/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/hpux/kmem/dfile.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dproc.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/aix/dnode.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/darwin/kmem/dproc.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/misc.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/sun/dlsof.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/du/dproto.h
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/dstore.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/aix/dsock.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+os/dsock.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+os/dstore.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+obsd/machine.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+os/machine.h

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/lsof_fields.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/du/dsock.c
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Notes for the distribution of lsof version 4


```
******************************************************************
| The latest release of lsof is always available via anonymous ftp |
| from lsof.itap.purdue.edu.  Look in pub/tools/unix/lsof.        |
******************************************************************
```


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  How Lsof Works
  Lsof Output
  Getting Started Quickly
  Limiting, Filtering, and Selecting Lsof Output
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4.81, October 21, 2008

4.82, March 25, 2009

4.83, January 18, 2010

Dialects Supported
==================

Lsof (for LiSt Open Files) lists files opened by processes on
selected Unix systems. Version 4 is a source reorganization of
version 3, itself a major revision of version 2. Version 4 has
been tested on:

 AIX 5.3
 Apple Darwin 9 (Mac OS X 10.5)
 FreeBSD 4.9 for x86-based systems
 FreeBSD 7.[012], 8.0 and 9.0 for AMD64-based systems
 Linux 2.1.72 and above for x86-based systems
 Solaris 9, 10 and 11

(The pub/tools/unix/lsof/contrib directory on lsof.itap.purdue.edu
contains information on other ports.)

If your favorite Unix dialect is not in the list, or if your version
of it is more recent than the ones listed, please contact me at
<abe@purdue.edu>.

Version 3 of lsof was tested on:

 AIX 3.2.5, 4.1[.[1234]], and 4.2
 BSDI BSD/OS 2.0, 2.0.1, and 2.1 for x86-based systems
 DC/OSx 1.1 for Pyramid systems
 Digital UNIX (DEC OSF/1) 2.0, 3.0, 3.2, and 4.0
 EP/IX 2.1.1 for the CDC 4680
 FreeBSD 1.1.5.1, 2.0, 2.0.5, 2.1, 2.1.5 for x86-based
  systems
 HP-UX 8.x, 9.x, 10.01, 10.10, and 10.20
 IRIX 5.2, 5.3, 6.0, 6.0.1, and 6.[124]
 Linux through 2.0.27 for x86-based systems
 NetBSD 1.0, 1.1, and 1.2 for x86 and SPARC-based
  systems
 NEXTSTEP 2.1 and 3.[0123]
 OpenBSD 1.2 and 2.0 for x86-based systems
 Reliant UNIX 5.43 for Pyramid systems
 RISC/os 4.52 for MIPS R2000-based systems
 SCO OpenServer Release 1.1, 3.0, and 5.0.x for x86-based
  systems
 SCO UnixWare 2.1 and 2.1.1 for x86-based systems
 Sequent PTX 2.1.[1569], 4.0.[23], 4.1.[024], 4.2[.1],
  and 4.3
 Solaris 2.[12345], 2.5.1, and 2.6-Beta
 SunOS 4.1.x
 Ultrix 4.2, 4.3, 4.4, and 4.5

Version 3 and its predecessor, version 2, may be found at:

 ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD

How Lsof Works
==============

Using available kernel data access methods -- getproc(), getuser(),
kvm_*(), nlist(), pstat(), read(), readx(), /proc -- lsof reads
process table entries, task table entries, user areas and file
pointers to reach the underlying structures that describe files
opened by processes.

Lsof interprets most file node structures -- advfsnodes, autonodes,
cnodes, cdrnodes, devnodes, fifonodes, gnodes, hsnodes, inodes,
mfsnodes, pcnodes, procnodes, rnodes, snodes, specnodes, s5inodes,
tmpnodes. It understands NFS connections. It recognizes FIFOs,
multiplexed files, Unix and Internet sockets. It knows about
streams. It understands /proc file systems for some dialects. On
many dialects it recognizes execution text and library references.
It knows about AFS on some Unix dialects.

Lsof Output
===========

The lsof output describes:

  * the identification number of the process (PID) that has opened
    the file;

  * the process group identification number (PGID) of the process
    (optional);

  * the process identification number of the parent process (PPID)
    (optional);

  * the command the process is executing;

  * the owner of the process;

  * for all files in use by the process, including the executing
    text file and the shared libraries it is using:

    * the file descriptor number of the file, if applicable;

* the file's access mode;

* the file's lock status;

* the file's device numbers;

* the file's inode number;

* the file's size or offset;

* the name of the file system containing the file;

* any available components of the file's path name;

* the names of the file's stream components;

* the file's local and remote network addresses;

* the TLI network (typically UDP) state of the file;

* the TCP state, read queue length, and write queue length
of the file;

* the file's TCP window read and write lengths (Solaris
only);

* other file or dialect-specific values.

Getting Started Quickly
======================

If you want to get started using lsof quickly, or see some examples
of how lsof can be used, consult the 00QUICKSTART file of the lsof
distribution.

The 00QUICKSTART file won't help you build or install lsof, but it
will cut through the density of the lsof man page, giving you more
readily an idea of what you can do with lsof.

For information on building and installing lsof, consult the 00README
file of the lsof distribution.

Limiting, Filtering, and Selecting Lsof Output
===

Lsof accepts options to limit, filter, and select its output.

These are the possible criteria:

* Process ID (PID) number -- to list the open files for a given
  process;

* Process Group ID (PGID) -- to list the open files for all
  the processes of a given process group;

* User ID number or login name -- to list the open files for
  all the processes of a given user;

* Internet address -- to list the open files using a given
  Internet address (host name), protocol, or port (number or
  name); or to list all open Internet files;

* command name;

* file descriptor name or number;

* list all open NFS files;

* list all open Unix domain socket files;

* list all uses of a specific file;

* list all open files on a file system.

Selection options are normally ORed -- i.e., an open file meeting
any of the criteria is listed. The selection options may be ANDed
so that an open file will be listed only if it meets all the
criteria.

In the absence of any selection criteria, lsof lists files open to
all processes.

Parsing Lsof Output with Another Program
=======================================

The lsof -F option directs it to produce "field" output that can
easily be parsed by another program. The lsof distribution contains
sample awk, perl 4, and perl 5 scripts in its scripts subdirectory
that show how to post-process field output.

Repeat Mode
===========

Lsof can be directed to produce output, delay for a specified time,
then repeat the output, cycling until stopped by an interrupt or
quit signal. This mode is useful for monitoring the status of some
file operation -- e.g., an ftp transfer or a tape backup operation.

Repeat mode is more efficient when combined with lsof's selection
options, since they limit lsof overhead.

It's possible to use lsof's field output options to supply repeat
mode output to another process for its manipulation. The scripts
subdirectory of the lsof distribution has sample Perl scripts
showing how to consume lsof repeat mode output from a pipe.

Distribution Restrictions
=========================

Lsof may be used and distributed freely, subject to these limitations:

1. Neither the author nor Purdue University is responsible for
   any consequences of the use of this software.

2. The origin of this software must not be misrepresented, either
   by explicit claim or by omission. Credit to the author and
   Purdue University must appear in documentation and sources.

3. Altered versions must be plainly marked as such, and must not
   be misrepresented as being the original software.

4. This notice may not be removed from or altered in the lsof source
   files.

Cautions
========

Lsof is a tool that is closely tied to the Unix operating system
version. It uses header files that describe kernel structures and
reads kernel structures that typically change from OS version to
OS version.

DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION,
ON ANOTHER.

On some Unix dialects, notably SunOS and Solaris, lsof versions
may be even more restricted by architecture type. An lsof binary,
compiled for SunOS 4.1.3 on a sun4c machine, for example, won't
work on a sun4m machine.

AN LSOF BINARY, COMPILED FOR ONE SOLARIS 1.X ARCHITECTURE, ISN'T GUARANTEED TO WORK ON A DIFFERENT SOLARIS 1.X ARCHITECTURE.

Distribution Contents

=====================

The lsof distribution is checked for completeness when it is constructed and by the Inventory script when you run the Configure script. (See The Inventory Script section of the 00README file of this distribution.)

Lsof is organized in these parts:

  * The main lsof directory, containing common sources, configuration and setup scripts and three subdirectories: dialects/, lib/, and scripts/.

    Lsof is compiled in the main lsof directory after configuration. The selected dialect sources are copied or linked from the specified subdirectory. (Symbolic linking is the standard method.)

    Common lsof definitions may be found in lsof.h; common function prototypes, proto.h; and common storage, store.c.

  * The dialects/ subdirectory contains subdirectories with sources specific to UNIX dialect implementations -- e.g., the dialects/sun/ subdirectory contains sources for the SunOS (Solaris 1.x) and Solaris (2.x) implementations of lsof. The dialects subdirectories also contain Makefiles and scripts for assisting dialect source configuration.

    Dialect configuration definitions may be found in dlsof.h; other dialect definitions, dlsof.h; dialect prototypes, dproto.h; and dialect storage, dstore.c.

  * The lib/ subdirectory contains sources for common lsof functions. Not all dialects use the functions -- some have their own versions of them. The lib/ functions are enabled and customized with #define's in the dialect machine.h header files.

  * The scripts/ subdirectory contains sample scripts for processing lsof field (-F) output. The scripts are written in AWK, Perl 4, and Perl 5.

The 00PORTING file of the lsof distribution has more information
on lsof components, configuration, and construction.

Warranty
========

Lsof is provided as-is without any warranty of any kind, either
expressed or implied, including, but not limited to, the implied
warranties of merchantability and fitness for a particular purpose.
The entire risk as to the quality and performance of lsof is with
you. Should lsof prove defective, you assume the cost of all
necessary servicing, repair, or correction.

Bug Reports
===========

Now that the obligatory disclaimer is out of the way, let me hasten
to add that I accept lsof bug reports and try hard to respond to
them. I will also consider and discuss requests for new features,
ports to new dialects, or ports to new OS versions.

PLEASE DON'T SEND A BUG REPORT ABOUT LSOF TO THE UNIX DIALECT
VENDOR.

At worst such a bug report will confuse the vendor; at best, the
vendor will forward the bug report to me.

Please send all bug reports, requests, etc. to me via email at
<abe@purdue.edu>.

The lsof-l Mailing List
=======================

Information about lsof, including notices about the availability
of new revisions, may be found in mailings of the lsof-l listserv.
For more information about it, including instructions on how to
subscribe, read the 00LSOF-L file of the lsof distribution.

Version 3 Release Notes
=======================

See 00DIST in the last lsof 3 revision 3.88, for its complete
set of release notes. Lsof revision 3.88 may be found at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD

3.0 May 24, 1994
  This is the first official release of lsof 3.

...

3.88 February 17, 1997

  +====================================+
  | This is the last version 3 revision. |
  +====================================+

  Added documentation files -- 00.README.FIRST[_<version>]
  and 00RELEASE.SUMMARY_<version> -- to the distribution.

What's new in Version 4
=======================

The main goal of version 4 was to eliminate the confusing common/
fragment source file technique. Changing the version number also
provided an opportunity to restart the numbering, which at 3.88
had risen to a large value.

The sources that appeared in the dialects/common subdirectory of
version 3 in fragment files have been incorporated into the version
4 liblsof.a library as *.c files. This results in significant
changes to many source files, scripts, and Makefiles of all dialect
versions. It allows elimination of some source files -- ddev.c,
dfile.c, dmnt.c -- for dialects now obtaining functions from
liblsof.a that formerly came from making dialect source files by
combining fragment files.

The version 4 liblsof.a sources are stored in the lib/ subdirectory
of the main lsof directory. The liblsof.a functions are activated
and conditioned in their source files by values #define'd in the
dialect dlsof.h and machine.h header files.

Dialects that provide a private version of a library function refrain
from #define'ing the symbol that would activate the library function
code.

Version 4 Release Notes
=======================

4.0 February 24, 1997

```
+===================================+
| This is the first lsof 4 revision. |
+===================================+
```

Reorganized sources: eliminated code fragment files
and created a library in their place. Modified or
deleted many dialect source and header files.
Changed documentation accordingly.

Added a warning to sgi/Makefile and 00FAQ that advises
against using the IRIX C compiler -n32 option when
compiling lsof. Thanks go to Peter Ilieve
<peter@memex.co.uk> for bringing this to my attention.

Dropped IRIX 5.2 in mid-stream, because my 5.2 test
system was upgraded to 5.3.

4.01 March 3, 1997
  Added TFS support for Pyramid dialects.

  Added test to Configure and to the IRIX dnode.c
  for the different cnode struct that appears in
  <cachefs/cachefs_fs.h> on the 6.2 IMPACT distribution.
  Heddy Boubaker <boubaker@amfou.cenatls.cena.dgac.fr>
  alerted me to the cnode change and helped test this
  lsof adjustment.

  Shut down the lsof child process before doing a -r
  sleep(). A comment from Dan Mercer <dam@mmm.com>
  prompted this.

4.02 March 21, 1997

  Based on a report from Pasi Kaara <Pasi.Kaara@atk.tpo.fi>,
  disabled HP-UX CCIT support in lsof for HP-UX
  versions 10 and above. Pasi's report also led to
  changes in the HP-UX machine.h to support use of
  gcc to compile lsof for HP-UX 10.20 and warnings
  against using `cc -Aa` or `gcc -ansi` to compile
  lsof under HP-UX 10.x.

  With help from Richard Allen <ra@hp.is> taught
  HP-UX 10.x lsof to name file systems better by
  using the virtual file system device number. Elias
  Halldor Agustsson <elias@rhi.hi.is> provided a test
  system.

Changed NEXTSTEP and UNIXWARE Makefiles to use
safer quoting when generating version.h. The change
was suggested by Bob Farmer <ucs_brf@unx1.shsu.edu>.

Added SHELL=/bin/sh string to all Makefiles.

Added support for Linux 2.1.28 on a test system,
kindly provided by Jonathan Sergent <sergent@purdue.edu>.
Configure tests the Linux 2.1.x's C library lseek()
function for proper handling of kernel offsets.
If lseek() appears suspect, Configure activates
the use of a private lseek() function. Changed
the private nlist() function to nlist_private()
and taught it to use the query_module() syscall in
place of the deprecated get_kernel_syms() one.
Added rudimentary AX.25 support for Pierfrancesco
Caci <ik5pvx@infogroup.it> who helped test it.
Updated the old get_kernel_syms() code to recognize
and skip module name entries.

Prompted by Marty Leisner <leisner@sdsp.mc.xerox.com>,
eased the requirement that service name lookup for
the -i option be accompanied by a protocol name. The
name is not needed if both TCP and UDP names yield the
same port number.

Added xusers.awk script from Dan Mercer <damercer@mmm.com>
to the distribution scripts/ subdirectory.

Changed Configure script to use LSOF_VERS for all
UNIX dialect version numbers and to pass LSOF_VERS
to the dialect Mksrc functions. Also added the
ability for a dialect stanza to declare a different
dialect Makefile source. Modified dialect Mksrc
files -- e.g., linux and sun -- accordingly.

Added support for BSD/OS 3.0 with help from Jim
Reid <jim@mpn.cp.philips.com>. Terry Kennedy
<TERRY@spcvxa.spc.edu> kindly provided a test
system. During the port corrected a bug that
prevented proper handling of revoked files.

4.03 April 7, 1997
At the suggestion of Dan Mercer <damercer@mmm.com>,
made HP-UX building of lsof aware of differences
between the HP-UX bundled and unbundled C compilers.

Added the ability for the lsof builder to define the

default warning message issuance state. By default the
issuance of warning messages is disabled; defining
WARNINGSTATE in machine.h disables it. The Customize
script was updated to handle WARNINGSTATE. Dan Mercer
suggested this.

Eliminated compiler complaint about improperly cast
get_Nl_value() argument in ncache_load() in lib/rnch.c.

Corrected zeromem() argument error in SCO dproc.c.
Sped up parent directory cache lookup slightly.

Updated for PTX 4.4, including additional VxFS (EFS)
file system support.

4.04 April 17, 1997
   At the suggestion of Bela Lubkin <belal@sco.COM>
   changed device cache handling to be more tolerant
   of a device cache file whose [cm]times are older
   than the ones on /dev or /devices. The change
   required adding information to Solaris device cache
   file clone lines, so the first time lsof 4.04 is
   run under Solaris it will complain about a bad
   cached clone device in a previous device cache
   file, then regenerate it.

   Added boot file path detection for SCO OSR 5 and
   above, based on information supplied by Bela.

   Fixed two bugs in DEC OSF/1 lsof -- an error in
   reporting locks and a missing continue statement
   in readdev() after a failure to open a directory.
   Jan Ole Suhr <josuhr@informatik.tu-clausthal.de>
   reported the second bug and supplied a fix.

   Fixed XFS problems with IRIX 6.2 by abandoning the
   idea that SGI will distribute XFS header files and
   defining an lsof-private xfs_inode structure. John
   Paul Morrison <John.Paul.Morrison@MultiActive.com>
   helped develop and test the 5.3 definition. John
   R. Vanderpool <fish@daacdev1.gsfc.nasa.gov> helped
   develop and test the 6.2 definition.

   Remove obsolete comments about common/*.frag files.

   Updated Linux lsof for Linux version 2.1.35.

4.04 April 18, 1997

Supplement Regenerated the 4.04 distribution to correct a non-
device-cache #define misplacement in the Solaris and
SunOS dlsof.h. Alexandre Oliva <oliva@dcc.unicamp.br>
reported the problem.

4.05 April 24, 1997
Corrected an error in 00DCACHE.

Made sure SCO /etc/ps/booted.systems is closed.

Based on an observation by Bela Lubkin <belal@sco.COM>
that the lsof child had needless file descriptors
open, closed all but the open pipes between the
lsof parent and child.

Decommissioned CDC EP/IX support; I no longer have a
test system.

Based on a suggestion from Patrick Connor
<connor@phreak.csd.sgi.com>, added -xansi to CFLAGS
for IRIX 5.3 and 6.[234].

Also at Patrick's suggestion changed Configure to
propagate exact SunOS 4.1.x version to the main
and library Makefiles. This allowed the sunos413
and sunos413cc Configure abbreviations to be
shortened to sunos and sunoscc.

Updated obsolete argument uses (-H changed to -n)
in count_pf.perl* and watch_a_file.perl scripts.

Adjusted Solaris 2.6 lsof for Beta_Update with tips
from Casper Dik <casper@holland.Sun.COM>.

Fixed a Solaris 2.4 TCP address reporting bug.

4.06 April 30, 1997
Added a step to the Makefile clean rules that does
a make clean in the lib subdirectory; suggested by
Casper Dik <casper@holland.Sun.COM>. (Configure's
-clean argument already did this.)

Fixed an incorrect awk argument in the sunos*)
Configure stanza, reported by Alexandre Oliva
<oliva@dcc.unicamp.br>.

Added CD9660 (aka ISO) file system support to
FreeBSD, NetBSD, and OpenBSD with mods and help

from Kenneth Stailey <kstailey@disclosure.com>.
(BSDI already had CD9660 support.) While at it,
added file descriptor system support to BSDI and
FreeBSD.

Added /kern file system support to OpenBSD. The
support wasn't extended to BSDI, FreeBSD, or NetBSD,
because it requires Kenneth Stailey's changes to
/sys/miscfs/kernfs/kernfs.h.

Updated IRIX 6.3 support after getting access to
a test system, provided by John Paul Morrison
<John.Paul.Morrison@MultiActive.com>. Improved
the handling of IRIX 5.1 and greater FIFOs.

4.07 May 12, 1997
  Based on AIX problem reports from David Capshaw
  <David.Capshaw@SEMATECH.Org>, changed the aix*
  Configure script stanza to avoid -bnolibpath for
  gcc (which the GNU loader doesn't grok) and AIX
  below 4.1.4 (where -bnolibpath hasn't been tested
  or is known to be unimplemented), and to refuse to
  use gcc for compiling lsof in AIX versions below
  4.1 (because of possible structure alignment
  problems). Updated 00FAQ appropriately.

  Added OpenBSD support for EXT2FS. This support
  has yet to be tested.

  Tested lsof under OpenBSD 2.1.

  Activated /kern file system support for NetBSD when
  Configure senses that /sys/miscfs/kernfs/kernfs.h
  defines the kern_target structure. This support
  has not been tested under NetBSD, although it has
  been tested under OpenBSD.

  Made some simple changes to the BSDI machine.h,
  suggested by Jeffrey C. Honig <jch@bsdi.com>.

  Improved handling of alternate dialect Configure
  abbreviations -- aix and aixgcc, hpux and hpuxgcc,
  solaris and solariscc, and sunos and sunoscc.

4.08 May 23, 1997
  Cleaned up dialect Makefile's, staring with a suggestion
  from Christopher Schanzle <chris@cam.nist.gov>.

Improved Configure's -clean processing.

Corrected bugs in Solaris lock reporting.

Changed NetBSD Configure stanza to put -I/usr/include
before -I/sys.

4.09 June 1, 1997
Adjusted for latest FreeBSD 3.0 release. This
required adding a new kernel name cache module for
reading BSD-form hashed kernel name cache entries,
rnmh.c, to the lsof library, and adding a #define
to each machine.h to select it.

Activated rnmh.c for BSDI 2.1, BSDI 3.0, NetBSD
1.2, and OpenBSD 2.1.

4.10 June 8, 1997
Adjusted for Linux 2.1.x (x > 35) kernels with
hashed task structure pointers. Marty Leisner
<leisner@sdsp.mc.xerox.com> and Jonathan Sergent
<sergent@io.com> tested the adjustment.

Replaced readdev() stat() calls with lstat() to
reduce device table and cache entries with the same
device number and inode values. Added code to
remove all remaining duplicates. This fixes a
Linux problem reported by Jonathan Sergent and
makes device node name output predictable.

Corrected a bug in UnixWare stream file handling
that prevented searching for the stream file by
its associated character device name.

Added Pyramid code to determine Reliant UNIX clone
major device number differently from that of DC/OSx.

4.11 June 12, 1997
Changed Configure to sense that the PTX inp_[fl]addr
members of the inpcb structure of <netinet/in_pcb.h>
have a struct type and set HASINADDRSTR for use in
PTX dnode.c and dsock.c tests.

Changed PTX version 4.1.4 tests to use 4.1.3 instead.
Carson Wilson <carson@mcs.com> reported the need
to do this and tested the change.

Fixed a block device table indexing bug in lib/rdev.c,

reported by Carson Wilson. The same bug was squashed
in pyramid/ddev.c.

Added code to the Pyramid Reliant UNIX kread()
function to compensate for an address boundary
error in the kernel's /dev/kmem driver.

Verified that lsof compiles and works under AIX
4.2.1. Added an AIX test for the presence of NFS
header files, defined HAS_NFS and adjusted AIX
dialect sources accordingly.

Based on a suggestion from Gaylord Holder
<holder@phy.ucsf.EDU>, added DEC OSF/1 code to
auto-detect the booted file, whence kernel symbol
addresses are obtained.

4.12 June 24, 1997
Corrected a device number sign extension problem
in the reading and writing of device cache file.
The problem was reported by Bela Lubkin <belal@sco.com>
and he suggested a fix.

Fixed an SCO stream device lookup problem. The
report and solution came from Bela Lubkin

Enhanced the Configure script to enable cross-
configuration of lsof, based on suggestions from
Marty Leisner <leisner@sdsp.mc.xerox.com>. A new
documentation file, 00XCONFIG, describes the process.

Made Pyramid OBJFS support conditional on the
presence of supporting header files. Corrected
the Pyramid MkKernOpts script so it generates the
necessary -D's for the Nile/Jolt architecture.
Richard Coley <rcoley@pyra.co.uk> helped.

Added another IRIX xfs_inode variant for 6.2, 32
bits, no XFS rollup patch.

Tested under UnixWare 2.1.2.

4.13 July 9, 1997
Taught Pyramid lsof to grok ttyfs vnodes with help
from Richard Coley <rcoley@pyra.co.uk>. Fixed some
minor bugs in Pyramid FIFO reporting. Eliminated
use of the Pyramid UCB compatibility library at
Richard's suggestion.

Eliminated reporting of "strange" inode numbers
for SCO OSR 3.2v5.0.x HPPS files with help from
Bela Lubkin <belal@sco.com>

Modified port to service name lookup to use a small
number of getservbyport() calls before reading the
entire map with getservent(). Changed port reporting
to represent a zero as `*' to be consistent with
other prt number reporting tools like netstat.
Casper Dik <casper@holland.Sun.COM> suggested these
changes -- the getserv*() one to improve performance
for large NIS service name maps.

Changed all readdev() functions to make the absence
of block devices a warning instead of a fatal error
after Brian Redman <ber@ms.com> reported his IRIX
6.4 system had no block devices. (It really did
have block devices, but readdev()'s lstat() use
caused it to miss them in a directory symbolically
linked from /dev/dsk->/hw/disk.) Fixed Brian's
real problem by changing the IRIX readdev() to use
stat() on /dev nodes if a Configure test shows /hw
is readable. Extended the potential to do the same
to all readdev() functions.

For consistency and convenience changed some
Configure abbreviations and dialect subdirectory
names: "decosf" abbreviation and "osf" dialect
subdirectory name to "du"; "netbsd" dialect
subdirectory name to "n+obsd"; "next3" abbreviation
and "next" dialect subdirectory name to "ns"; "sco"
abbreviation and dialect subdirectory name to "osr";
"sgi" dialect subdirectory name to "irix"; and
"unixware" abbreviation and dialect subdirectory
name to "uw".

Added #if/#endif clauses to the AIX rmdupdev()
function to avoid clone processing for AIX versions
less than 4.1.4. The problem was reported by Toralf
Foerster <toralf.foerster@io-warnemuende.de>, who
supplied corrective code.

Added support for new style NetBSD inode with i_ffs
and i_e2fs union members.

Improved Configure and 00FAQ information on Digital
UNIX configuration subdirectory with suggestions

from Brad Krebs <brad@EECS.Berkeley.EDU>.

4.14 July 22, 1997
Reorganized the Solaris handling of the inode
structure header file, ufs_inode.h, to eliminate
VxFS structure definition conflicts for Solaris
2.4, based on information from Greg Earle
<earle@netbsd4me.jpl.nasa.gov>.

Cleaned up some typos and confusion in Configure's
help output, based on comments from Bela Lubkin
<belal@sco.com>

Added a 00DIALECTS file, containing UNIX dialect
version numbers, that can be used by Configure and
the man page.

4.15 August 15, 1997
Aligned `Configure -help` output better. Removed
Configure's 2.6 Beta test adjustments.

Added improved Solaris VxFS configuration and
handling, based on information from Greg Earle
<earle@netbsd4me.jpl.nasa.gov>.

Added socket state -- TCO or TPI -- for socket
files at the suggestion of Ian Fitchet
<I.D.Fitchet@ftel.co.uk>.

4.16 September 25, 1997
Added reporting of TCP/TPI queue lengths and window
sizes ala netstat to NAME column. Added -T option
to select or de-select TCP/TPI info reporting.
(Window sizes are only reported for Solaris.)
Fixed anomalies along the way in SIZE/OFF processing
for some dialects.

Fixed service name argument processor to allow
minus signs as part of the name. Consequently this
disallows names with embedded minus signs from
being specified as the start of a range.

Added 00FAQ entries explaining why lsof won't find
a file being edited with vi, why window sizes aren't
reported for all dialects, and what the "no more
information" message means.

Forced Pyramid CC to be /usr/ccs/bin/cc to avoid

accidental use of the BSD variant in /usr/ucb/cc.

Added support for Linux glibc2, including a Configure
test; cross-Configure support (00XCONFIG); and much
unfortunate and risky sleight-of-hand in lsof Linux
dialect header and source files, forced upon lsof
by incompatibilities between Linux kernel and glibc2
header files.

Included in scripts/identd.perl5 a Perl 5 implementation
of an identd server, using lsof, provided by Kapil
Chowksey <kchowksey@hss.hns.com>.

Updated IRIX 6.4 xfs_inode guess.

4.17 October 14, 1997
  Added -V option for verbose search result reporting.
  Verbose reports are prepared for failure to locate
  file names, command names, Internet addresses or
  files, login names, NFS files, PIDs, PGIDs, and UIDs.

  Augmented Linux NFS file test to cope with kernels
  whose NFS code is in a loadable module. Need for
  the test was pointed out by Jonathan Sergent
  <sergent@csociety.ecn.purdue.edu>. The change
  required that Linux have private dmnt.c source,

  Completed a Linux 2.1.57 port on a system provided
  by Jonathan Sergent.

4.18 October 25, 1997
  Eliminated memory leaks in alloc_lfile(), lkup_port(),
  and NEXTSTEP's process_text() function.

  Added recognition of OpenBSD 2.2 in Configure,
  supplied by Kenneth Stailey <kstailey@disclosure.com>.

  Consolidated print_file() functions to use the one
  in lib/prtf.c. Made it configurable and changed
  it to size print columns dynamically.

  !!! WARNING !!!

  WITH DYNAMICALLY SIZED PRINT COLUMNS LSOF 4.18
  PRODUCES OUTPUT SIGNIFICANTLY DIFFERENT FROM THAT
  OF PREVIOUS REVISIONS. LINES ARE GENERALLY SHORTER
  AND THERE IS GENERALLY LESS BLANK SPACE BETWEEN
  COLUMNS AND THE ITEMS IN THEM. THERE ARE NO LONGER

ANY SPACES BETWEEN DEVICE NUMBER ELEMENTS, ONLY
COMMAS.

!!! WARNING !!!

Added special types and print specification modifiers
for file size and offset to handle UNIX dialects
with 64 bit sizes and offsets. Paul Eggert
<eggert@twinsun.com> reported the need for this
addition.

With Paul Eggert's help picked lint from the lsof
library, the main level lsof sources, and the Sun
dialect sources.

Added documentation, including the file 00LSOF-L,
about the lsof-l LISTSERV.

Added support for Reliant UNIX on the RM600. Bob
Passarella <rmpassar@pyramid.com> supplied the
changes. Kevin Smith <kevin@pyramid.com> helped
arrange test systems. While incorporating Bob's
changes, modified lib/rnch.c to handle kernel ncache
structs whose name is accessed via a char *, rather
than in a char array.

Changed #include order of <sys/socketvar.h> for
Solaris 2.x. W. Richard Stevens <rstevens@kohala.com>
pointed out the need to do this.

4.19 October 30, 1997
Changed Pyramid Reliant RM600 proc scan to skip
SSYS (p_flag) processes, since they don't seem to
have a readable u_cdir vnode.

Enabled Pyramid Reliant UNIX kread() work-around
for DC/OSx, too, since its read(/dev/kmem) kernel
driver seems to share the page boundary bug this
work-around circumvents.

Changed SzOffFtm_d and SzOffFtm_dv (new formats at
4.18 to print size and offset) from signed to
unsigned. Setting them signed at 4.18 was an
oversight.

Plugged a memory leak that caused the loss of 130
bytes per repeat-mode pass. Fixed it with a simple
work-around in main(). Lionel Cons <Lionel.Cons@cern.ch>

reported the leak.

4.20 November 11, 1997
Tested under BSDI 3.1.

Added support for Reliant UNIX Mesh IPC files with
help from Billy Ho <bho@pyramid.com>.

Added support to Digital UNIX lsof that uses the
libmsfs tag_to_path() function (when it exists) to
look up AdvFS path names. The idea and sample code
came from Dean Brock <brock@cs.unca.edu>. Converted
Dean's code into more general purpose support for
private name cache lookups via the HASPRIVNMCACHE
#define in the dialect machine.h file and code
conditional on it in the printname() function.

Taught Digital UNIX lsof to recognize NFS3 file
systems. Corrected Digital UNIX lsof DEVICE column
alignment.

4.21 December 1, 1997
Squashed bug, introduced at revision 4.18, that
resulted in double reporting of each selected PID
when terse mode (-t) was specified.

Corrected minor bug, also introduced at 4.18, that
might cause an extra print_proc() pass when one
PID has been specified.

Added -R to lsof options in scripts/idrlogin.perl*.
The option should have been there -- it was supposed
to be mandatory for PGID reporting -- but a bug,
corrected in revision 4.18, previously made -R
unnecessary.

Enabled configuring for BSDI BSD/OS 4.0 per a
suggestion from Jeff Honig <jch@bsdi.com>.

Enabled replacement of scoff_t with off64_t (scoff_t
is used to type r_size and r_localsize in the rnode
struct) for IRIX 5.3 systems that have the NFS
kernel rollup patch (1477). This compensates for
SGI's failure to distribute an updated <sys/fs/rnode.h>
with their patch.

Validated under Linux 2.0.3[12], Linux 2.1.64, and
NetBSD 1.3.

Added FreeBSD root directory reporting, courtesy
of Dan Nelson <dnelson@emsphone.com>.

4.22 December 15, 1997
Made adjustments for Linux 2.1.7[02].

Improved NAME information for Linux UNIX domain
sockets.

Added option +|-M to control the reporting of
portmapper registration information in square
brackets after the TCP or UDP port or service name.
Kenneth Stailey <kstailey@disclosure.com> suggested
the feature and provided sample code from OpenBSD.
Reporting is disabled by default in the distribution
and may be enabled with +M; if lsof is compiled
with HASPMAPENABLED (e.g., from machine.h), reporting
will be enabled by default and can be disabled with
-M.

Changed the -w option to +|-w to match the syntax
of the +|-M option and to eliminate any options
that flip meaning when a symbol is defined at
compile time. For both +|-M and +|-w, specifying
`-' when the default state is disabled or specifying
`+' when the default state is enabled causes no
problems.

!!!WARNING The -w option has changed in lsof 4.22. WARNING!!!

Made the +|- prefix legal for most options, but
didn't document it in the man page or help panel.
Most options that disable something -- e.g., -b,
-C, -n, -P -- now disable when the prefix is `-'
and enable when it is `+'. Since the states these
options disable are enabled by default, I chose to
avoid documentation complexity and confusion by
not mentioning that they can be used with the `+'
prefix.

Condensed the help panel.

Made sure Digital UNIX Configure stanza puts normal
include path (e.g., /usr/include) before system
include paths.

Added IPX socket information reporting to Linux

with help from Jonathan Sergent <sergent@purdue.edu>.

4.23 January 16, 1998
Fixed conflict arising from the quondam replacement
of the Sun Solaris <netdb.h> with a BIND/BSD version.

With help from Jonathan Sergent <sergent@purdue.edu>
developed a /proc file system based Linux lsof.
It needs some Linux 2.1.x release to work -- I'm
not sure which, but I tested under 2.1.72, 2.1.76,
and 2.1.79. The Configure script selects special
sources for this lsof, so the full lsof distribution
now contains both /dev/kmem and /proc based sources
for Linux lsof. An optional kernel mod, written
by Jonathan, enhances the /proc-based lsof ability
to recognize IPX socket files. Reorganized and
augmented the Linux sections in 00FAQ to explain
the two types of Linux lsof.

Defined DOSTAT_FUNCTION for dostat() in misc.c to
select the function, stat() or lstat(), it will use.
DOSTAT_FUNCTION is normally undefined, defaults to
lstat(), and is only defined for the /proc-based
Linux lsof in its dlsof.h.

Made conditional on the presence of IRIX 6.4 XFS
rollup patch #6 an XFS node change introduced in
revision 4.16.   Identified the patch with help
from John R. Vanderpool <fish@daacdev1.gsfc.nasa.gov>.

Added NFS node compensation for NetBSD 1.3. The
code and suggestion for it was supplied by Jean-Luc
Richier <richier@imag.fr>.

Added diagnostic messages to the /dev/kmem-based
Linux Mksrc script to report errors during the
construction of the kernel name cache header file,
kncache.h. Added 00FAQ information on kncache.h.

Added a new Linux test host, running 2.0.33 and
GlibC, provided by Steve Logue <stevel@mail.cdsnet.net>.

Ported to PTX 4.1.3 and 4.4.2. Adjusted lib/rnch.c
for 4.4.2 to allow customization f additional ncache
struct element names.

4.24 January 28, 1998
Changed /proc-based Linux lsof offset test to use "/"

instead of "/etc/passwd".

To assist Jim Mintha <jim@geog.ubc.ca> with the
packaging of lsof for Debian Linux, added a
DEBIAN_LINUX_LSOF #define to trigger the activation
of special system map file location code in the
/dev/kmem-based dproc.c.

Applied modification to dialects/bsdi/dlsof.h from
Ingimar Robertson <iar@skyrr.is>, enabling lsof to
compile for BSDI BSD/OS 2.0.

Corrected a documentation error in 00DCACHE, pointed
out by Thomas Anders <anders@hmi.de>. The error was
created when the -V option was added at lsof 4.17.

Made IRIX 5.3 through 6.3 lsof aware of IRIX SCSI
tape devices (e.g., /dev/tape). Dave Olson of SGI
and Randolph J. Herber of FNAL provided valuable
advice, and Igor Schein <ischein@air-boston.com>
helped test.

Added a machine.h symbol (NEVER_HASDCACHE) that
prevents Customize from offering to change HASDCACHE.
The symbol may appear anywhere in machine.h --
e.g., in a comment. Included the symbol in a
comment of the HASDCACHE section of the /proc-based
Linux lsof machine.h, and accompanied it with
warnings against #define'ing HASDCACHE. Did the
same thing for WARNDEVACCESS (NEVER_WARNDEVACCESS
is the suppressant.)

4.25 February 7, 1998
Corrected an IRIX mis-cast of file offset (position).
Igor Schein <ischein@air-boston.com> reported the
problem. This was offered as a patch to 4.24.
Picked some lint Igor pointed out.

At Igor's suggestion added an optional decimal
digit size argument to the -o option. This argument
specifies how many file offset decimal digits can
follow "0t" before lsof switches to a "0x..." form.
The argument size specification doesn't count the
two characters of the "0t". A size of 0 means
unlimited. The default is OFFDECDIG (8), preserving
compatibility with existing lsof output; it can be
changed by the lsof builder. When size is specified
with -o it does not force offset display; -o without

a size still must be used to do that.

Added an IRIX 6.2, 32 bit system, XFS node patch,
courtesy of Ulrich Bernhard <rzubu@rzu.unizh.ch>.

For my own convenience enabled Configure to use
/usr/local/bin/gcc for NEXTSTEP. This allows
circumvention of a gcc 2.8.0 ranlib problem on
my test 3.1 `040 cube.

Added flags recommended by the RISC/os and Ultrix
compilers for the updated (and longer) main.c.

Updated FreeBSD cd9660_node.h Configure test.

4.26 February 17, 1998
  Added shared process group processing for IRIX 5.3,
  and IRIX 6.1 and above, based on investigation of
  a bug report from Igor Schein <ischein@air-boston.com>.
  Igor helped test this addition.

  Improved handling of file system name arguments.
  It's now done in a manner similar to fuser. The
  -f argument forces path names to be considered as
  simple files, rather than as file system names.
  The +f flag forces them to be considered as file
  system names. Normally path arguments are considered
  file system names when they match a mounted-on
  directory in the system's mount table, or when they
  match a mounted file system's block device. Igor
  Schein helped test this change.

  Igor also suggests that the proper compilation of
  the IRIX 6.4 proc structure after patch 2536 has
  been installed may need -DPIOMEMOPS. So lsof's
  MkKernOpts script was updated to propagate that
  option from CCOPTS in /var/sysgen/system/irix.sm,
  even though patch 2536 doesn't add -DPIOMEMOPS to
  it. Added a 00FAQ item on this patch.

  Added a fatal warning message about names forced
  to be file system names (with +f) that have no
  match in the mount table.

  Improved the -V message for files and file systems
  for which no open files were found. Added reporting
  of /proc file and file system search failures.

Did some code reorganization to combine the multiple
ck_file_arg() functions into one. Moved the new
function from the library to the top level and put
it in arg.c; moved the usage function from arg.c
to a new top-level source file, usage.c, to balance
top-level source file size. The new usage.c depends
on version.h; arg.c no longer does.

Added flag recommended by the DU compiler for the
updated (and longer) main.c.

4.27 March 6, 1998
At the request of Igor Schein <ischein@air-boston.com>
added a conditional repeat mode option, using the
`+' prefix to the `r' option. +r operates as does
-r with the exception that it exits the first time
no open files have been listed during a cycle.
The exit code will be zero when any open files have
been listed; one, if none were ever listed.

Ported lsof to HP-UX 11.0 with the help of Richard
Allen. This port hasn't been tested on a 64 bit
kernel; I'm sure it won't work there without more
mods. It may not work on PA 2 architectures; I've
only tested it under PA 1 and a separate, busy
tester reported PA 2 problems that I've been unable
to investigate.

In anticipation of getting access to a 64 bit HP-UX
kernel and the pending start of the Solaris 2.7
Beta test (It will have 64 bit kernel addressing.),
started adding support for 64 bit kernel pointers.
This includes: ubiquitous use of the KA_T cast
for kernel pointers; a format to print them,
KA_T_FMT_X; a function to print them, print_kptr();
and modifications to most kernel-related functions
-- e.g., process_file(), process_node(),
process_socket(), readvfs() -- to process kernel
addresses as KA_T types.

Fixed minor bug in handling path name arguments
that end with a `/'.

Removed support for RISC/os; its test system is no
longer available.

Made modifications to insure that lsof output
doesn't contain non-printable characters. All such

characters are now printed in the printf form
"\x%02x". Several new common functions were
installed in misc.c to support "safe" printing.
This second major modification in 4.27 to common
and dialect code could have introduced bugs not
yet detected.

4.28 March 10, 1998
Refined unprintable format to use \b, \f, \r, \n,
\t, and ^* (for CTRL) forms. Corrected omission
of safestrprt() use for field output command name.
These changes were offered as patches to 4.27.

Made space an unprintable character (\x20) in the
COMMAND column; printable elsewhere, including the
NAME column, field output, and error messages.

Made sure FD column is parseable as a single entity
-- i.e., has no embedded space. Thus, if the access
mode is unknown but there is a known lock mode, (a
very rare case) the access mode will be printed as
`-'.

Picked lint with gcc 2.8.0 under Solaris 2.6.

With the help of Dave Olson of SGI identified a
proc struct element that should have been added to
<sys/proc.h> by IRIX 6.4 patch 2536. Added a
work-around for it to the lsof Configure script.
Igor Schein <ischein@air-boston.com> identified
that the patch caused a proc structure length
complaint from lsof. Removed an obsolete 00FAQ
item on the patch, installed at lsof 4.26, explaining
that no solution was yet available.

Added a 00FAQ item on how BIND installs its own
header files, including <netdb.h>, which may cause
the rpcent struct definition to vanish. Solaris
has an automatic lsof work-around, but that hasn't
been (and probably can't be) propagated to all
dialects supported by lsof. The 00FAQ item recommends
re-installation of the vendor header files that
BIND has replaced. (Others include <rpcent.h>,
<sys/bitypes.h>, and <sys/ctypes.h>.)

Made AIX AFS fixes.

4.29 March 26, 1998

Corrected bug in Internet address matching. The matching formerly stopped if the foreign address matched, thus failing to check the local address for a match. That led to a possible false "Internet address not located" warning (i.e., in response to -V) about the local address, when both foreign and local addresses were specified with -i. This correction was offered as a patch to 4.28.

Changed readmnt() usage in an attempt to defer mount readlink() and stat() delays until they are necessary.

Corrected two bugs in the Digital UNIX readdev() function. Made the correction available as a patch to 4.28 and regenerated the 4.28 DU binaries.

Added a missing argument to a print-kptr() call in the HP-UX dsock.c. The missing argument causes a fatal gcc error. The problem was reported by Eyal Shaynis <eyal.shaynis@telrad.co.il>. The fix was offered as a 4.28 patch.

Adjusted for Digital UNIX 4.0D; the spec_node structure is now defined in <sys/specdev.h>. Kris Chandrasekhar <Kris.Chandrasekhar@digital.com> identified the need for the adjustment.

Incorporated a bug fix from Brian McAllister <mcallister@mit.edu> to the DU readmnt() function. This fix was offered as a patch to 4.28.

Added "safe" printing to a SunOS clone device error message.

Corrected bug in tabling of Linux /proc-based lock info.

Corrected bug in handling of SunOS TLI streams. Dan Farmer <zen@trouble.org> reported the problem.

Added a Solaris 2.6 work-around to keep the BIND <sys/bitypes.h> from colliding with the Solaris <sys/int_types.h>.

Strengthened the Configure test for /proc-based Linux lsof, based on a report from Marty Leisner <leisner@sdsp.mc.xerox.com>.

Tested on OpenBSD 2.3.

Made AIX changes that allow use with 3.2.5. The changes were suggested and tested by Brett Hogden <hogden@rge.com>.

Added Solaris 2.6 AFS support. Disabled reporting of some node numbers for Solaris 2.5 and above open AFS files. The node number computation algorithms used for SunOS 4.1.x and Solaris less than 2.5 no longer always work under Solaris 2.5 and above.

4.30 April 9, 1998
Corrected a pid structure member naming error for UnixWare < 2.1.2. The problem was reported by Richard van Meurs <vanmeurs.anva@atriserv.nl>. He supplied the correction. This was offered as a patch to 4.29.

Had a report from Igor Schein <ischein@air-boston.com> that IRIX 6.4 patch 2839 is another SGI kernel patch, along with 2536, that changes the size of the proc structure in the kernel without changing the proc structure in <sys/proc.h>. Upon further investigation found that the effect of these patches on the proc structure is not consistent. Therefore, dropped the Configure patch test for IRIX 6.4 and made the code in irix/dproc.c slightly more tolerant of proc structure size differences for IRIX 6.4. Igor help test the change.

Corrected Solaris >= 2.5 AFS inode number generation. Craig Everhart <Craig_Everhart@transarc.com> helped find the cause of the problem. This was offered as a patch to 4.29.

Refined the Linux /dev/kmem-based glibc evasion for the timeval structure to make it work with glibc version 2.0.7. This required defining a new global symbol, TIMEVAL_LSOF, default timeval, that the /dev/kmem-based Linux lsof can set to its private glibc timeval name, distinct from the kernel timeval name.

Added support for Alpha to the /dev/kmem-based Linux lsof. Alexandre Oliva <oliva@dcc.unicamp.br> provided a test system. Added an item to 00FAQ

about lsof, the Alpha processor, and Linux.

Added a 00FAQ item about lsof year 2000 compliance.
Basically it says lsof is probably compliant,
because its only date or time computations are done
with time_t values, but I haven't done any specific
Y2K validation. I don't have plans to do any.

Added support for UnixWare 7. Chris Daniels
<chrisd@dlpco.com> provided a test system and Don
Draper <dond@sco.COM> provided technical information.
Added BFS and SFS file system support to lsof for
UW 2.1.[12] and 7.

Updated Solaris VxFS support for VxFS 3.2.1. Greg
Earle <earle@netbsd4me.jpl.nasa.gov> reported the
need for the update. Greg and Roger Klorese
<rogerk@veritas.com> provided technical information.
Scott McClung <mcclung@primenet.com> tested.

Changed IRIX XFS patch detection in anticipation of
learning there are multiple XFS patches for IRIX 6.4
that require different versions of the lsof-invented
xfs_inode structure.

4.31 April 21, 1998
Added a VxFS #if/#endif wrap to a section of the
HP-UX dnode.c that wasn't properly protected. The
problem was reported by Peter Klosky <PKlosky@bdm.com>.
This was offered as a patch to 4.30.

Added support for Solaris 2.7 (first Beta release).
Mike Sullivan <Mike.Sullivan@Eng.Sun.COM> provided
technical advice and helped test. Charles Stephens
<cfs@jurassic.eng.Sun.COM> also helped test.

Fixed bug in /proc-based Linux that caused it to
access /proc/mounts excessively. Marty Leisner
<leisner@sdsp.mc.xerox.com> provided a syscall
trace that identified the bug. The fix was offered
as a patch to 4.30.

Adjusted the IRIX 6.4 private structure definition
for the XFS node to accommodate patch 2970. Igor
Schein <ischein@air-boston.com> identified the
patch and the required adjustment.

4.32 May 11, 1998

Corrected Solaris 2.7 code for reporting PCFS
(floppy disk) node numbers. Casper Dik
<casper@holland.sun.com> supplied the fix. The
fix was offered as a patch to 4.31.

Corrected a bug in conditional repeat mode handling
pointed out by Igor Schein <ischein@air-boston.com>.
This was offered as a patch to 4.31.

Improved reporting of AIX open(/dev/memory device)
errors.

Corrected a Solaris < 2.5 KA_T declaration error,
pointed out by Robert Kiessling <robert@easynet.de>.
Changed KA_T from a #define to a typedef for all
dialects to prevent future problems of this kind.

Changed the sample Perl 5 script big_brother.perl5
to report a four digit year from localtime().

Added support for AIX 4.3[.1]. Bill Pemberton
<wfp5p@tigger.itc.virginia.edu> provided a test
system. Andrew Kephart <akephart@austin.ibm.com>
and Tom Weaver <tvweaver@austin.ibm.com> provided
technical assistance. Niklas Edmundsson
<nikke@ing.umu.se> did 4.3.1 testing.

Added -qmaxmem option to CFLAGs for an AIX compilation
with an xlc version 4.x compiler.

Adjusted Linux socket handling for changes in the
AX25 members of the sock struct.   Richard Green
<rtg@tir.com> pointed out the problem. Tested
/dev/kmem-based lsof under Linux 2.0.34.

4.33 May 22, 1998
  Added generic IPv6 support to common lsof sources
  and specific IPv6 support to AIX sources. Andrew
  Kephart <akephart@austin.ibm.com> supplied the
  additions and helped with testing. Bill Pemberton
  <wfp5p@tigger.itc.virginia.edu> provided a test
  system. The modification affected sources for
  every dialect, whether it supports IPv6 or not, by
  changing the interfaces to the common Internet
  address function ent_inaddr().

  Added support for the NetBSD UVM virtual memory
  system. Paul Kranenburg <pk@cs.few.eur.nl> supplied

technical details.

Bracketed HP-UX 11 use of <sys/spinlock.h> with
#if/#endif _KERNEL.

Corrected printing of PCB address in DEVICE column
for IRIX.

4.34 June 26, 1998
Updated 00FAQ to discuss TCP and UDP ports private
to the AIX kernel and 00README to describe how ACLs
can be used to give lsof permission to read the
kernel memory devices. Add information to 00FAQ
and 00README about other OpenBSD architectures
where lsof is reported to compile and run. Added
section to 00FAQ discussing how an incorrect loader
path environment variable value can prevent lsof
from loading correctly.

Improved Solaris namefs and doorfs support so that
it is now possible to search for an open VDOOR file
by the path name of its fattached file system
object. Igor Schein <igor@txc.com> requested the
ability to do such a search. Even with the change,
lsof can't always identify path names for open
VDOOR files.

Also at Igor's request, improved reporting of
information on open Solaris VCHR files that share
a common vnode, and Solaris UNIX domain socket
files.

Corrected print_kptr() argument error in PTX dnode.c,
reported by Mark Price <mprice@sequent.com>.
Compensated for ncache element naming differences,
introduced at PTX 4.4.2; Kurtis D. Rader
<krader@sequent.com> reported the problem.

Changed output column title from INODE to NODE to
better reflect the column's contents of node IDs
for more than just inodes.

Improved Configuration and processing for Solaris
AFS. Corrected AIX AFS 3.4 afs_rwlock_t simulation.

Corrected a cast problem with two AIX knlist()
calls, thus quieting an AIX 4.2.1 compiler argument
type warning. Jon Champlin <champlin@us.ibm.com>

reported the problem.

Added support to most dialect versions (exception:
/proc-based Linux) to warn when the identity of
the kernel where lsof was compiled doesn't match
the running identity. The warning can be suppressed
with -w. Note: determining AIX state requires
calling oslevel, a potentially slow operation.
Jon Champlin <champlin@us.ibm.com> suggested this
addition.

!!!! WARNING !!!!   !!!! WARNING !!!!   !!!! WARNING !!!!

Those using the lsof cross-configuration capability
(see 00XCONFIG), should be aware that the kernel
identity test feature introduces two new basic
cross configuration environment variables, LSOF_ARCH
and LSOF_VSTR.

!!!! WARNING !!!!   !!!! WARNING !!!!   !!!! WARNING !!!!

Identified a situation where a Solaris UNIX domain
socket name is known and can be searched for by
name; added the necessary code.

4.35 July 17, 1998
Made the kernel identity check an option with the
HASKERNIDCK #define in machine.h. Enabled altering
of HASKERNIDCK with the Customize script. Added
a clause to the help output that indicates the
build-time HASKERNIDCK status.

Added more information to the NAME column for
Solaris UNIX domain sockets. Made them searchable
by their clone device path name. Igor Schein
<igor@txc.com> requested this.

Completed the HP-UX 11 port with support for its
optional 64 bit kernel. Rich Rauenzahn
<rrauenza@cup.hp.com> provided a test system.
Corrected errors with HP-UX 11 lock reporting and
private kernel structure and type definitions.
Added support for HP-UX NFS3 files.

Limited mount table warnings -- e.g., when -b is
used -- to one set per mount point.

Fixed some mount table scanning and usage bugs,

including one in Solaris, reported by Kjetil Torgrim
Homme <kjetilho@ifi.uio.no>.

4.36 August 4, 1998
Made corrections and additions to IPv6 support and
to AF_ROUTE socket handling, supplied by Jean-Luc
Richier <Jean-Luc.Richier@imag.fr>. Jean-Luc's
additions provide IPv6 support for the Inria IPv6
implementations on FreeBSD and NetBSD.

Fixed two Solaris 2.5, 2.5.1, 2.6 and 2.7 TCP and
UDP host name or IP address reporting bugs, reported
by James Mathiesen <James-Mathiesen@deshaw.com>.
This fix was offered as a patch to 4.35.

Updated the Customize script to cause ENTER to use
all defaults. Amir J. Katz <amir@ndsoft.com>
suggested this and helped test the changes.

Updated Solaris ICMP and IP stream handling, based
on a report from Igor Schein <igor@txc.com>.

Fixed a bug in the Digital UNIX mount table handling,
reported by Bob Ward <bward@thehartford.com>.
While working on the bug, found and updated some
obsolete AdvFS code. This fix was offered as a
patch to 4.35.

4.37 September 15, 1998
Deactivated SGI IRIX support and archived revision
4.36 sources and binaries in pub/tools/unix/lsof/OLD.

Improved performance of FD searching. This was
offered as a patch to 4.36.

Amir J. Katz <amir@ndsoft.com> pointed out that
ranlib isn't needed for AIX or Solaris. Made
appropriate Configure script changes.

Fixed a file offset reporting bug for HP-UX VCHR
and VBLK device nodes located on a VxFS root. Doug
Siebert <douglas-siebert@iowa.edu> reported the
bug. The fix was offered as a patch to 4.36.

Resolved an HP-UX root device name reporting bug,
partly caused by an out-dated local copy of the
<sys/mount.h> mount structure, by generating a
local header file with the structure that can be

compiled without needing _KERNEL defined. Doug
Siebert also reported this bug.

Changed some dialect source code -- Digital UNIX,
Solaris, SunOS, and UnixWare -- to make more
consistent with ps the user ID lsof reports in the
USER column. Added a 00FAQ entry about it. Igor
Schein <igor@txc.com> reported the Solaris and
SunOS lsof inconsistencies with what ps(1) reports.

Ported lsof to Pyramid ReliantUNIX 5.44.

Added brackets as comments to case, do, done, else,
endif, esac, if, and while statements in Configure
to assist in navigating its clauses.

Added more Linux 2.0.x glibc work-arounds.

Added support for UnixWare 7.0.1.

Ralph Forsythe <ralph@contact-paging.com> provided
a new FreeBSD test system.

4.38 November 25, 1998
Added support for recent FreeBSD 3.0 distributions.
A 3.0 test system was provided by David O'Brien
<obrien@NUXI.com>. This was offered as a patch
to 4.37.

Updated the scripts/idrlogin.perl* files to look
for sshd processes in addition to rlogind and
telnetd ones.

Added support for DU 5.0 Beta. Berkley Shands
<berkley@cs.wustl.edu> provided a test system.

Added support for OpenBSD 2.4 with changes supplied
by Kenneth Stailey <kstailey@disclosure.com>.

Changed the Solaris 2.7 tests and documentation to
Solaris 7.

Made some changes to the header files for NEXTSTEP
3.3 and added support for OPENSTEP 4.x with help
from Michael A. Hovan III <mhovan@BLaCKSMITH.com>
and Carl Lindberg <Carl_Lindberg@BLaCKSMITH.com>.
The combined dialect subdirectory is named n+os.
One of Carl's changes propagates RC_CFLAGS to the

library Makefile. Timothy J. Luoma <luomat@peak.org>
helped test under NEXTSTEP 3.3 and OPENSTEP 4.2.

Made UW 7.x version sensitive to the presence of
ptf7038. Added peer PCB address to Unix domain
socket Name column, even when a path name has been
located. Information for these changes was supplied
by Francis Le Bourse <flebourse@intelcom.fr>. Lee
Penn <lee@dlpco.com> provided a test system.

Tested lsof under OSR 5.0.5 on a test system also
provided by Lee Penn.

Made path name argument processing more tolerant
of errors per a suggestion from Julian Gordon
<julian@cadence.com>.

Acquired a new UnixWare 2.x test system, generously
provided by Computer Classroom, Inc. -- Matthew
Thurmaier <matt@compclass.com>, Ken Laing
<ken@compclass.com>, and Andrew Merril
<andrew@compclass.com>. Updated Configure to accept
a UnixWare version of 2.1.3.

Updated kmem-based lsof for Linux 2.0.36.

Updated NetBSD sources for a change in a UVM virtual
mapping header file.

Corrected a cache allocation bug in Sun format
kernel name cache handling. The bug only shows up
when the kernel name cache is inaccessible.

4.39 December 29, 1998
Corrected problems with large device number handling
for 64 bit Solaris 7. The problems were reported
by Steve Bellenot <bellenot@math.fsu.edu>. Steve
helped test the fixes. The fixes were offered as
two patches to lsof 4.38.

Improved FreeBSD Configure operations for header
files that must be obtained from the kernel source
tree, based on a suggestion from David O'Brien
<obrien@NUXI.com>.

For Bela Lubkin <filbo@deepthought.armory.com> made
optional with +f[cfn] the display of file structure
address, shared use count, and node structure

address. /proc-based Linux doesn't implement this
feature, because it doesn't read kernel structures
from kernel memory. Modified the PTX -X option to
take advantage of the new file structure display
option. Added shared.perl5 to the scripts/
subdirectory to provide an example of how +f[fn]
might be used to track shared file descriptors and
files.

Added more /dev/kmem-based Linux glibc evasions,
provided by Jeff Johnson <jbj@redhat.com> and Maciej
Lesniewski <nimir@kis.p.lodz.pl>. Jeff helped test
them on various Linux architectures.

Tested on AIX 4.3.2; no changes were required.
Doug Crabill <dgc@purdue.edu> provided a test
system.

Fixed -c option to detect missing command name when
following option begins with `+'.

4.40 January 25, 1999
Added support for using the CDS compiler for Reliant
Unix 5.44 and above. Made Reliant Unix MIPC support
optional, dependent on the presence of <sys/mipc.h>.

Based on a report from Michael Schmitz <MSchmitz@lbl.gov>
that /dev/kmem-based lsof misbehaves on a Linux
2.0.x m68k kernel without module support, made the
absence of query_module() or get_kernel_syms()
Linux kernel support a fatal error. Updated relevant
sections of 00FAQ to reflect the change.

Added the ability to force the Linux Configure
stanza to use the /proc or /dev/kmem source base
via a LINUX_BASE environment variable specification.
This is a cross-configuration assist.

Added "+D <dir>" and "+d <dir>" options for directory
searching. +D searches the entire tree, starting
at <dir>, including <dir>, its contents, and its
subdirectory branches; +d searches only <dir> and
its contents, but not its subdirectory branches.
Improved lsof's searching of the specified name
list to compensate for anticipated long lists from
+d and +D.

Made an egrep in the Solaris Configure stanza usable

by the standard and XPG4 egrep's. Kenneth Stailey
<kstailey@disclosure.com> pointed out the improvement.

Fixed bugs in /dev/kmem-based Linux and UnixWare
Unix domain socket name searching.

Changed a Linux Alpha #include to be conditional
on the presence of its named header file, so that
lsof will compile on Red Hat 5.1 and 5.2 (Linux
kernel 2.0.35) where the header file is absent.
The problem was reported by Alexandre Oliva
<oliva@dcc.unicamp.br>.

Fixed an AIX 4.3+ bug in procinfo struct space
allocation, reported by Jeff Stewart <jws@purdue.edu>.
This was offered as a patch to 4.39.

Added an lstatsafely() function to offer the same
isolation for lstat() calls that statsafely() offers
for stat() calls. This made DOSTAT_FUNCTION no
longer necessary, so deleted it.

With help from Laurent P. Montaron <lpm@sequent.com>
ported lsof to PTX 4.4.4. Laurent did a monumental
job of identifying TCP/IP changes by their TCP
version, rather than by their PTX (With mix 'n
match PTX and TCP/IP versions, the PTX version
often has no bearing on the TCP/IP version.), and
changed the Configure script and pre-processor
#if/#else/#endif blocks to match. He also updated
Unix domain socket handling for PTX TCP/IP versions
4.5 and above.

Updated CLIENT handle acquisition of fill_portmap()
in print.c to use the more modern RPC function
clnt_create() in place of clnttcp_create() where
possible. PTX 4.4.4 requires clnt_create().

4.41 February 27, 1999
  Added FreeBSD 3.1 and and 4.0 support with help
  from Sheldon Hearn <axl@iafrica.com>, David O'Brien
  <obrien@NUXI.com>, and John Polstra <jdp@polstra.com>.

  Corrected bungled AIX 4.3+ patch that went into
  lsof 4.40.

  Reorganized the Configure script to improve Makefile
  construction. A specific impetus for this was to

allow FreeBSD system-wide make flags to be propagated
to the lsof Makefiles, but other goals were to make
sure that the DEBUG= make entry can over-ride
standard CFLAGS values, and to better manage the
identification of compilers and their versions.
Two compiler-related values may now be supplied in
environment variables: 1) the compiler path in
LSOF_CC; and 2) the compiler version in LSOF_CCV.
00XCONFIG documents them.

Added support for Pyramid Reliant Unix bsdsfs,
msockfs, and sockfs file systems.

Added an optional LSOF_CINFO string to Configure,
producing a CINFO string in selected Makefiles,
producing a #define LSOF_CINFO in selected version.h
header files. The purpose of this is to allow
Configure the option to propagate information to
the lsof -v output. It is now used for Linux to
identify the code base, and for HP-UX 10.30 and
11.0 and Solaris 7 to identify the kernel bit size.

Added system information to NEXTSTEP and OPENSTEP
-v output, from the second line of hostinfo's
output.

Fixed a login name buffer overflow problem in the
processing of -u option values. This was offered
as a patch to 4.40. !!!THIS IS A SERIOUS STACK
OVERFLOW BUG; A LINUX EXPLOIT EXISTS FOR IT THAT
OPENS A BASH SHELL WITH LSOF'S AUTHORITY -- E.G,
SETGID(KMEM) POWER!!!

Improved the Solaris mount table filter so the
volume manager's fake mount point, "/vol", is
ignored and doesn't supplant "/" in NAME column
path assemblies. Igor Schein <igor@txc.com> reported
this bug and provided important help in finding
it. This was offered as a patch to 4.40.

Changed the Linux /dev/kmem-based lock ownership
test to answer a problem reported by Tom Christiansen
<tchrist@jhereg.perl.com>. This was offered as a
patch to 4.40.

Installed an HP-UX 11 patch, suggested by Kevin
Vajk <kvajk@cup.hp.com>, that adjusts a private
lsof kernel header file, derived via Q4, to correspond

to an HP-UX patch bundle.

Made NetBSD 1.3I sockproto structure adjustment.

4.42 March 30, 1999
Fixed a typo in the HP-UX dfile.c that caused +fF
and +fN output controls to swap effect.

Enabled for OpenBSD 2.5 per notice from Kenneth
Stailey <kstailey@kstailey.tzo.com>

Made more VM accommodations for FreeBSD 4.0.

Improved file system search reporting to include
path name components when they're available, instead
of mindlessly reporting the file system name in
the NAME column. Guy Dallaire <gdallair@geocities.com>
brought the need for this change to my attention.

Updated Solaris 2.6 VxFS for Veritas Oracle Database
Edition 2.0, VxFS version 3.3, and VxVm version
2.5.4, based on a report from Chris Kordish
<chris.kordish@East.Sun.COM>. Chris kindly provided
a test system.

Improved HP-UX ipc_s patch detection in Configure,
response in .../dialects/hpux/hpux11/ipc_s.h, and
documentation in 00FAQ, Kevin Vajk <kvajk@cup.hp.com>
helped test.

Added to Customize the option to suppress HASKERNIDCK
selection for specified dialects. Suppressed it
for /proc-based Linux lsof, and removed its test
and code from there. Tin Le <tin@netimages.com>
alerted me to the need for this update.

Ported to official Digital UNIX 5.0 release.

Changed DU lsof to use the knlist(3) function when
no kernel file has been specified with -k. This
change was suggested by Erich Wimmer
<Erich.Wimmer@digital.com>.

Updated Configure for latest NetBSD (1.3I?) with
UVM support the default.

4.43 May 11, 1999
Corrected a typo in the Solaris gcc discussion in

00FAQ. Made changes to the Solaris 2.5[.1] private
tcp_s structure. Both changes were done in response
to reports from Igor Schein <igor@txc.com>, who
tested the Solaris 2.5 change.

Made more IPv6 adjustments to lsof for Tru64 UNIX
(Digital UNIX) 5.0, based on information obtained
from Compaq by Berkley Shands <berkley@cs.wustl.edu>.

Corrected HP-UX error message about HP-UX 11 q4 usage.
Amir Katz <amir@ndsoft.com> reported the correction.

Fixed a GlibC 2.1 conflict in /proc-based Linux lsof.

Fixed a man page typo reported by Vlad Harchev
<hvv@hippo.ru>.

Changed some Solaris 2.7 references to Solaris 7
in Configure and 00XPORTING.

Added a Solaris example to the echo statements that
are the install rule in the SunOS/Solaris Makefile.

Added a field to the file structure output --
FILE-FLAG (file structure open flags, f_flag[s],
and process file flags, typically u_pofile)) --
enabled with +f[gG]. Its field output character
is 'G'.

Figured out another piece of the HP-UX 11 patched
ipc_s structure puzzle with the help of Keith Kalet
<KEITH_KALET@HP-USA-om41.om.hp.com>.

Fixed a PTX real vnode to real inode interpretation
bug.

Added link count to lsof output. Eric Dumazet
<dumazet@risgw.ris.fr> requested and helped test
it. The new +L option enables and filters it.
Its field output character is `k'.

Updated Configure script to recognize NetBSD 1.4.

Updated AFSConfig to handle default answers to
questions.

Incorporated patch from Jonathan Sergent <sergent@io.com>
that enables /proc-based Linux lsof to run on both

32 and 64 bit kernels.

Updated Configure script with a patch from David
O'Brien <obrien@NUXI.com> that recognizes FreeBSD 3.2.

4.44 June 24, 1999
Corrected use of nlink member of hsnode for SunOS
4.1.x High Sierra File System files. John Dzubera
<zube@tlaloc.stat.colostate.edu> reported the
problem and helped test the fix. Also fixed a
SunOS segmentation fault bug. These fixes were
offered as a patch to 4.43.

Improved handling of /proc-based Linux UNIX PCB
address.

Fixed a NEXTSTEP and OPENSTEP bug that made repeat
option (-r) processing malfunction. This fix was
offered as a patch to 4.43.

Fixed Configure so it doesn't use -O in the Cflags
for the bundled HP-UX C compiler. Jim Ankenbrandt
<jankenbrandt@penton.com> reported the problem.

Corrected output ordering of parent PID and process
group ID when both -R and -g are specified.

Enhanced the pdev.c and pdvn.c library modules for
wider use. These dialect versions use the new
library modules: DEC OSF/1, Digital UNIX, and Tru64
UNIX; Pyramid DC/OSx and Reliant UNIX; SCO OSR and
UnixWare; and Sequent PTX.

Added basic clone device support to /dev/kmem-based
HP-UX lsof for HP-UX 10.30 and higher.

Added raw socket support to /proc-based Linux lsof.

Changed NODE-ADDR column title to NODE-ID in
anticipation of using more general identification
information in the column.

Ported to UnixWare 7.1, using a test system kindly
provided by Matt Thurmaier <matt@compclass.com>
and Don Draper <dond@sco.com>.

Updated for NetBSD 1.4C VM changes, and a new
current and root working directory structure.

Made minor adjustment for latest Tru64 UNIX 5.0
Beta release.

4.45 July 30, 1999
Fixed quoting problem in DEC OSF/1, Digital Unix,
and Tru64 UNIX Makefile's install rule. The problem
was reported by Berkley Shands <berkley@cs.wustl.edu>.
Fixed bug in Tru64 UNIX 4 lsof that caused FDs to
be skipped. These fixes were offered in a patch
to 4.44.

Fixed a repeat-mode /proc-based Linux lsof bug,
reported by Sami Farin <sfarin@ratol.fi>. This
was offered as a patch to 4.44.

Picked lint, some reported by Sami Farin.

Corrected a 00DCACHE documentation error in a sample
shell script. The problem was reported by Chad R.
Larson <chad@larsons.org>. Changed commented-out
entries in machine.h files so they require more
thought and work when the comments are removed,
based on a remark by Chad.

Compensated for the practice of Solaris 7 and above
to record the dev= value in /etc/mnttab in 32 bit
mode, even on 64 bit systems. This was offered as
a patch to 4.44.

Added a C library test for /proc-based Linux lsof,
so that the #include files can be adjusted for a
non-GlibC environment. The need for this was
reported by Andrew Hill <andrewh@tirin.openworld.co.uk>.
This was offered as a patch to 4.44.

Added support for Auspex LFS 1.8.1 and 1.9.2 to
SunOS 4.1.4 lsof. The support was requested by
Quentin Fennessy <quentin@dvorak.amd.com>, who
provided information and did testing.

Enabled IPv6 support code for NetBSD and OpenBSD,
conditional on Configure script tests. Wolfgang
Rupprecht <wolfgang@wsrcc.com> supplied the NetBSD
code and tested it. The OpenBSD code I constructed
has been compiled but not tested.

Updated the identd Perl 5 script, based on a report

from Wendy Lin <af5@taiyang.cc.purdue.edu> that
the space in its response line in front of the user
name violates RFC 1413.

Added IPv6 support to /proc-based Linux lsof.
Jonathan Sergent <sergent@ETLA.NET> and Andrew
Thomas Sydelko <sydelko@ecn.purdue.edu> kindly
provided a test system.

Updated man page description of AIX multiplexed
files to indicate that they might be /dev/ptc or
/dev/pts, depending on the AIX version. The
correction was suggested by Onno van der Linden
<onno@simplex.nl>.

Sylvain Robitaille <syl@alcor.concordia.ca> reports
lsof passes his Y2K tests.

4.46 October 23, 1999
Corrected /proc-based Linux lsof to detect that an
IPv6 address is a mapped IPv4 address. The problem
was reported and analyzed by Arkadiusz Miskiewicz
<misiek@misiek.eu.org>, who also tested the fix.

Added a libc5 library /dev/kmem-based Linux lsof
circumvention, supplied by Jason Lingohr
<lingman@lucid.net.au>.

Corrected a bug in -t (terse) AIX output, reported
by Wendy Lin <af5@taiyang.cc.purdue.edu>. I
introduced the bug at revision 4.43 when adding
FILE_FLAG reporting. This was offered as a patch
to 4.45.

Added a work-around for a problem in the OpenBSD
2.3 <sys/pipe.h> header file. Volker Borchert
<bt@teknon.de> provided and tested it.

Improved description of cross-building lsof for a
64 bit Solaris 7 system on a 32 bit system with
suggestions from Phillip Edwards
<Philip.Edwards@sn.wpafb.af.mil>.

Fixed a gawk POSIX-mode pattern error in the Linux
/dev/kmem-based Mksrc script, based on a tip from
Ambrose C. Li <acli@mingpaoxpress.com>.

Fixed a bug in the Tru64 UNIX IPv6 handling, courtesy

of a report from Casper Dik <casper@holland.sun.com>.

Enabled support for OpenBSD 2.6.

Enabled support for BSDI BSD/OS 4.1, based on a
report from Jeffrey C Honig <jch@bsdi.com> that
only a Configure script change is necessary.

Enabled Configure script to use gcc for building
lsof for a 64 bit Solaris 7 and 8 kernels, if the
gcc version is 2.95 or above.

Improved -i option handling for systems with IPv6
support so that it will search for a host name in
both IPv4 and IPv6 families, when that is possible.
As a companion modification, changed -V processing
to report a single error when a multiple host name
match is requested. Casper Dik <casper@holland.Sun.COM>
helped test.

Fixed a DEC OSF/1, Digital UNIX, Tru64 UNIX repeat
mode bug, reported by Mayer Ilovitz <mayer@cooper.edu>.
Mayer helped test the fix. The fix was offered as a
patch to 4.45.

Changed Solaris socket file recognition scheme, so it
is (nearly) the same through Solaris 8, where the
previous clone device scheme no longer works.

With significant assistance from Casper Dik, added
support for Solaris 8 Beta and Beta refresh. The
IPv6 support in Solaris 8 is still in some flux,
so there are temporary compensations for the
differences between Beta IPv6 support and Beta
refresh IPv6 support. Casper and I hope those
differences disappear by FCS.

Improved the delivery of information on Solaris
2.5.1, 2.6, 7, and 8 door files.

Fixed a repeat mode bug that surfaces when /etc/passwd
changes between cycles. The bug report and diagnostic
help were supplied by Igor Schein <igor@txc.com>.
The fix was offered as a patch to 4.45.

Added support for INRIA IPv6 to NetBSD. Jean-Luc
Richier <Jean-Luc.Richier@imag.fr> provided patches
and a test system on which to verify them.

Added support for AIX 4.3.3. Jeff W. Stewart
<jws@anaconda.cc.purdue.edu> provided a test system.

Made adjustments for FreeBSD 4.0-current.

Improved reporting of information for AIX sockets that
lack protocol control blocks.

4.47 November 29, 1999
Based on a query from Jean-Pierre Radley <jpr@jpr.com>,
changed the lsof top-level Makefile to propagate
CFGF to the library Makefile. (DEBUG was already
being propagated.) Added osrgcc and scogcc Configure
abbreviations (to use gcc) for Jean-Pierre.

In response to a query from Igor Schein <igor@txc.com>,
improved the Configure script test for Solaris 7
and 8 that decides if the compiler can produce 64
bit executables.

Made an ugly hack, based on making a private rnode
structure definition from q4 output, to compensate
for HP-UX 10.20 and lower recent NFS3 patches. HP
didn't supply an updated <nfs/rnode.h> with the
patches. The problem was reported by Will Partain
<partain@mekb2.sps.mot.com>. Elias Halldor Agustsson
<elias@hi.is> helped identify the patches as
PHNE_18173, PHNE_19426, PHNE_19937, and PHNE_20091,
and provided a test system.

Switched BSDI test system from 2.1 and 3.1 to 4.0.1,
courtesy of Terry Kennedy <terry@tmk.com>.

Added some more dev_t hacks for Alpha FreeBSD 4.0.

Added support for IPv6 on BSD 4.x. The support hasn't
yet been tested, just compiled.

Added support for the mnt file system (mntfs or
/etc/mnttab) on Solaris 8. Tested on Solaris 8
BETA-Refresh.

Made selection of optional fields (e.g., PPID with
-FR) in a field output specification select the
optional field, too, so that the option selector
for the field (e.g., -R) isn't also required. This
change was made in response to an inquiry from John

DuBois <spcecdt@armory.com>. This may require some
revision to scripts that parse all field output;
two scripts in the lsof distribution's scripts/
subdirectory had to be updated.

Corrected handling of Linux IPv4 addresses mapped
in IPv6 addresses.

Tested under OpenBSD 2.6.

4.48 January 14, 2000
  Modified -i argument processing of colon-separated
  IPv6 addresses to recognize an IPv4 address mapped
  in an IPv6 address and handle it as an IPv4 address.
  This was offered as a patch to 4.47.

  Added a defined symbol (NOWARNBLKDEV) to control
  (inhibit) the issuance of a warning when no block
  devices are found. This was done anticipating its
  need in FreeBSD 4.x, but that dialect version no
  longer has any block devices, so HASBLKDEV was
  disabled for it instead. NOWARNBLKDEV was left in
  place for possible use in the future.

  Enabled KAME IPv6 Configure support for FreeBSD
  when <netinet6/in6.h> is found.

  Disabled use of gcc to compile lsof for 64 bit
  HP-UX 11.

  Updated Configure to recognized FreeBSD 3.4.

  Based on suggestions from Bernt Christandl
  <beb@MPA-Garching.MPG.DE> improved AFS configuration
  for AIX and Solaris, and updated AIX AFS 3.5 support.
  Johannes Tax <tax@bluedog.oit.unc.edu>, Hung T.
  Pham <hung_pham@unc.edu>, and Curt Freeland
  <curt@grumpy.cse.nd.edu> provided test systems.

  Updated lsof's private rnode definition for AIX
  4.3.3, since IBM still doesn't ship the
  <oncplus/nfs/rnode.h> header file and the rnode
  structure definition in <nfs/rnode.h> doesn't match
  what the kernel uses. This was offered as a patch
  to 4.47.

  Weakened the test in the Linux /proc-based lsof of
  the field count of data lines in /proc/net/{tcp,udp}.

It appears that recent 2.3.x Linux kernels have
added untitled fields to these files. The bug
report came from Gabor Liptak <gaborliptak@usa.net>.

Adjusted for a FreeBSD 4.0 change in the definition
of [_]KERNEL. David O'Brien <obrien@NUXI.com> reported
the problem and provided a test system.

Removed the HASPPID bracket from Fppid (the -R
option state variable) so that the field select
table will compile even when HASPPID is not defined.
This problem was introduced at revision 4.47 with
code that causes some field output characters to
set option states. The problem was reported by
David Bacon <bacon@birch.eecs.lehigh.edu>.

4.49 April 3, 2000
Made clearer in man page that "Lxx" FDs are AIX
loader table references. Also updated the 00FAQ
discussion of the Stale Segment ID bug to include
AIX 4.3.x.

Modified support for NetBSD 1.4Q to include the
<sys/buf.h> header file to cope with an MFS change.

Added support for OpenBSD UVM virtual memory.

Added support for AIX systems with > 2GB of memory.
Chris Sylvain <csylvain@itg.ummc.umaryland.edu>
reported the problem and provided the solution.
Chris also supplied some minor code cleanup. This
was offered as a patch to 4.48.

Based on new information from Igor Schein <igor@txc.com>
made additional compensation in Configure script
for 64 bit Solaris 7 and 8 gcc.

Added some 00FAQ info on the effect ordering of
the +fg and -FG options has on output format.

Improved NetBSD IPv6 configuration, based on a
suggestion from Thomas Klausner
<wiz@danbala.ifoer.tuwien.ac.at>. Added code to
convert IPv4-mapped-in-IPv6 addresses to IPv4
addresses.

Updated the information in 00FAQ and the HP-UX 11
binary directory README files on the HP-UX 11 ipis_s

patch with new information supplied by Eric McWhorter
<emcwhorter@xsis.xerox.com>.

Added documentation on changes to HASFSTYPE and
HASNCACHE, and the new HASPRIVPRIPP.

Adjusted Configure for FreeBSD 5.0. Made additional,
necessary changes to Configure and the BSDI sources
to eliminate load errors.

Added KAME IPv6 support to FreeBSD at the request
of Ollivier Robert <roberto@eurocontrol.fr>, who
provided a test system.

Corrected the script that generates the CHECKSUMS
files for binaries to correctly name the detached
PGP certificate. The documentation bug was reported
by Michael Hennecke <hennecke@rz.uni-karlsruhe.de>.

4.50 June 29, 2000
Added a NetBSD alpha test host, courtesy of Ray
Phillips <r.phillips@mailbox.uq.edu.au>. An lsof
4.49 binary, built on Ray's 1.4.1 system was made
available prior to the 3.50 release.

Upgraded the system map file tests in /dev/kmem-based
Linux lsof, making the use of DEBIAN_LINUX_LSOF
unnecessary. Tested the changes on a system made
available by Vincent Kujala <kujala@geog.ubc.ca>
and Jim Mintha <jim@ic.uva.nl>.

Forced AIX to use the large-file-enabled versions
of lstat (lstat64) and stat (stat64) if <sys/stat.h>
contains stat64. This should allow lsof to stat()
AIX files > 2GB even when the builder has not
defined the "large file enabled programming
environment." Configure tests <sys/stat.h> and
puts -DHASSTAT64 in the Makefile's CFLAGS to make
this happen. Fernando A.B. Whitaker
<whitaker@cenapad.unicamp.br> reported the problem.
This was offered as a patch to 4.48.

Enabled Configure script to handle OpenBSD 2.7.
Angelos D. Keromytis <angelos@dsl.cis.upenn.edu>
reported the availability of OpenBSD 2.7 and supplied
the Configure script patch.

Improved handling of DOOR and fattach()'d files in

Solaris.

Changed message about missing kernel symbol file
from "not yet determined" to "none found".

Updated FreeBSD, NetBSD, NEXTSTEP, OpenBSD, and
OPENSTEP support to report "no PCB" and the values
of the SO_CANTSENDMORE and SO_CANTRCVMORE state
flags when a socket structure has no inpcb pointer.
This modification was made to AIX lsof at revision
4.46. Added an entry to 00FAQ about sockets that
have no inpcb pointer.

Upgraded support for FreeBSD 5.0-CURRENT. Ben
Smithurst <ben@scientia.demon.co.uk> supplied
patches and did testing. David O'Brien <obrien@NUXI.com>
supplied a test system. The update included dropping
the Fctty part of file descriptor file system
support, conditional on a Configure script test.
I propagated those changes to BSDI, NetBSD, and
OpenBSD in anticipation of their having the
modification in the future. David also arranged
with Michael Haro <mharo@area51.fremont.ca.us> for
a FreeBSD 3.4 test system.

In response to an lsof 3.72 bug report from Jim Mewes
<jim@corp.phone.com>, added more kernel address
filtering to the lsof function, kread(), that reads
Solaris kernel data.

In response to a report from Marc Duponcheel
<marc@offline.be>, added tests to the /proc-based
Linux lsof to ignore file systems of types "autofs"
and "pipfs".

Based on a report and information supplied by Casper
Dik <casper@holland.Sun.COM>, updated the ncache_load()
function in lib/rnch.c with new code that deals
with a post Solaris 8 change in kernel name cache
(DNLC) handling. Casper tested the update, which
should be invisible to Solaris versions without
the new DNLC code.

Added support for Solaris VxFS QIO files, based on
a report from Kieran Broadfoot <kieran.broadfoot@gs.com>.
Kieran help test the support.

Added support for PTX 4.4.6 and 4.5[.1] with help

from the usual cast of good people at Sequent.

Added support for 64 bit file sizes and offsets on
BSDI, FreeBSD, NetBSD, and OpenBSD, based on a
report from Dan Nelson <dnelson@emsphone.com>.
Dan supplied a patch and did FreeBSD testing.

Added Configure script recognition of NetBSD 1.5,
based on a report from Andrew Brown <atatat@atatdot.net>.
Thomas Klausner <wiz@danbala.ifoer.tuwien.ac.at> updated
the NetBSD port package to use a pre-release of this
addition.

At the last minute saw a notice via deja.com's
UseNet search service that FreeBSD 3.5 had been
released and lsof didn't grok it. Added recognition
of 3.5 to lsof's Configure script, but didn't have
the opportunity to test lsof on 3.5.

4.51 August 21, 2000
Added Configure script support for the upcoming
Solaris 9 release based on suggestions from Casper
Dik <Casper.Dik@holland.sun.com>.

Changed sample Perl scripts to assume that
/usr/local/bin/perl is Perl 5 and Perl 4 may be
found in /usr/local/bin/perl4.

Updated Configure to recognize FreeBSD 4.1 and made
a FreeBSD pre-release distribution available.

Bela Lubkin <belal@sco.COM> tested lsof on the
upcoming SCO OSR 5.0.6 release and reports that
lsof appears to work properly.

Updated the AIX compiler test in Configure to
recognize its version 5.

Updated AIX 4.3.3 support with automatic recognition
of the proper rnode structure, based on machine
bit width. Also added code to detect when processing
the -X option that lsof has been compiled with the
"other" AIX 4.3.3 user structure and to apply
compensations. When a compensation method works,
it's applied during subsequent -X processing; when
none works, further -X processing is disabled.

Added Tru64 UNIX 5.1 support. Updated Tru64 UNIX

library text file support to recognize new kernel
support for AdvFS library files. Berkley Shands
<berkley@cs.wustl.edu> and Klaus Saggerer USG
[saggerer@zk3.dec.com> helped put me in contact
with Chang Song <song@zk3.dec.com>, the developer
of 5.1's new kernel name cache and he helped me
develop new code in lsof to access it.

Corrected reporting of PTX fattach()'d address.

Changed Configure and dlsof.h for NetBSD and OpenBSD
to use /usr/include/uvm header files when available.
Andrew Brown <atatat@atatdot.net>, Thomas Klausner
<wiz@danbala.ifoer.tuwien.ac.at>, and Wolfgang
Rupprecht <wolfgang@wsrcc.com> pointed out the need
to do this for NetBSD. Andrew provided access to
a NetBSD 1.5 system for verifying the changes.

Installed snprintf() support, including a private
version in the lsof library for those UNIX dialects
without the function. Changed all sources to use
it instead of sprintf() and strcpy().

Fixed a memory leak in the readvfs() functions of
BSDI, DEC/OSF1, Digital UNIX, FreeBSD, NetBSD,
OpenBSD, and Tru64 UNIX.

Tested on Linux 2.4.

Modified the Pyramid MkKernOpts script to compensate
for `uname -s` configuration alternatives. Robert
Dahlem <Robert.Dahlem@ffm2.siemens.de> supplied
the modification.

Obtained access to an FCS Solaris 8 64 bit system
and built lsof on it, using Sun Workshop C 5.0 and
gcc 2.96 20000814 (experimental). Both compilers
produce a working lsof.

4.52 November 8, 2000
  Completed work on an HP-UX 11.11 port that uses a
  pstat(2) interface provided by HP. To distinguish
  it from its predecessors for HP-UX, this lsof
  version is called PSTAT-based and the predecessor
  versions are now called /dev/kmem-based. I am
  indebted to the far-sightedness and support of
  these good people at HP for making PSTAT-based lsof

possible: Carl Davidson, Louis Huemiller, Rich
Rauenzahn, and Sailu Yallapragada. The PSTAT-based
sources are in lsof_4.52/dialects/hpux/pstat, the
/dev/kmem-based ones in lsof_4.52/dialects/hpux/kmem.

Ported to IBM Monterey for Merced|Itanium, aka AIX
5L. It configures via the Configure script's "aix"
abbreviation and has been tested on AIX 5L Beta 3.
Jay Beck, Steve Dibbell, Loc Le, Nasser Momtaheni,
and Malcom Zung of IBM provided generous support.
Since AIX 5L is still in Beta testing, this port
can't be considered complete.

Added Configure support for OpenBSD 2.8. David
Mazieres <dm@cs.nyu.edu> provided a test system.

Based on a report from Marc Christensen
<marc@mecworks.com> added sockfs to the mount scan
exemption list for /proc-based Linux lsof.

Added large file, CDFS, and DOSFS for UnixWare 7.x.
Added UnixWare device memory mapping support. All
UnixWare changes were supplied by Eric Dumazet
<edumazet@cosmosbay.com> Eric also supplied some
miscellaneous bug fixes.

Deferred name cache loading until printname() needs
to use the name cache.

Terminated Pyramid, SunOS 4.1.x, and Ultrix support,
because test systems are no longer available.
Final Pyramid and Ultrix source code distributions
for lsof revision 4.51 may be found on lsof.itap.purdue.edu
in pub/tools/unix/lsof/OLD/src. The no longer
supported SunOS 4.1.x source code is still distributed
with the Solaris source code.

Added code to set Solaris node address to real vnode
address, when applicable.

John Speno <speno@lopan.isc-net.upenn.edu> provided
information that enabled me to update the Tru64
AdvFS (MSFS) node definition for AdvFS version 5.

Added Tru64 5.x CFS support with help from Kris
Chandrasekhar <Kris.Chandrasekhar@compaq.com>,
Diane Lebel <lebel@zk3.dec.com>, and John Speno.
The support only provides information about cached

file attributes.

Installed a Configure patch for HP-UX 11 supplied by
Kenneth Stailey <kstailey@disclosure.com> that adds
another command to q4 input.

Tested on FreeBSD 4.2.

Will Day <willday@rom.oit.gatech.edu> and Frank
Winkler <frank.winkler@germany.sun.com> graciously
supplied Solaris 8 binaries.

Added Solaris 9 text file support, supplied by
Casper Dik <Casper.Dik@holland.sun.com>.

4.53 December 6, 2000
  Added the AIX 5L j2_lock.h to the distribution with
  a Configure script step to use it when it's missing
  from /usr/include/j2.

  Removed SunOS 4.1.x support.

  Removed Linux 2.0.x /dev/kmem support.

  Fixed VBLK and VCHR special device file reporting
  to handle /dev information more accurately.

  Added a Apple Darwin / Mac OS X 1.2 port, provided
  by Allan Nathanson <ajn@apple.com>. Allan also
  arranged for a test system so I can maintain this
  port. An additional test system was provided by
  Dale Talcott.

  Dropped claims of support for all UnixWare versions
  except 7.1.0, since that is the only version on
  which I can test lsof. Even though lsof 4.53 is
  deprecated for UnixWare 2.1.3, installed a patch
  for it with testing done by A. Channing Clark
  <clark.channing@heb.com>.

  Dropped claims of support for all SCO OpenServer
  versions except 5.0.5, since that is the only
  version on which I can test lsof.

4.54 January 19, 2001
  Added compensation for a change that made the
  FreeBSD mount structure invisible. I can only test
  back to 3.2 and the compensation works there, so

it's been #ifdef'd for 3.2 and above. David O'Brien
<obrien@FreeBSD.org> provided the necessary clue.

Based on a report from Valdis Kletnieks
<Valdis.Kletnieks@vt.edu>, changed all IPv6 support
to report a TYPE of IPv6 for sockets with IPv4
addresses mapped in IPv6 addresses. The previous
lsof behavior was to report their TYPE as IPv4.

Restored the Linux GlibC test to Configure, removed
at revision 4.53, based on a report from John Dzubera
<zube@cs.colostate.edu>, that RedHat Linux 6.0 still
needs the test.

Made setting of link count for Solaris more selective.

Limited Readlink() recursion to MAXSYMLINKS. The bug
was reported by Jan Dvorak <johnydog@go.cz>.

Dropped the *claim* that lsof runs on Solaris 2.5.1.
It may well do so, but I no longer have access to a
test system.

Fixed an #endif comment typo, reported by Igor Schein.

Fixed a typo in a cast for a Tru64 UNIX 5.1 function
and updated Configure for Tru64 UNIX 5.0 and 5.1 with
information from Jesse Perry <jesse.perry@compaq.com>.

Corrected non-fatal typos in the AdvFS support in
dnode.c for Tru64 UNIX.

Added msdos file system support for NetBSD and OpenBSD.
Andrew Brown <atatat@atatdot.net> requested and helped
test it.

4.55 February 15, 2001
   Based on a report from Bernd Eckenfels <ecki@lina.inka.de>
   added support in lsof for files in /proc/<PID>/maps
   that have been deleted.

   Changed PGRP output title to PGID, conforming to
   the most common current abbreviation for Process
   Group ID (PGID). While some systems continue to
   use *pgrp for internal kernel variable names, most
   systems that support the display of PGID via ps(1)
   now title it PGID. The lsof -g and -Fg options
   operations are unchanged in function; only titles

and descriptions have changed. Also changed internal
variable names from *PGRP and *pgrp to *PGID and
*pgid where possible.

Dropped the *claim* that lsof runs on HP-UX 9.x.
It may well do so, but I no longer have access to
a test system.

In response to a suggestion from Jeff Howie
<jeff.howie@federated.ca> added support for command
name selection by regular expression. A new form
of the -c option value is use to identify and
specify a regular expression.

Restore the *claim* that lsof works on UnixWare
7.0, since I re-acquired a test system.

4.56 May 3, 2001
  Corrected some problems Amir Katz <Amir_Katz@bmc.com>
  found with Insure++, one in lib/dvch.c, the rest
  in Solaris sources. Amir's report also helped me
  find an error in an snpf() call that caused (the
  unsupported) Solaris 2.5.1 lsof to crash. Wally
  Winzer, Jr. <wally.winzer@ChampUSA.COM> helped test.

  Added support for UnixWare 7.1.1 and above in-kernel
  UNIX sockets. John Hughes <john@Calva.COM> kindly
  provided code and access to a test system. John
  also provided a test system and advice for adding
  UnixWare 7.1.1 NonStop Cluster and CFS support.
  More help with that effort came from Kurt Gollhardt
  (SCO), Barbara Howe (SCO), Bela Lubkin (SCO), and
  Dewan Rashid <Dewan.Rashid@ir.com>.

  Archived a set of compilation hints (patches) from
  Bill Melvin <Bill.Melvin@esc.edu> that make it
  possible to compile the old, unsupported lsof 3.08
  sources on UnixWare 1.x without NFS or CDFS support.

  Installed support supplied by Allan Nathanson
  <ajn@apple.com> for the Darwin "Gold Master" release,
  Mac OS X 10.0 (aka Darwin 1.3 in its public source
  version). Added Allan's CVS repository suggestions
  to the script that gets additional header files
  from an open source repository.

  Tested an HP-UX 11.11 kernel patch from Sailu
  Yallapragada that enables reporting of TCP/IP

information for telnetd processes that use the
telnet multiplexor. I don't yet know the kernel
patch ID.

Made the Solaris inclusion of <inet/mi.h> conditional
on the Solaris version. (It's apparently not needed
at 2.6 and above.) Bill Watson <bill.watson@uk.sun.com>
brought this to my attention.

Added alternate Linux 2.4.x lock extent test, supplied
by Jim Mintha <jim@ic.uva.nl>.

Rearranged the lines and pre-processor tests in
regex.h, lib/regex.c, and lib/snpf.c so that unifdef
can be used to eliminate copyright and GPL statements
when the files aren't being used for a particular
dialect. (USE_LIB_* definitions in a dialect's
machine.h header file determine if one or more of
those three files are to be used.)

Added preliminary support for Solaris 8 with VxFS
3.4. This support will be refined as I get
information from Veritas about how they will
distribute the kernel header files lsof needs.
Those header files were omitted from the standard
VxFS 3.4 distribution. Technical assistance and
testing were provided by Calle Dybedahl <cdy@algonet.se>,
Gary Millen <gary.millen@veritas.com>, Rainer Orth
<ro@TechFak.Uni-Bielefeld.DE>, Peter C. Vernam
<pvernam@draper.com>, and Donna Yobs
<Donna.Yobs@veritas.com>

Tested on FreeBSD 4.3-STABLE.

Dropped the *claim* that lsof works on UNIX dialects
where I no longer have test systems: BSDI 2.1,
3.[01] and 4.0; DEC OSF/1, Digital UNIX and True
64 UNIX 2.0 and 3.2; FreeBSD 2.1.[67], 2.2[.x],
3.[012345] and 4.[01]; HP-UX 10.20; NetBSD 1.[234];
SCO OpenServer 5.0.5; and SCO UnixWare 7.0

Tested on Solaris 9 BETA, s81_36.

4.57 July 19, 2001
Help (-h) and version (-v) output now have URLs
for the newly created and timeliest lsof FAQ
(00FAQ in the lsof distribution) at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/FAQ

and the man page for the current lsof distribution
at:

ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/lsof_man

Based on a report from Steve Laubscher
<slaubs@woodward.com>, modified dlsof.h for PTX
4.6[.1] to avoid a temporary dnlc_t definition
needed at PTX 4.5.1.

Corrected test for old Linux kernels in Configure.
Henri Karrenbeld <ishtar@cal044202.student.utwente.nl>
brought the error to my attention. Limited Linux
claims to 2.1.72 and above in the documentation.

Improved HP-UX 11 Configure stanza and stream socket
handling.

Constructed a work-around for the HP-UX 11 optional
OnlineJFS package. The work-around sadly requires
lsof to have a private version of the vx_inode
structure, since the OnlineJFS package doesn't
update <sys/fs/vx_inode.h>. Troyan Krastev
<Troyan.Krastev@ricoh-usa.com> brought the bug to
my attention and Michael Bracewell
<michael@ra.TSS.PeachNet.EDU> provided a test system
where I developed the work-around.

Added locale support to lsof's isprint() test,
based on a suggestion from Dan Mercer <damercer@mmm.com>.
Lsof will use setlocale(), when that function and
its supporting <locale.h> header file are available.

Added OpenBSD 2.9 support.

Based on a report from Aaron Rhodes <arhodes@psionic.com>
and with testing help from Aaron, made the lsof
4.56 revision compile and work on OpenBSD 2.6.
While that OpenBSD version is no longer supported,
Aaron's report exposed a Configure script bug
affecting OpenBSD versions lsof does support.

Updated for FreeBSD 5.0-CURRENT. Szilveszter Adam
<sziszi@petra.hos.u-szeged.hu> help test. The lsof
FreeBSD ports packager, David O'Brien <obrien@FreeBSD.org>,
assisted.

Tested on AIX 5.1. Loc Le and Nasser Momtaheni of
IBM provided test systems.

4.58 September 13, 2001
Added options to safestrprt() and safestrprtn() to
surround the string with "" and to suppress the
printing of an ending '\n'. Use of these functions
in device cache file error message reporting answers
a suggestion for better error reporting from John
Jackson <jrj@purdue.edu>.

Fixed a Solaris 2.6 and above problem related to
searching for "large" (O_LARGEFILE) files by name;
lsof was using the wrong version of [l]stat(2).
The bug was reported by Daniel Trinkle
<trinkle@cs.purdue.edu>.

Added AIX 4.1.4 and above XTI socket support.

Added OSR Xenix Shared Data and Semaphore file type
support with modifications supplied by Bela Lubkin.

Updated OPENSTEP support with modifications from Carl
E. Lindberg <lindberg@clindberg.org>. The changes
enable the correct reporting of executable and
library open files ("txt" type).

Limited claims of OpenServer support to the versions
where I currently test, 5.0.4 and 5.0.6. (Lsof
probably works on 5.0.5.)

Enabled processing of -C option for PSTAT-based HP-UX
lsof.

Enabled and tested on FreeBSD 4.4.

Corrected a file system test example in 00QUICKSTART,
based on a report from Jun Biao WANG <wangjunb@cn.ibm.com>.

Made available for re-distribution a user-contributed
port of lsof 4.51 to Reliant UNIX 5.45. Thomas
Mauterer <Thomas.Mauterer@philosys.de> contributed
the port.

4.59 October 20, 2001
With the closing of the Sequent Synergy Links Lab
by IBM, terminated lsof support for PTX. The last

tested PTX lsof revision, 4.58, is available on
lsof.itap.purdue.edu in .../lsof/OLD/src.

Adjusted for FreeBSD 5.0-CURRENT NFS header file
changes, based on a report from Jos Backus
<josb@cncdsl.com>.

Corrected a bug in the way Linux lsof identifies
the owner of a process. Lionel Cons <lionel.cons@cern.ch>
reported the problem and tested the fix. Added
code to avoid stat(2) calls on regular Linux files
whenever possible. Lionel reported the need to do
this (AFS files) and tested the new code.

Added new output field for raw device number in
hex. The field is identified with 'r'. This field
is NOT selected when -F or -F0 is specified so that
its appearance won't disturb existing scripts that
process field output.

Added support for OpenUNIX 8. A test system was
provided by Larry Rosenman <ler@lerctr.org>.
Matthew Thurmaier <matt@compclass.com> and many
people from Caldera provided technical assistance.

Added an additional UVM test to the NetBSD Configure
stanza. Andrew Brown <atatat@atatdot.net> supplied
the test; it recognizes NetBSD 1.5Y UVM changes to
the vnode structure recently committed by Chuck
Silvers.

Applied Configure and get-xnu-headers.sh script
changes suppled by Allan Nathanson <ajn@apple.com>
for Darwin 1.4.

Added for Bela Lubkin <belal@mammoth.ca.caldera.com>
OSR-specific environment variables to supply values
to the Configure script. The variables are described
in 00XCONFIG.

Added an IP version selector to the -i option
parameters.

4.60 November 9, 2001
Added special handling to and corrected bugs in
the matching of IPv4 in IPv6 addresses to -i6:<...>
selectors.

Made 00FAQ corrections and updates, based on
discussions with Igor Schein <igor@txc.com>.

Modified Configure script to detect a 64 bit capable
gcc compiler and permit it to be used to build 64
bit (PA-RISC 2) lsof for HP-UX 11.00. Tested with
HP's gcc package, which Rich Rauenzahn of HP kindly
installed on a test system at HP. Stefan Marquardt
<stefan.marquardt@hagebau.de> helped test.

Made lsof's method of killing its child process
more robust, based on a suggestion from Bela Lubkin
<belal@caldera.com>.

Modified all dialect Makefile segments to accept
select -v #define's from the environment -- a
builder's comment, host, logname, system information
and user name. This was done for Bela Lubkin, so
he can "tune" the -v output when he packages lsof
in the upcoming Caldera OSR 5.0.7 release.

Changed Perl scripts in scripts/ to put the lsof
path consistently in $LSOF. Also added a fix from
Bela Lubkin to scripts/big_brother.perl5 that allows
it to tolerate SCO OSR "ago" clauses in open UDP
file information. Strengthened emphasis in
scripts/00README that the scripts are examples that
shouldn't be expected to run on all UNIX dialects
without modification.

At Bela Lubkin's suggestion changed the device
cache file format examples in 00DCACHE and 00FAQ
to avoid "%U%". That's an SCCS escape sequence.

Added support for OpenBSD 3.0.

Added +DAportable to CFLAGS for 32 bit HP-UX 11.
Amir Katz <Amir_Katz@bmc.com> suggested the addition.

4.61 January 22, 2002
Updated field output example Perl scripts in the
scripts/ subdirectory to discover the lsof path,
starting at .. and proceeding through the PATH
environment variable's directories.

Added minor OSR Configure script fixes, provided
by Bela Lubkin <belal@caldera.com>.

In response to a report from Joshua Wright
<Joshua.Wright@jwu.edu> modified NetBSD and OpenBSD
Configure stanzas and sources so that lsof can be
built when there is no system source tree (e.g.,
/usr/src/sys).

In response to a report from Peter Valchev
<pvalchev@openbsd.org> improved the UVM test in
the OpenBSD Configure stanza.

Updated Configure script to recognize FreeBSD 4.5.
Updated for FreeBSD 5.0 procfs and pseudofs changes.

Updated HP-UX stanza to see if the compiler named
in the LSOF_CC environment variable is the bundled
compiler. If it is, "-O" is omitted from the
compiler flags.

Updated Digital UNIX 4.x and Tru64 UNIX error message
related to kernel name list failures. Added an FAQ
section about how a kloadsrv daemon failure can cause
knlist(3) to fail. The condition was reported by
Douglas B. Jones <douglas@gpc.peachnet.edu>

Based on a report from Mark W. Eichin <eichin@thok.org>
made Linux lsof capable of handling and reporting
file sizes greater than 32 bits.

Tested on Solaris 9 BETA-Refresh.

Corrected a bug in the matching of IPv4 addresses,
mapped in IPv6 addresses, to an IPv4 parameter to
an -i option.

Ported to 64 bit Power AIX 5.1 kernel with advice
from David Clissold <cliss@austin.ibm.com> and Marc
Stephenson <marc@austin.ibm.com>, and on a test
system provided by Loc Le <lple@us.ibm.com>.

4.62 March 7, 2002
Updated 00README to reflect the usefulness of gcc
for building AIX lsof. Documented a report from
Brian L. Gentry <BGentry@nationsrent.com> of success
on AIX 4.3.3. I documented my success on 32 bit
Power AIX 5.1 and my lack of success on ia64 AIX
5.1 and 64 bit Power AIX 5.1.

Improved UnixWare >=7.1.1 reporting of UNIX socket

NAME field information for NonStop Cluster systems
with a patch provided by John Hughes <john@Calva.COM>.
Offered John's improvement as a patch to lsof 4.61.

Corrected bugs in handling of open files on block
devices by OSR lsof. The bugs were reported by
Bela Lubkin <filbo@deepthought.armory.com>.

Fixed bug in writing >32 bit device numbers for
block devices to the device cache file.

Added support for reporting block special nodes
not in /dev (or /devices). That required "like
device special" be changed to "like block special"
and "like character special". (00FAQ was updated.)

Based on a report from Peter Valchev <pvalchev@openbsd.org>
improved the definition of the source for NetBSD
and OpenBSD kernel symbols (the nlist() source
file). NetBSD now defaults to getbootfile(3) if
it is available, /netbsd otherwise. OpenBSD now
defaults to /dev/ksyms if it is available, /bsd
otherwise.

Made possible compilation under BSD/OS (BSDI) 5.0
with changes to Configure, dialects/bsdi/dlsof,
dialects/bsdi/dproc.c and lib/rnmh.c. The changes
were suggested by Steven Hinkle <hinkle@bsdi.com>.
Note that these changes do not substantiate a claim
that lsof works on BSDI 5.0, because I haven't
tested it there.

Updated OpenUNIX private <sys/fs/memfs_mnode.h>,
based on a report from Larry Rosenman <ler@lerctr.org>
that it had been updated by Caldera patch OU800PK3.
Unfortunately the patch only corrects some of the
problems with the header file, so it is still
necessary to distribute a private patched version
of it with the lsof sources.

Applied a man page correction reported by Frederic
Delanoy <max_ok@yahoo.com>.

Corrected cast bugs related to using the HP-UX
bundled C compiler on HP-UX 11.11.

4.63 April 23, 2002
    Added HPUX_BOOTFILE environment variable for use

by the Configure script in determining HP-UX kernel
configuration information -- e.g., the state of
the ipis_s structure in the HP-UX 11 kernel. The
change was suggested by Marc Bejarano <beej@alum.mit.edu>.
Marc also suggested some changes to the HP-UX
section in 00FAQ that discusses Configure's use of
q4 for HP-UX 11.

Fixed a bug in the Solaris lsof file system matching
code. It was not reporting that VCHR files in
/devices were in / when /devices was in /, too.

Corrected bugs in device number, file size, file
offset, and raw device number field output generation.

Added recognition of OpenBSD 3.1 to the Configure
script with a suggestion from Peter Valchev
<pvalchev@sightly.net>. Note that this change does
not constitute a claim that lsof works on OpenBSD
3.1, because I haven't tested it there.

Built an automated test suite. (See 00TEST and
the tests/ sub-directory of the lsof main directory).
Bela Lubkin requested it. Dale Talcott, John
Hughes, and Larry Rosenman helped me validate it
on their systems.

During the development of the test suite I discovered
the following lsof bugs or missing features, and
corrected or supplied them.

* Corrected the reporting of locks for:
  o Digital UNIX 4.0d and Tru64 Unix 5.[01];
  o HP-UX 10.30 and 11.00;
  o OpenUNIX 8;
  o UnixWare 7.1.1.

* Enabled HP-UX 10.30 and 11.00 to report open NFS
  file link counts.

* Corrected the reporting of UNIX domain socket
  names for Apple Darwin, FreeBSD 4.5 and above,
  NetBSD 1.4.1 and above, and for OpenBSD 3.0 and
  above.

* Enabled HP-UX 11.11 to stat(2) large files.

* Fixed handling of combination 32 and 64 bit

device numbers in AIX 64 bit architectures.

Updated the AIX 4.3.3 NFS rnode recognition code,
first installed at revision 4.51. It looks like
some IBM update has restored a single rnode structure
independent of the machine bit width.

Updated the NetBSD and OpenBSD sources so NetBSD
can process DTYPE_PIPE files, as OpenBSD was already
able to do.

Updated Darwin get-xnu-headers.sh script to reflect
information about a recent reorganization of the
Darwin CVS hierarchy, supplied by Allan Nathanson
<ajn@apple.com>.

Added defense against the standard I/O descriptor
attack.

4.64 June 26, 2002
Corrected some FreeBSD pre-processor directives.
David O'Brien <obrien@NUXI.com> pointed them out.

Updated lsof's main() function to: 1) close all
open file descriptors above 2 before starting; and
2) to set a non-interfering umask. Moved GET_MAX_FD
test from misc.c to proto.h, so that main() could
use it. Added multiple-include protection to
proto.h.

Moved FAQ's test suite Q's & A's to a more appropriate
section. Added a Q&A on HASSECURITY option and
its affect on searching for open files. (That was
already in the man page.)

Updated hpux/kmem/dnode.c for HP-UX < 11 compilation
with information from John Dzubera <Zube@CS.ColoState.EDU>.
While lsof doesn't support HP-UX < 11 any more, I
try to avoid disabling it there when possible, and
a locking fix for HP-UX >= 11 in lsof 4.63
inadvertently disabled compilation of lsof for
HP-UX < 11. Fixed long-standing bug in HP-UX 10.20
lock reporting.

Removed language from the test suite programs that
requires an ANSI-C compiler. This allowed the test
suite to be validated with cc and gcc on the un-
supported HP-UX 10.20.

At the suggestion of Manuel Bouyer <bouyer@antioche.eu.org>
switched NetBSD and OpenBSD lsof from using nlist()
to using kvm_nlist(). Made the same change for
BSDI, Darwin, and FreeBSD.

Validated test suite on OPENSTEP 4.2.

In response to a suggestion from Jeff Stoner
<jstoner@blackboard.com> enhanced support for the
FD list of the -d option to allow it to be either
an exclusion or inclusion list, using the '^' prefix
to denote exclusions.

Made adjustments for FreeBSD 4.6 and 5.0-CURRENT.
Fixed a FreeBSD /etc/make.conf CFLAGS extraction
bug, reported by Kris Kennaway <kris@obsecurity.org>,
and new a bug in the fix, reported by Eric Cronin
<ecronin@eecs.umich.edu>

Added nullfs support for FreeBSD, NetBSD, and OpenBSD
at the request of Andrew Brown <atatat@atatdot.net>.

Modified all readmnt() functions to ignore mounted-on
directory names that don't begin with '/'.

Tested on NetBSD 1.6A and OpenBSD 3.1.

Upgraded to Solaris 9 FCS with two changes to the
BETA-Refresh support: 1) an adjustment to dnode.c
for a change in the so_so (sonode) structure; and
2) addition of Solaris 9 FCS specific DNLC code.
David Comay <David.Comay@Eng.Sun.COM> sent me the
dnode.c change and Casper Dik <Casper.Dik@sun.com>
helped with the new DNLC support code.

Applied OpenUNIX changes that permit lsof to compile
and run on the upcoming 8.0.1 release. The changes
were supplied by Robert Lipe <robertl@caldera.com>.
Larry Rosenman <ler@lerctr.org> provided a test
system.

Added Solaris fd file system support.

4.65 October 10, 2002
Adjusted for change in FreeBSD 5.0-CURRENT inode
structure, reported by David O'Brien <obrien@NUXI.com>.
Adjusted for changes in FreeBSD 5.0-CURRENT <sys/vnode.h>.

One change was reported by Anders Nordby
<anders@FreeBSD.org>. Adjusted for FreeBSD 5.0-CURRENT
on sparc64 architecture.

Enhanced the error reporting of Solaris lsof when
it detects a kvm_open() failure, and added a 00FAQ
entry on the cause, based on a report from Peter
J. Bertoncini <pjb@anl.gov>.

Enabled compiling of lsof for NetBSD 1.5 with the
NULL file system, using a patch from Andrew Brown
<atatat@atatdot.net>.

Removed a hack in the LTbigf test program that was
once needed when it was compiled on Solaris 9 BETA-
Refresh with gcc. The hack isn't needed on Solaris
9 FCS. Janet Hempstead <jan@library.carleton.ca>
brought the need for this change to my attention.

Applied a patch, supplied by Andrew Brown
<atatat@atatdot.net>, that updates lsof for NetBSD
version 1.6F. Corrected handling of the NetBSD
nullfs.

Updated to BSDI BSD/OS 4.3 on a test system kindly
provided by Terry Kennedy <terry@tmk.com>.

Updated to FreeBSD 4.7.

Updated to Apple Darwin 1.5, 5.x and 6.x with
patches supplied by Allan Nathanson <ajn@apple.com>.
The patches include IPv6 support.

Updated Configure to use the -bnolibpath loader
option when building lsof on a PowerPC, running
AIX 5 or greater. Valdis Kletnieks
<Valdis.Kletnieks@vt.edu> informed me this was
needed. Lsof for AIX 5.x was initially developed
on the IA64, where -bnolibpath can't be used and
I didn't think to restore it to PowerPC loads when
AIX 5.x became available for that architecture.

Updated to UnixWare 7.1.3 on a test system provided
by Larry Rosenman <ler@lerctr.org>. Removed claims
that lsof works on OpenUNIX 8.0.1, because UnixWare
7.1.3 is the release name of OpenUNIX 8.0.1.

Based on a comment that his e-mail address was

wrong in the lsof distribution from Kenneth Stailey
<kstailey@disclosure.com>, removed all e-mail
addresses from lsof documentation files except this
one, 00DIST. The addresses in 00DIST are used to
send revision release notices to those who contributed
to a revision, but the addresses in this file for
previous revisions and in other documentation files
sometimes grow stale and are never validated.

4.66 December 22, 2002
Acquired Solaris 7 and 8 test systems, courtesy of
John Dzubera <Zube@CS.ColoState.EDU>. Updated
00TEST and tests/TestDB accordingly.

Clarified FreeBSD 5.0 architecture claims at the
suggestion of David O'Brien <obrien@NUXI.com>.
Also implemented David's suggestion to change
Intel to x86.

Installed changes to DNLC handling in OSR lsof in
preparation for handling changes in the OSR 5.0.7
DNLC cache. Information about the changes and
patches to handle them were supplied by Bela Lubkin
<filbo@deepthought.armory.com>.

Upgraded True 64 UNIX support to the 5.1B release
on a test system provided by Berkley Shands
<berkley@cse.wustl.edu> Had to used relaxed ANSI
compilation because of an error in a system header
file and other lsof source usages.

Implemented the HASNOSOCKSECURITY compile-time
option. When it and HASSECURITY are defined, lsof
will be built to list only the user's open files,
but will also list anyone else's open socket files,
provided the "-i" option selects their listing.
Updated the Customize script to ask about setting
HASNOSOCKSECURITY. Left it undefined in all dialect
machine.h header files. This change was requested
by Kenneth Stailey <kstailey@speakeasy.net> for
use with ntop.

Added support for OpenBSD 3.2 and its kernel trace
file.

Improved lsof help (-h) and version (-v) information
reporting.

Fixed a FreeBSD 4.7 and above off-by-two UNIX domain
socket path termination bug, reported by Ken Stailey
<kstailey@speakeasy.net>

4.67 March 27, 2003
Began the transition of the lsof ftp server host
name from vic.cc.purdue.edu to lsof.itap.purdue.edu.
That reflects Purdue organizational changes. This
first step makes the new name an alias to the old
one.   The old name, vic.cc.purdue.edu, will remain
usable for an extended period.

Corrected a revision number reference in section
17.17 of 00FAQ on the appearance of Solaris negative
DNLC caching handing.

Updated 00FAQ discussion of compilers for 64 bit
Solaris.

Validated test suite for 64 bit Solaris 8 and gcc.

At the request of Alek O. Komarnitsky <alek@komar.org>
added the "+c <width>" option to enable optional
changing of the COMMAND column output maximum width
from the default to <width>. The default maximum
width remains CMDL, as defined in lsof.h.

Fixed three AIX kernel bit size detection bugs,
one in the AIX Configure script stanza, the second
and third in the AIX dproc.c get_kernel_access()
function. The bugs were reported by Pierre-Yves
Fontaniere <pyf@cc.in2p3.fr>, who tested the fixes.

Added kernel event queue file support for FreeBSD,
NetBSD and OpenBSD. Andrew Brown <atatat@atatdot.net>
supplied the code.

Updated to AIX 5.2 on a test system provided by
Dale Talcott <dtalcott@purdue.edu>. Had to build
work-arounds for two missing AIX 5.2 header files,
<j2/j2_snapshot> and <proc/proc_public.h>. Corrected
an off-by-one UNIX socket addressing bug. Taught
AIX lsof to handle both jfs and jfs2 files at the
same time. Adjusted for an IBM mistake in the
sizing of the fdsinfo structure in <procinfo.h>
Toshiya Nakamura <TOSHIYAN@jp.ibm.com> helped test,

Updated to FreeBSD 4.8. Corrected another bug in

FreeBSD UNIX domain socket name handling.

Corrected gcc build problems on HP-UX 11i, reported
by Yuliy Minchev <yuliy@mobiltel.bg>.

Updated BSDI BSD/OS support to 4.3.1.

Augmented a lock ID test on NetBSD to check if the
ID is an LWP pointer.

4.68 June 18, 2003
Enhanced Configure script's cleanup operations.

Added support for OpenBSD 3.3, based on a report
from Peter Valchev <pvalchev@sightly.net>.

Improved the description of the detached PGP
signature certificate file in the main lsof README
file, based on a suggestion from Diana Stockdale
<diana@mpl.ucsd.edu>.

Installed a work-around for FreeBSD 5.0-CURRENT on
Alpha to avoid a compiler register use complaint.

Corrected a 'c' option error message. Gnele
<blaadeleng@yahoo.com> reported the problem.

Upgraded EXT2FS and UFS support for NetBSD and
OpenBSD to handle new inode information, and the
fast UFS1 and UFS2 file systems.

With the help of Andrew Brown <atatat@atatdot.net>
determined the NetBSD snapshot (1.6F) at which
<sys/mount.h> could be included under _KERNEL, thus
eliminating the lsof netexport.h hack. The same
change applies to OpenBSD versions 3.3 and above.

Applied a patch from Armin Gruner <ag@muc.de> that
corrects the use of the HASPROCFS definition in the
FreeBSD dialect sources.

Corrected spelling errors in 00FAQ and in the
generated 00.README.FIRST_<version> file of the
distribution archive. John Jackson <jrj@purdue.edu>
and Ray Phillips <r.phillips@jkmrc.uq.edu.au>
spotted and reported the errors.

Corrected a spelling error in a comment and incorrect

use of an alarm function in the LTsock test program.

At the suggestion of Stuart Anderson <sba@srl.caltech.edu>
added preliminary (and incomplete) SAM-FS file system
support to Solaris lsof. Completion awaits availability
of SAM-FS internals.

Fixed a Solaris device name printing bug, reported by
Ric Anderson <ric@tick.Telcom.Arizona.EDU>, only
visible when HASDCACHE is not defined. Ric helped
test the fix.

Fixed an AIX kernel bit size handling bug related
to the NFS node (rnode) structure.

Corrected a print_kptr() function call error in the AIX
AFS code, reported by David Steiner
<david.r.steiner@Dartmouth.EDU>. Upon further reflection
and because I no longer have appropriate AIX AFS test
systems, disabled AIX AFS support in the Configure script
for AIX versions above 4.3.3.0 or AIX AFS versions above 3.5.

Added support for FreeBSD 5.1.

With advice from Allan Nathanson <ajn@apple.com> adjusted
the Darwin get-xnu-headers.sh script to access the kernel
header files needed by lsof from a new form of the Apple
open source repository.

Installed Linux and lsof library bug fixes and
improvements, supplied by Marian Jancar <mjancar@suse.cz>.
One Linux improvement handles mount strings that
have octal escapes in them, eg., \040 for embedded
blanks. Marian tested the changes.

4.69 October 16, 2003
  Received and applied an OpenBSD patch from Peter Valchev
  <pvalchev@sightly.net> that replaces a ctob() call with
  a sysconf() call. Peter claims sysconf() is needed for
  OpenBSD on SPARC. (It is not needed for NetBSD on SPARC.)

  With the upgrade of my only Solaris 7 test system
  to, Solaris 8, dropped the *claim* that lsof works
  on Solaris 7. That doesn't mean it won't work
  there, so those who want lsof for Solaris 7 probably
  should be able to build it there and it probably
  will work there.

Revised lsof's DNLC handling for BSD derivatives,
including: BSDI; Darwin, DEC OSF/1, Digital UNIX
and Tru64 UNIX; FreeBSD; NetBSD; and OpenBSD. The
latest NetBSD distribution's dropping of the vnode
capability ID (v_id) required the revision.

Adjusted to the latest FreeBSD 5.1-CURRENT.

Added NetBSD support for using kvm_getproc2().

Added a patch from Andrew Brown <atatat@atatdot.net>
to handle NetBSD enum conflicts and changes in the
<miscfs/kernfs/kernfs.h> and <miscfs/procfs/procfs.h>
header files.

Added a "#define _KERNEL" to the AIX dnode2.c source
file for compatibility with a new <j2/j2_inode.h>
AIX 5.2 header file version. The addition was
supplied by Dick Dunbar <Dick.Dunbar@Siebel.com>
and was offered as a patch to lsof 4.68/

Added support for a second type of Solaris SAMFS.
Stuart Anderson <sba@srl.caltech.edu> provided the
support. SAMFS support in lsof SOLARIS remains
scanty, because Sun won't release any details on
its kernel structures.

Dropped the *claim* that lsof works on AIX 4.3.3,
because I was unable to test it there. That doesn't
mean it won't work there, so those who want lsof
for AIX 4.3.3 probably should be able to build it
there and it probably will work there.

Updated for Solaris 10 on test systems provided by
Mike Miscevic <miscevic@hotpop.com>. Casper Dik
<casper@holland.sun.com> provided significant help.
During the Solaris 10 port found and fixed an lofs
handling bug that prevented reporting of open lofs
file lock status.

Updated the DNLC test, LTdnlc, to provide a possible
explanation about file systems on which the test
might fail.

Modified the procedure for obtaining missing Darwin
XNU kernel header files. The new one requires more
manual intervention, but is the best that can be
done with the way Apple open sources are now

organized. 00FAQ explains the new procedures for
those not used to downloading Apple open source
files.

Added support for Apple Darwin 7.0 (Mac OS X 10.3)
with patches supplied by Allan Nathanson <ajn@apple.com>.
Dropped the *claim* that lsof builds and works on
Apple Darwin below 6.0.

Validated lsof on FreeBSD 4.9, using a test system
provided by Ben Lewis <bl@purdue.edu>.

Validated lsof on FreeBSD 5.1-CURRENT for Amd64.
David O'Brien <obrien@FreeBSD.org> provided a test
system.

Changed the NetBSD Configure stanza to do header
file searches in /usr/include by default. The
LSOF_INCLUDE and NETBSD_SYS environment variables
may still be used to specify other search paths.
Discussions with Andrew Brown and Wolfgang S.
Rupprecht <wolfgang@wsrcc.com> led to the change.

4.70 January 16, 2004
Improved shell-portability of the linux stanza of
the Configure script with a patch from Paul Jarc
<prj@po.cwru.edu>.

Added a "silent" rule to tests/Makefile for Paul.
Updated, extended and clarified the test suite
documentation in 00FAQ and 00TEST.

Fixed Solaris 10 dlsof.h typo, reported by Mike
Miscevic <miscevic@hotpop.com>. The typo prevents lsof
from loading cleanly in Solaris 10 builds past 40.

Fixed a Solaris HSFS node number reporting bug and
added a structure definition work-around for Solaris
10.

Converted PGP signing to GPG. My previous PGP key can
be used, but the gpg "--allow-non-selfsigned-uid"
option may have to be used when it is imported into a
GPG key ring.

Added bz2 compression.

Updated for OpenBSD 3.4.

Added a work-around for a missing header file in the
s10_44 Solaris 10 build.

Added support for FreeBSD 5.2-BETA and 5.2-CURRENT.

Updated Linux AX25 support with modifications supplied
by Lutz Poetschulat <dl9cu@db0zwi.de>.

Added raw IPv6 support to Linux lsof.

Improved handling of parameters after "-i@".

Improved file name test in LTdnlc.c.

Added loop count controls to the reading of Solaris
lock chains. The change was implemented as a result of
a report from Steve Gonczi <steve@relicore.com>.

Based on a report from John Jackson <jrj@purdue.edu>,
enabled a Solaris 10 <sys/lgrp.h> work-around for
Solaris 9, too. (Patch 112233 installs an lgrp.h on
Solaris 9 that needs the work-around.)

With help from Andrew Brown <atatat@atatdot.net> and
John Heasley <heas@netbsd.org> added log-structured
file system (LFS) support for NetBSD and OpenBSD.

Added AMD64 to the list of FreeBSD 5.x-CURRENT
supported architectures. FreeBSD.org provides a test
system, courtesy of (I believe) David O'Brien
<obrien@FreeBSD.org>.

Added a cast to lseek() in the HP-UX /dev/kmem-based
kread() function to make it work properly with the
bundled HP C compiler.

4.71 March 11, 2004
Added text file support to Apple Darwin lsof and
enabled the lsof executable portion of the LTbasic
test. Added support for Darwin kernel queue, POSIX
semaphore and POSIX shared memory files. Tested on
Darwin 7.2 (aka Mac OS 10.3.2).

Added process_kqueue() function prototypes for FreeBSD,
NetBSD and OpenBSD.

Picked some lint in AIX sources, lib/rnmh.c and

tests/LTsock.c.

Added "-x [fl]" cross-over option, which enables +d and
+D processing to cross over symbolic links and|or file
system mount points. Discussion with Johan Lindquist
<johan@smilfinken.net> and Eric Williams (aka The Ghost
In The Machine) <ewill3@earthlink.net> on Linux news
groups revealed the need for the option.

Updated support for UnixWare 7.1.4.

Added support for the optional reporting of socket
options, socket states and TCP flags for most currently
supported dialects. John Smith <lbalbalba@hotmail.com>
and Tristan Nefzger <tn@bhtrader.com> requested the
information. The dialects and their versions for which
this feature has become available include:

  AIX 4.3.2 and 5.[12]
  Apple Darwin 7.2
  BSDI BSD/OS 4.3.1
  Digital UNIX and Tru64 UNIX 4.0
  FreeBSD 4.9 and 5.2
  HP-UX 11 and 11.11 (aka 11i)
  NetBSD 1.6ZH
  OpenBSD 3.4
  OPENSTEP 4.2
  OpenUNIX 8
  SCO OpenServer Release 5.0.6
  Solaris 2.6, 8, 9 and 10
  UnixWare 7.1.[134]

Modified the Configure stanza for HP-UX 11 with better
q4 detection. Steve Bonds <3vhmxxm02@sneakemail.com>
supplied the modification.

Applied a patch from Mike Miscevic <miscevic@hotpop.com>
to enable lsof to compile with the zone support in the
Solaris 10 s10_b51 release. Added information on lsof
zone behavior to 00FAQ.

Added a "-z [z]" option to Solaris 10 lsof. It enables
the listing of zone name and can also be used to select
the listing of processes and their files from specified
zones.

4.72 July 13, 2004
  Corrected Solaris 10 ZONE column title display bug with

a patch from Joep Vesseur <Joep.Vesseur@Sun.COM>. Joep's
fix was offered as a patch to 4.71.

Based on a report from Jean-Pierre Radley <jpr@jpr.com>
about an unexpected GNU uname Configure interaction on
OSR, and working from information received from Bela
Lubkin, changed the OSR Configure stanza to use
/bin/uname instead of uname. Added an FAQ entry about
Configure version detection problems.

Added the +m and "+m m" options in response to a dialog
with Robert T. Brown <rbrown@netmentor.com>. The
options allow the creation of a mount table supplement
file which can be used on selected dialects to get
device numbers when stat(2) and lstat(2) can't deliver
them. (That's generally the result of an inaccessible
NFS server.) Currently the new options are supported
only on Linux.

Made cpumask_t typedef _KERNEL compensation for FreeBSD
5.2-CURRENT. Refined it for 5.2.1-RELEASE with testing
help from Scott Ellentuch <tuc@ttsg.com>.

Added support for FreeBSD 4.10. Larry Rosenmann
<ler@lerctr.org> kindly provided a test system.

Added support for NetBSD 2.0 with patches supplied by
Andrew Brown <atatat@atatdot.net>. Andrew also
provided two test systems.

Made handling of Linux maps file more robust, based on
a report from Jan Blunck <J.Blunck@tu-harburg.de>. As
a side benefit, made handling of generated stat(2)
information more flexible.

As a result of a discussion with Jason Fortezzo
<fortezza@mechanicalism.net>, adjusted lsof for Solaris
to obtain the maximum user name length from ut_name of
the utmpx structure, if <utmpx.h> exists.

Tested under OpenBSD 3.5.

Updated 00README information about using gcc (via the
Configure aixgcc abbrevisiation) to compile lsof on
AIX. Ann Janssen <ajanssen@nebook.com> made me aware
the information was out of date.

Added an AIX SIGDANGER handler and some 00FAQ sections

on lsof memory usage after a discussion with Tom Qin
<tom.qin@citigroup.com> about lsof memory usage.

Added scripts/sort_res.perl5, contributed by Fabian
Frederick <fabian.frederick@gmx.fr>. The script
displays lsof output sorted by size and path name.

Improved handling of files on Linux NFS mount points
that use the root_squash option, based on discussions
with Paul Szabo <psz@maths.usyd.edu.au>.

Updated FreeBSD 5.2-CURRENT support, based on a problem
report from Filippo Natali <filippo@widestore.net>.

Corrected improper FreeeBSD 5.x-CURRENT #if condition,
reported by Kim Culhan <kimc@kim.net>.

Added a Configure script work-around for AIX 5.2 lsof
with JFS2, compiled by gcc >= 3.3. The work-around
was supplied by Florian M. Weps <fmw@hactrn.ch>.

4.73 October 21, 2004
Added an __XPG4_CHAR_CLASS__ #define before
#include'ing <ctype.h> on Solaris to restore lsof's
ability to display special characters such as acute-e.

Added wide-character (e.g., UTF-8) support where
possible, prompted by a request from Kyungjoon Lee
<kjoonlee@gmail.com>. Some older dialects -- e.g.,
NetBSD 1.4.1 -- don't support wide characters, so the
wide character support is enabled by definitions in
each dialect's machine.h. Dialects with wide-
character support are listed in 00FAQ.

Make a FreeBSD 5.2-CURRENT adjustment for <sys/pipe.h>,
supplied by Sergey A. Osokin <osa@FreeBSD.ORG>.

Implemented a Linux feature request made by Jakub
Jelinek <jakub@redhat.com> that enhances lsof's ability
to locate UNIX domain sockets whose paths are named as
arguments. Jakub supplied suggested code.

Dropped *claims* that lsof works on AIX below 5.1, SCO
Dropped *claims* that lsof works on AIX below 5.1, SCO
Openserver 5.0.4, Tru64 UNIX 5.0, and UnixWare below
7.1.4. Lsof will probably build and work on those UNIX
dialect versions, but I no longer have any way to test
lsof on them.

Added support for FreeBSD 5.3 and 6.0. The FreeBSD
5.3 support hasn't been tested.

Added FD test code that will allow dialect versions to
test FD option selections. Used the new code in the
PSTAT-based HP-UX lsof to enable it to avoid scanning
the mount table when its information is not needed.
The addition was made in response to a query from
Harvey Garner <Harvey.Garner@championusa.com> about
lsof performance in a busy NFS environment.

Upgraded lsof's AIX support level to AIX 5.3, based on
a report from Dick Dunbar <Dick.Dunbar@Siebel.com>. (I
have not tested lsof under AIX 5.3.) Based on Dick's
recommendation and local testing changed the C for AIX
version 6 and higher -qmaxmem option value to -1.

Made LSOF_AR environment variable more useful and
documented it in 00XCONFIG.

Corrected the use of sum(1) to generate signatures for
the lsof distribution and binaries to match the
documentation that claims it is sum -r output. Jin
Guojun <jin@george.lbl.gov> noticed and reported the
problem.

Tested under OpenBSD 3.6.

Added checksum and GPG certificate files for the bz2,
gz and Z lsof distribution archives. The new files
reside with the distribution archives and supplement
the signature information already inside the archives.

Validated on Solaris 10, i8xpc, build s10_63.

4.74 January 17, 2005
Fixed a Solaris segment fault bug on systems that lack
a /dev/allkmem device. Offered the fix as a patch to
lsof 4.73. The bug was reported by Donald Zoch
<donald.zoch@amd.com>.

Updated lsof for FreeBSD 6.0 and higher for a change in
<sys/vnode.h>, based on a report from Sergey A. Osokin
<osa@FreeBSD.ORG>. Made the update available in a 4.74
'A' edition pre-release.

Filed an HP bug report about missing pstat(2) CWD info

for LOFS on HP-UX 11.11 and higher. The missing CWD
info was noticed by Ermin Borovac <e.borovac@bom.gov.au>.
Added info to 00FAQ about the problem, which can cause
the lsof test suite's LTbasic test to fail.

Updated the q4-generated tcp_s.h in the lsof
distribution and added socket option support for HP-UX
11.00. Erwin Reyns <ereyns@europarl.eu.int> helped
test.

Updated for Solaris 10, build s10_69, with a patch
supplied by Mike Miscevic <miscevic@hotpop.com>.

Added v_path support to Solaris 10 lsof. That relieves
it of having to read and decode the kernel DNLC, and
delivers full paths more reliably.

Added specialized NFS4 support to Solaris 10 lsof.

Applied Solaris 10 patches to lsof supplied by Casper
Dik <casper@holland.sun.com>.

Updated lsof for NetBSD 2.99.10 and tested it on a
system provided by Andrew Brown <atatat@atatdot.net>.

Added support for the FreeBSD 6.0-CURRENT f_vnode
pointer in the file structure.

Added BSDI, FreeBSD, NetBSD and OpenBSD support for the
*effnlink member of the inode structure. This makes
the lsof LTnlink test run faster on all modified
dialects and correctly on OpenBSD.

Added ptyfs support for NetBSD, using modifications
provided by Andrew Brown.

Changed the netbsd Configure stanza to look by default
for system header files in both /usr/include and
/usr/src. (The NETBSD_SYS environment variable can
still be used to select an alternate for /usr/src.)

Corrects two FreeBSD 4.10 RPC/XDR type definitions.

Added an FAQ Q&A about setuid and setgid restrictions
in HP-UX 11.11. The information in the answer was
supplied by Frank Sanders <frank.sanders@siemens.com>.

Added abbreviations for AXI FCIO and FSNAPSHOT file

flags. Holger VanKoll <Holger.VanKoll@swisscom.com>
reported the missing FCIO.

Adjusted lsof's private AIX 64 bit rnode structure for
64 bit AIX 5.2 systems. (IBM doesn't distribute a
correct <nfs/rnode.h> for it.)

Corrected a Linux socket inode printing bug reported by
Igor Schein <igor@txc.com>.

Updated for FreeBSD 4.11. The support compiles but
hasn't been tested.

Back-ported a FreeBSD 6.0-CURRENT fix to FreeBSD
5.3-RELEASE-p1. That was done to solve a compilation
problem reported by Radko Keves <rado@daemon.sk>.

4.75 May 16, 2005
Dropped the *claim* that lsof works on DEC OSF/1 and
Digital UNIX, since my last 4.0 test system has been
removed. The last tested distribution of lsof on DEC OSF/1
and Digital UNIX was revision 4.74. It has been archived
on lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

Added negation forms to the values in the -g (PGID) and
-p (PID) lists. Negated PGID and PID values, like
negated UID or login name values, are applied without
ORing or ANDing and take effect before any other
selection criteria are applied.

At the request of Marcin Gozdalik <gozdal@gmail.com>
added a -X option for Linux. The option inhibits the
reading of the /proc/net/tcp* and /proc/net/udp*
files.

Based on a report from David Gutierrez
<davegu1@hotmail.com> changed DEC OSF/1 process table
allocation to request memory in smaller increments.

Based on a report from jayjwa <jayjwa@atr2.ath.cx>
updated the Customize script to use "tail -n 1" where
possible.

Enabled support for FreeBSD 5.4.

Improved the BSDI, FreeBSD, NetBSD, OpenBSD and Solaris
kvm_open() and kvm_openfiles() error messages.

Enabled support for NetBSD 2.99.12.

Improved HP-UX Configure stanza with help from Piet
Starreveld <pstarrev@csc.com>. Picked some lint Piet
found.

Enabled IPv6 support for HP-UX > 11. Piet Starreveld
helped test it on 11.23, among others.

Updated for HP-UX 11.23 on the ia64 architecture.

Updated to latest FreeBSD 6.0-CURRENT, using a test
system provided by Andrzej Tobola <ato@iem.pw.edu.pl>.

Added support for SCO OSR 6.0.0 and UnixWare 7.1.4 with
help from Richard at SCO.

Corrected a Linux bug in NFS handling, reported by Karel Zak
<kzak@redhat.com>. Karel supplied a patch.

Improved the code for accessing an AIX 3.2 and higher
sockaddr_un structure, thus eliminating a segmentation
fault possibility.

Updated for AIX 5.3.

Added preliminary (DEBUG) support for the AIX SANFS
file system.

Fixed a bug in the Solaris 10 processing of the vnode's
v_path pointer with code supplied by Edward Jajko
<ejajko@portal.com>. The fix was offered as a patch to
4.74.

Dropped support for OpenUNIX 8, since a test system is
no longer available. Archived an OpenUNIX-only
distribution of the last revision (4.74) tested on
OpenUNIX in pub/tools/unix/lsof/OLD/src.

Tested under Openbsd 3.7.

Tested under Darwin 7.7.0.

Enabled building on amd64 Solaris 10 with hints from
Marc Aurele La France <tsi@ualberta.ca>. Marc provided
a test system.

Supplied a missing quote in the FreeBSD Configure

stanza. Carl Cook <Info@quantum-sci.com> reported the
problem.

Removed "-O" option from tests/Makefile so that the
HP-UX bundled compiler won't complain.

4.76 August 30, 2005
Corrected an example and spelling errors in man page.

Updated for Apple Darwin 8.x with changes supplied by
Allan Nathanson <ajn@apple.com>. Allan also provided a
test system.

Completed documentation of CLRLFILEADD in all machine.h
files.

At the request of Chris Markle <cmarkle@sendmail.com>
added partial listen queue length to socket options
displayed when -Tf is specified. Partial queue length
is not reported for all dialects. (00FAQ lists the
ones where it is reported.)

Updated for FreeBSD 7.0 with information supplied by
Andrzej Tobola <ato@iem.pw.edu.pl>.

Updated Solaris VxFS support for VxFS versions 4 and
above with technical advice from Craig Harmer
<craig_harmer@symantec.com>, Gary Millen
<gary_millen@symantec.com> and Chuck Silvers
<charles_silvers@symantec.com>. Testing help was
provided by Michael Antlitz <mantlitz@prophasys.com>,
Steve Ginsberg <steve@dhapdigital.com> and Kenneth
Stailey <kstailey@yahoo.com>.

Fixed a Solaris address space map processing bug.
Janardhan Molumuri <mjanardhan@gmail.com> reported the
bug and help me identify it. Made the fix available as
a patch to 4.75.

Added support for Solaris 10 port and CTFS files. The
CTFS support is imcomplete, because I don't know how
to get inode number, size and link count. (There's
a new 00FAQ entry about that.)

Investigated a report from Christopher J Warweg
<warwegc@GAO.GOV> that the CHECKSUMS for the lsof 4.75
binary for 64 bit Solaris 8 was incorrect. It was my
packaging error. I rebuilt and repackaged the binary.

Enabled support for Linux map file names with embedded spaces.

4.77 April 10, 2006
Added -X option support for Solaris 10 and above. When -X is specified lsof will report cached v_node path names for unlinked files, followed by "(deleted)". Improved cached vnode path name handling by adding "(?)" to the end of path names of questionable accuracy. Updated 00FAQ to reflect these changes.

Updated for FreeBSD 7.0-CURRENT.

Fixed name addition spacing bug, reported by Stuart Anderson <anderson@ligo.caltech.edu>. Also updated Solaris 10 SAMFS support at Stuart's request.

Added missing "break;" and another HASSTATVFS test to the NetBSD and OpenBSD dnode.c. Bill Behr <bbehr@networkstoragecorp.com> reported those needs.

Fixed an HP-UX 11 file descriptor "chunk" size problem, reported by Per Allansson <per@appgate.com>. Per helped devise the fix and tested it. This fix was offered as a patch to lsof 4.76.

Updated for FreeBSD 6.0-STABLE and FreeBSD 6.1-PRERELEASE.

Updated scripts/sort_res.perl5 with changes supplied by Frederick Fabian <fabian.frederick@skynet.be>, the author of the script.

Corrected +|-M man page documentation error, reported by Roger Cornelius <rac@tenzing.org>.

Improved FreeBSD user device random seed generation in response to a problem report from Danny Braniss <danny@cs.huji.ac.il>.

Eliminated three syntax error bugs and other compiler complaints from the PSTAT-based lsof. H. Merijn Brand <h.m.brand@xs4all.nl> reported the problems and tested the fixes.

Eliminated compiler complaints in the test suite.

Investigated problems with the building of lsof on
PA-RISC HP-UX 11.23, based on a report from John
Orndorff <John.Orndorff@sungard.com>. Found that
neither the HP bundled C compiler nor gcc would build
lsof, but the the HP unbundled ANSI C compiler would.
Concluded that HP bundled C compiler can't handle
<gssapi/gssapi.h>. Devised a work-around to gcc's
omission of the rpcent structure definition of
<netdb.h> that allows it to compile lsof's print.c, but
the resulting binary doesn't run reliably. Documented
the situation in 00FAQ.

Changed reporting of unknown file types. The number of
an unknown type is now reported as four octets. The
change was made in response to a Linux lsof bug report
from Karel Zak <kzak@redhat.com>.

Dropped the *claim* that lsof works on BSDI BSD/OS
since my last test system has been removed. The last
tested distribution of lsof for BSDI BSD/OS was
revision 4.76. It has been archived on
lsof.itap.purdue.edu in pub/tools/unix/lsof/OLD/src.

As a result of discussing the lsof source tar's MD5
checksum with Andrew Bell <andrew.bell.ia@gmail.com>,
changed the description of a suitable MD5 tool in the
lsof distribution's documentation to name the openssl
"dgst" command.

Enabled compilation on Solaris 10 1/06 with a fix sent
by Jason Fortezzo <fortezza@mechanicalism.net>. Made
the fix available as a patch to 4.76.

Adjusted to FreeBSD 5.5-PRERELEASE.

Corrected a bug in the lsof library's process_file()
function to enable the locating of AIX XTI sockets by
their TCP/IP address values. The bug was reported by
Michel Dubois <Dubois@sears.ca>.

Based on a bug report from Karel Zak <kzak@redhat.com>
added command name length checking to as many dialects
as possible (Linux for Karel) for the "-c c" option.

Updated for OpenBSD 3.[89]. Tested the 3.9 update on a
system provided by David Mazieres. I have not tested
on OpenBSD 3.8, but David reports lsof 4.76 worked
there.

Ended regression testing of lsof on 32 bit Solaris 8
with the ending of access to a test system. Lsof
continues to be tested on 64 bit Solaris 8.

4.78 April 24, 2007
Added more information to the lsof FAQ about missing
link counts and sizes on Linux files.

Simplified Linux stat() and lstat() usage.

Relocated #define's that prevent OpenBSD compilation on
systems without a /proc file system. Pieter Bowman
<bowman@math.utah.edu> reported the problem.

Added code to avoid processing Linux /proc/<PID>/maps
file entries with zero device and node numbers. Some
such entries now have names associated with them that
are not path names -- e.g., "[heap]", "[stack]" or
"[vdso]". Scott Worley <sworley@chkno.net> reported
lsof's mishandling of such entries.

Added SELinux security context support, provided by
James Antill <james.antill@redhat.com>. I have not
tested this, but James and Karel Zak <kzak@redhat.com>
have.

Added the #include of <sys/types.h> to Solaris lsof to
enabled compilation on Solaris 10 6/06. Peter Harvey
Peter.Harvey@Sun.COM diagnosed the problem and supplied
a patch.

Added better support for JFS2 on AIX 5.2 and 5.3, based
on bug reports and help from Thomas Braunbeck
<BRAUNBEC@de.ibm.com> and Tom Whitty <TWHITTY@cerner.com>.

Documented that lsof supports AIX 5.3 only up through
maintenance level 1 (ML1).

Enabled Solaris lsof to locate the AFS vnode operation
address for OpenAFS 1.4.1. The fix was supplied by
Robert Jelinek <Robert.Jelinek@MorganStanley.com>.

Enabled support for Solaris 10 ZFS. If the necessary
ZFS header files aren't found, lsof offers the option
to drop ZFS support, to use internal, possibly
inaccurate structure definitions, or to supply a path
to the missing header files. Horst Scheuermann

<Horst.Scheuermann@uni-trier.de> provided a development
system and helped test the support.

Corrected a typo in the man page, reported by Eric S.
Raymond <esr@thyrsus.com>.

Changed the spelling of macroes to macros in lsof
source and documentations files, based on a suggestion
from Josh Soref <timeless@gmail.com> and verification
with the OED.

The following dialects are no longer supported: 32 bit
AIX 5.2, HP-UX 11, OpenStep 4.2, Solaris 2.6, Solaris
8, True Unix 64 and UnixWare 7.1.4. Lsof may work on
them, but I no longer have test systems for them.
Support for OpenBSD ends at its version 3.9 for lack of
interest in the port.

4.79 April 15, 2008

```
**************** IMPORTANT NOTE *****************
*                              *
* Lsof support has been reduced to the following *
* dialects: AIX, FreeBSD, Linux and Solaris, and *
* only in selected versions of those dialects.   *
* The selected versions are listed in this file  *
* and in other lsof documentation.            *
*                              *
* I have made this move because of retirement    *
* and because I no longer have many test systems *
* available to me.                  *
*                              *
* Vic Abell                  *
*                              *
**************************************************
```

Fixed a Solaris VXFS permission problem when accessing
the VXFS inode offsets. The bug was reported by
Gregory A. Ivanov <ivga@mts.ru>. Gregory tested the
fix.

Moved an #include <string.h> later in FreeBSD dlsof.h
to enable compilation on recent FreeBSD releases. The
change was supplied by Roy Marples <uberlord@gentoo.org>.

Improved Linux /proc file stream reading speed by applying
an expanded version of a patch from Eric Dumazet
<dada1@cosmosbay.com> that allocates a page size buffer

to each stream. Improved TCP, TCP6, UDP and UDP6 hashing
by determining the hash bucket count from the /proc/net
sockstat and sockstat6 files. The improvement was
suggested by Eric and he provided sample code. Eric also
tested both improvements.

Modified Configure script to build lsof on FreeBSD
6.2. Tested it on a system provided by Larry Rosenman
<ler@lerctr.org>.

Fixed a Linux maps file processing bug that prevented path
names from having an embedded colon. James Lingard
<jchl@arastra.com> reported the bug and helped with its
fix.

Based on reports from Eric Dumazet and Samuel Thibault
<samuel.thibault@ens-lyon.org> added support for the
Linux 2.6.22 kernel's /proc/<PID>/fdinfo files -- i.e.,
file offset and flags. Samuel Thibault provided a test
system.

Fixed a Linux UNIX socket memory leak, reported by
Philip Shin <pshin@xceedium.com>. Phillip supplied the
fix.

With generous assistance from HP added support for an HP-UX
11.23 patch that makes TLI/XTI socket address information
available.

Fixed a header file problem for FreeBSD 6.2 on the Alpha
architecture. The problem was reported by Pekka Honkanen
<phonkane@cc.hut.fi>. Pekka tested the fix.

Based on a report and using suggested fixes from Karel Zak
<kzak@redhat.com>, made these changes to Linux lsof: corrected
a getpidcon() error message; insured that inode numbers are
handled correctly for their unsigned long long type; and
improved SELinux handling. At the request of Alon Bar-Lev
<alonbl@gentoo.org> added the LINUX_HASSELINUX environment
variable to enable or inhibit SElinux support unconditionally.

Updated Configure for FreeBSD 8.0-CURRENT and tested lsof on
AMD64 there.

Added a patch provided by Oles Hnatkevych
<don_oles@able.com.ua> for FreeBSD systems where the root
file system is on a CD9660 device.

Added compensation for the disappearance of FMARK and FDEFER from the FreeBSD 8.0-CURRENT <sys/file.h>.

Updated FreeBSD lsof with ZFS support. Larry Rosenman <ler@lerctr.org>, Erwin Lansing <erwin@FreeBSD.org>, Wesley Shields <wxs@atarininja.org> and Dmitry Morozovsky <marck@rinet.ru> provided test systems.

Fixed a socket file identification problem reported by Pavol Rusnak <stick@gk2.sk>. Pavol also reported the cause of the problem.

Added the ability to format the repeat mode marker line with strftime(3), where the dialect supports the localtime(3) and strftime(3) C library functions. The addition was suggested by Mike Depot <mdepot@comcast.net>, who also tested it. The addition required creating a new main lsof source module, util.c, that contains functions whose compilation conflicts with the general header file tree defined by lsof.h and dlsof.h.

Based on reports from Andrei V. Lavreniyuk <andy.lavr@reactor-xg.kiev.ua> and Pav Lucistnik <pav@FreeBSD.org> updated the FreeBSD 7.0 and above file lock handling to use new locking structures. The update requires a terrible hack to get a definition for the lock owner structure from a kernel source module into a local lsof header file.

4.80 May 12, 2008
Updated for a FreeBSD 7.0 and above byte level locking change. The problem was reported by Conrad J. Sabatier <conrads@cox.net>, who helped test the update. Wesley Shields <wxs@FreeBSD.org> provided an 8.0-CURRENT test system.

Propagated the FreeBSD 7.0 and above locking changes to FreeBSD 6.x, based on a report from Edwin Groothuis <edwin@FreeBSD.org>.

Added warnings for unsupported dialects or versions.

Added Linux support for the UDPLITE protocol. Eric Dumazet <dada1@cosmosbay.com> supplied a patch.

Added a missing quote to the Configure script's FreeBSD stanza.

Added a usage.o rule to the HP-UX PSTAT-based
Makefile. I mistakenly deleted the rule at revision
4.79. The missing rule was reported by Kawaljeet Kaur
<kawaljeet.malviya@gmail.com> who tested the corrected
Makefile.

4.81 October 21, 2008
Updated the Darwin libproc sources with changes from
Allan Nathanson <ajn@apple.com>. Tested them on a iMac
mini, provided by Apple Inc.

Changed dummy declarations in library source files to
eliminate complaints about unused variables and empty
object files. This change may not work on dialects I
can no longer test; it has been tested on some versions
of AIX, Darwin, FreeBSD, Linux and Solaris.

At the request of Hal Brooks <hal@uga.edu> added support
for Linux /proc/net/packet files. Hal tested it.

Added socket file only performance enhancements to Linux
and PSTAT-based HPUX lsof.

Added htonl call around improper usage of INADDR_LOOPBACK;
report from an Apple engineer forwarded by Allan Nathanson
<ajn@apple.com>.

Adjusted for FreeBSD-8.0 change in device number handling.
The adjustment should work for FreeBSD 5 and above, should
the 8.0 change be propagated downward. The problem was
reported by Pav Lucistnik <pav@FreeBSD.org>. An updated
test system was provided by Erwin Lansing <erwin@FreeBSD.org>.

Reduced AIX support to version 5.3, since test systems with
older versions are no longer available to me.

At the request of Marjo F. Mercado <mmercado@xceedium.com>
and Phil Shin <pshin@xceedium.com> applied some speed
improvements to lsof, particularly when the files of
interest are /Internet files -- i.e., selected with lsof's
-i" option. Added a two new options to assist the
improvements: 1) "-c^<command>" to tell lsof to exclude the
named command(s); and 2) "-stcp|ud>:[^]state' to tell lsof
to include in its reporting or exclude ('^') from its
reporting Internet files in the named states (e.g., LISTEN,
^CLOSE_WAIT, IDLE, etc.) For the most part these changes
apply only to AIX, Darwin, FreeBSD, PSTAT-based HP-UX, Linux
and Solaris, since those are the only places I could test

them. They are controlled by the HASTCPUDPSTATE definition
in each dialect's machine.h header file. Marjo and Phil
provided HP-UX 11.23 and 11.31 test systems.

Fixed a stat(2) problem on HP-UX 11.31 while testing the
speed improvements.

Adjusted for kernel header file changes in FreeBSD
8.0-CURRENT. Larry Rosenman <ler@lerctr.org> provided
a test system.

Added a warning for Solaris systems where VxFS node info
can't be obtained from the VxFS utility library. The
warning was requested by Tom Matthews <Tom.MATTHEWS@rbs.com>.

Corrected mishandling of file system path name arguments
that have trailing slashes, except, of course, the root
file system, "/". Allan Nathanson <ajn@apple.com> reported
the bug.

4.82 March 25, 2009
  Corrected an over-zealous exclusion test that caused
  lsof to report nothing when it was given no arguments
  and built with HASSECURITY and HASNOSOCKSECURITY enabled.
  Joshua Kinard <kumba@gentoo.org> reported the bug and
  supplied information for reproducing it.

  Based on a report from Dan Trinkle <trinkle@cs.purdue.edu>
  corrected use of <sys/utsname.h> for 32 bit Solaris 10
  and above compilations. Simultaneously eliminated a
  casting complaint in arg.c and updated Configure to use
  the appropriate 64 bit compilation option (-xarch=v9 or
  -m64) with the Solaris Sun C compiler.

  Updated for FreeBSD 7.1-PRERELEASE with information
  supplied by Larry Rosenman <ler@lerctr.org>.

  Updated the Darwin libproc sources with changes from
  Allan Nathanson <ajn@apple.com>. Tested them on a iMac
  mini, provided by Apple Inc. Allan also provided man
  page corrections.

  Updated the FreeBSD Makefile to use the ${MAKE} variable
  for ZFS dnode2.c module compilation, based on a suggestion
  from Alexis Ballier <aballier@gentoo.org>.

  Improved the Solaris VxFS library location test, based on a
  suggestion from Jason Fortezzo <fortezza@mechanicalism.net>.

Jason tested the change.

Updated Solaris 10 ZFS support for ZFS version 4 and ZFS
pool version 10, using a test system kindly provided by
Vladislav Nespor <vladislav.nespor@id.ethz.ch>. Renata
Maria Dart <renata@slac.stanford.edu> tested on ZFS
version 4, verifying that the update works there, too.
(ZFS pool version 10 is apparently the ZFS version shipped
with the 10/08 update to Solaris. The original ZFS
support targeted ZFS version 3.)

I still consider ZFS support in Solaris lsof a hack,
because it depends on a znode structure definition that
I developed using dbx. Sun is remiss in not distributing
the ZFS header files used to build the distributed kernel.

Because of the znode structure definition hack, I can't
guarantee that lsof ZFS support will work for any other
versions of ZFS.

Solaris 10: adjusted to a change in the way devices are
stored in the kernel; fixed a problem in zone handling;
and added rudimentary sharedfs support. Carson Gaspar
<carson@taltos.org> reported the device number problem,
provided a test system, and tested the changes. Peter
Vines <psv2b@eservices.virginia.edu> reported the zone
handling problem and tested the fix.

Adapted to FreeBSD 8.0-CURRENT changes in device number
computation. Problem was reported by Erwin Lansing
<erwin@FreeBSD.org>. Larry Rosenman <ler@lerctr.org>
provided a test system.

Corrected Solaris Configure test for appropriate VxFS
library when using gcc to compile lsof.

Updated for loss of KAME IPv6 FreeBSD accommodations.

Adapted to FreeBSD 7.2. Made Configure script recognized
FreeBSD 6.3.

4.83 January 18, 2010
Converted Solaris 10 and above ZFS support to use the CTF
debugger library, libctf. Code was supplied by Robert
Byrnes <Robert.Byrnes@deshaw.com>.

Corrected a typo in the testing of the LINUX_HASSELINUX
environment variable in the Configure script. The error

was reported by Mike Frysinger <vapier@gentoo.org>.
At Mike's request made Configure script accept LSOF_RANLIB
(ranlib command), LSOF_CFGF (additional configuration flags)
and LSOF_CFGL (additional library specifications) from the
environment.

Enabled compilation of Solaris 10 lsof after a recent Sun
patch which changed the PC file system's structure. Peter
Vernam <pvernam@draper.com> reported the problem and helped
with the fix.

Made the sort of configuration CFLAGS in the CkTestDB
script impervious to locale settings.

Ported to Solaris 11, using a test system kindly provided
by David Day <dday76@gmail.com>.

Adjusted to the disappearance of <nfs/rpcv2.h> in FreeBSD
8.0-BETA1.

Changed Solaris node type lookup to a hashed method and
added some ability for it to handle duplicate vnodeop names
in /dev/ksyms.

Updated for FreeBSD 9.0-CURRENT. Andrzej Tobola
<ato@iem.pw.edu.pl> provided a test system. Extends the
fix to FreeBSD 6.0 and above via a Configure test and a
compile-time definition. The need for the extension was
reported by Erik Trulsson <ertr1013@student.uu.se>>

Made corrections to FAQ typographical errors, suggested
by Josh Soref <timeless@gmail.com>.

Added __UCLIBC__ test to Linux dlsof.h so lsof would compile
on an Intel ARM XScale processor. The addition was provided
by Doug Kehn <rdkehn@yahoo.com>.

Added test for <utmpx.h> to FreeBSD configuration. Improved
its use in lsof.h. The changes were supplied by Martin Wilke
<miwi@FreeBSD.org>.

Vic Abell <abe@purdue.edu>
January 18, 2010

Found in path(s):
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/00DIST

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/00DIST

No license file was found, but licenses were detected in source scan.

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*
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*   publication of such source code.
*/

Found in path(s):
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/uw/uw7/sys/fs/fifonode.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/uw/uw7/sys/fs/namenode.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/uw/uw7/sys/fs/fifonode.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/uw/uw7/sys/fs/namenode.h

No license file was found, but licenses were detected in source scan.

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/print.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/darwin/libproc/dlsof.h
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/darwin/libproc/dfile.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/darwin/libproc/dproc.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/util.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dzfs.h
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dnode2.c
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tar/lsof_4.83_src/dialects/du/ddev.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/du/ddev.c
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*/
/*
* GetOpt() -- Local get option
*
* Borrowed from lsof's main.c source file.
*
* Liberally adapted from the public domain AT&T getopt() source,
* distributed at the 1985 UNIFORM conference in Dallas
*
* The modifications allow `?' to be an option character and allow
* the caller to decide that an option that may be followed by a
* value doesn't have one -- e.g., has a default instead.

*/

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/uw/uw7/fs/nsc_cfs/cnode.h
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/aix/dnode2.c
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/*
* GetOpt() -- Local get option
*
* Liberally adapted from the public domain AT&T getopt() source,
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*
* The modifications allow `?' to be an option character and allow
* the caller to decide that an option that may be followed by a
* value doesn't have one -- e.g., has a default instead.
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/uw/dnode2.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/sun/dnode1.c

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/tests/LTsock.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/tests/LTnfs.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/tests/LTszoff.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/tests/LTbigf.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/tests/LTnfs.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/tests/LTdnlc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/tests/LTszoff.c
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/scripts/sort_res.perl5
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*
* @(#)cdefs.h 8.2 (Berkeley) 10/4/93
*/

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gz/lsof_4.83_src/dialects/osr/include/sys/cdefs.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/osr/include/sys/cdefs.h
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*
* $Id: pfsnode.h,v 1.1 1993/12/12 12:26:39 davidg Exp $
*/

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gz/lsof_4.83_src/dialects/freebsd/include/procfs/pfsnode.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/freebsd/include/procfs/pfsnode.h
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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/scripts/list_NULf.perl5
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/scripts/idrlogin.perl5
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/scripts/idrlogin.perl
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/scripts/list_fields.awk
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/scripts/list_fields.perl
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/scripts/list_fields.perl
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/scripts/idrlogin.perl5
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/scripts/list_NULf.perl5
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/scripts/list_fields.awk
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/scripts/shared.perl5
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/scripts/idrlogin.perl
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tar/lsof_4.83_src/dialects/darwin/kmem/dfile.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/darwin/kmem/dfile.c
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tar/lsof_4.83_src/dialects/freebsd/dnode1.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/osr/dproto.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/osr/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dproto.h

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dsock.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/n+obsd/dnode1.c

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* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/darwin/kmem/dnode1.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/darwin/kmem/dnode1.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/osr/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/osr/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/osr/dproc.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dmnt.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/freebsd/dnode1.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/osr/dnode.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dstore.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/kmem/dnode1.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/osr/machine.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/osr/dfile.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/n+obsd/dnode1.c

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/osr/dfile.c

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Making and Installing lsof 4


```
******************************************************************
| The latest release of lsof is always available via anonymous ftp |
| from lsof.itap.purdue.edu.  Look in pub/tools/unix/lsof.        |
******************************************************************
```

Contents

========================
Pre-built Lsof Binaries
========================

Avoid using pre-built lsof binaries if you can; build your own
instead.

I do not support lsof binaries built and packaged by third parties nor
lsof binaries built from anything but the latest lsof revision. (See
the Bug Reports section for more information on the details of lsof
support.)

One important reasone for those support restrictions is that when lsof
is built its Configure script tunes lsof to the features available on
the building system, often embodied in supporting header files and
libraries. If the building system doesn't have support for a
particular feature, lsof won't be built to support the feature on any
system.

The Veritas VxFS file system is a good example of a feature that
requires build-time support.

UNIX dialect version differences -- Solaris 8 versus 9, AIX 4.3.3
vesus 5.2, etc. -- can also render a pre-built lsof binary useless
on a different version. So can kernel bit size.

There are so many potential pitfalls to using an lsof binary
improperly that I strongly recommend lsof be used only where it is
built.

===========
Making Lsof
===========

 $ cd <lsof source directory>
 $ ./Configure <your dialect's abbreviation>
 $ make

(Consult the 00FAQ and 00XCONFIG files of the lsof distribution
for information about using make command invocations and environment
variables to override lsof default Makefile strings.)

This lsof distribution can be used with many UNIX dialects. However,
it must be configured specifically for each dialect. Configuration
is done in three ways: 1) by changing definitions in the machine.h
header file of the UNIX dialect of interest; 2) by defining
environment variable values prior to calling Configure (see the
00XCONFIG file, the Environment Variabls and Environment Variables
Affecting the Configure Script sections of this file); and 3) by
running the Configure shell script found in the top level of the
distribution directory.

You may not need to change any machine.h definitions, but you might
want to look at them anyway. Pay particular attention to the
definitions that are discussed in the Security section of this
file. Please read that section.

The Configure script calls three other scripts in the lsof
distribution: AFSConfig; Inventory; and Customize. The AFSConfig
script is called for selected dialects (AIX, HP-UX, NEXTSTEP, and
Solaris) to locate AFS header files and determine the AFS version.
See The AFSConfig Script section of this file for more information.

The Inventory script checks the completeness of the lsof distribution.
Configure calls Inventory after it has accepted the dialect
abbreviation, but before it configures the top-level directory for
the dialect. See The Inventory Script section of this file for
more information.

Configure calls the Customize script after it has configured the
top-level lsof directory for the declared dialect. Customize helps
you modify some of the important compile-time definitions of
machine.h. See the The Customize Script section.

You should also think about where you will install lsof and its
man page, and whom you will let execute lsof. Please read the
Installing Lsof section of this file for information on installation
considerations.

Once you have inspected the machine.h file for the dialect for
which you want to build lsof, and made any changes you need, run
the Configure script, supplying it with the abbreviation for the
dialect. (See the following table.) Configure selects the
appropriate options for the dialect and runs the Mksrc shell script
in the dialect sub-directory to construct the appropriate source
files in the top-level distribution directory.

Configure may also run the MkKernOpts script in the dialect
sub-directory to propagate kernel build options to the dialect
Makefile. This is done for only a few dialects -- e.g., DC/OSx,
and Reliant UNIX.

Configure creates a dialect-specific Makefile. You may want to
inspect or edit this Makefile to make it conform to local conventions.
If you want the Makefile to install lsof and its man page, you will
have to create an appropriate install rule.

Lsof may be configured using UNIX dialect abbreviations from the
following table. Alternative abbreviations are indicated by a
separating `|'. For example, for SCO OpenServer you can use either
the ``osr'' or the ``sco'' abbreviation:

```
 $ Configure osr
   or
 $ Configure sco
```

Abbreviations   UNIX Dialect
------------- ------------

```
  aix   IBM AIX 5.[23] and 5.3-ML1 using IBM's C Compiler
  aixgcc  IBM AIX 5.[12] and 5.3-ML1 using gcc
  darwin  Apple Darwin 7.x and 8.x for Power Macintosh systems
  decosf  DEC OSF/1, Digital UNIX, Tru64 UNIX 4.0 and 5.1
  digital_unix Digital UNIX, DEC OSF/1, Tru64 UNIX 4.0 and 5.1
  du   Digital UNIX, DEC OSF/1, Tru64 UNIX 4.0 and 5.1
  freebsd  FreeBSD 4.x, 4.1x, 5.x and [67].x
  hpux  HP-UX 11.00, 11.11 and 11.23, using HP's C
Compiler, both /dev/kmem-based and PSTAT-based
  hpuxgcc  HP-UX 11.00, 11.11 and 11.23, using gcc, both
/dev/kmem-based and PSTAT-based
  linux  Linux 2.1.72 and above for x86-based systems
  netbsd  NetBSD 1.[456], 2.x and 3.x
  next  NEXTSTEP 3.[13]
  nextstep  NEXTSTEP 3.[13]
  ns   NEXTSTEP 3.[13]
  nxt   NEXTSTEP 3.[13]
  openbsd  OpenBSD 2.[89] and 3.[0-9]
  openstep  OPENSTEP 4.x
  os   OPENSTEP 4.x
  osr   SCO OpenServer Release 5.0.6, using the C compiler
  from the SCO developer's kit
  osrgcc  SCO OpenServer Release 5.0.6, using gcc
  osr6  SCO Openserver 6.0.0, using the SCO C compiler
  sco   SCO OpenServer Release 5.0.6, using the C compiler
```

from the SCO developer's kit

scogcc SCO OpenServer Release 5.0.6, using gcc

solaris Solaris 2.x, 7, 8, 9 and 10 using gcc

solariscc Solaris 2.x, 7, 8, 9 and 10 using Sun's cc

tru64 Tru64 UNIX, DEC OSF/1, Digital UNIX 4.0 and 5.1

unixware SCO|Caldera UnixWare 7.1.4

uw SCO|Caldera UnixWare 7.1.4

If you have an earlier version of a dialect not named in the above list, lsof may still work on your system. I have no way of testing that myself. Try configuring for the named dialect -- e.g., if you're using Solaris 2.1, try configuring for Solaris 2.5.1.

After you have configured lsof for your UNIX dialect and have selected options via the Customize script (See the The Customize Script section.) , use the make command to build lsof -- e.g.,

 $ make

Other Configure Script Options
==============================

There are three other useful options to the Configure script besides the dialect abbreviation:

 -clean   may be specified to remove all traces of
   a dialect configuration, including the
   Makefile, symbolic links, and library files.

 -h   may be specified to obtain a list of
 -help Configure options, including dialect
   abbreviations.

 -n   may be specified to stop the Configure
   script from calling the Customize and
   Inventory scripts.

   Caution: -n also suppresses the AFSConfig
   step.

Environment Variables
=====================

Lsof configuration, building, and execution may be affected by environment variable settings. See the Definitions That Affect

Compilation section in the 00PORTING file, the General Environment
Variables section in the 00XCONFIG file, the Dialect-Specific
Environment Variables section in the 00XCONFIG file, and the
Environment Variables Affecting the Configure Script section of
this file for more information.

Note in the General Environment Variables section of the 00XCONFIG
file that there are five environment variables that can be used to
pre-define values in lsof's -v output: LSOF_BLDCMT, LSOF_HOST,
LSOF_LOGNAME, LSOF_SYSINFO, and LSOF_USER.

Security
========

If the symbol HASSECURITY is defined, a security mode is enabled,
and lsof will allow only the root user to list all open files.
Non-root users may list only open files whose processes have the
same user ID as the real user ID of the lsof process (the one that
its user logged on with).

However, if HASNOSOCKSECURITY is also defined, anyone may list
anyone else's open socket files, provided their listing is enabled
with the "-i" option.

Lsof is distributed with the security mode disabled -- HASSECURITY
is not defined. (When HASSECURITY is not defined, the definition
of HASNOSOCKSECURITY has no meaning.) You can enable the security
mode by defining HASSECURITY in the Makefile or in the machine.h
header file for the specific dialect you're using -- e.g.
dialects/aix/machine.h.

The Customize script, run by Configure when it has finished its
work, gives you the opportunity to define HASSECURITY and
HASNOSOCKSECURITY. (See the The Customize Script section.)

The lsof -h output indicates the state HASSECURITY and HASNOSOCKSECURITY
had when lsof was built, reporting:

  "Only root can list all files;"
 if HASSECURITY was defined and HASNOSOCKSECURITY wasn't
 defined;

  "Only root can list all files, but anyone can list socket files."
 if HASSECURITY and HASNOSOCKSECURITY were both defined;

  "Anyone can list all files;"
 if HASSECURITY wasn't defined. (The definition of

HASNOSOCKSECURITY doesn't matter when HASSECURITY isn't
defined.)

You should carefully consider the implications of using the default
security mode. When lsof is compiled in the absence of the
HASSECURITY definition, anyone who can execute lsof may be able to
see the presence of all open files. This may allow the lsof user
to observe open files -- e.g., log files used to track intrusions
-- whose presence you would rather not disclose.

All pre-compiled binaries on lsof.itap.purdue.edu and mirrored from
it were constructed without the HASSECURITY definition.

As distributed, lsof writes a user-readable and user-writable device
cache file in the home directory of the real user ID executing
lsof. There are other options for constructing the device cache file
path, and they each have security implications.

The 00DCACHE file in the lsof distribution discusses device cache
file path construction in great detail. It tells how to disable
the various device cache file path options, or how to disable the
entire device cache file feature by removing the HASDCACHE definition
from the dialect's machine.h file. There is also information on
the device cache file feature in the 00FAQ file. (The 00DCACHE
and 00FAQ files are part of the lsof distribution package.)

The Customize script, run by Configure after it has finished its
work, gives you the opportunity to change the compile-time options
related to the device cache file. (See The Customize Script
section.)

Since lsof may need setgid or setuid-root permission (See the Setgid
Lsof Dialects and Setuid-root Lsof Dialects sections.), its security
should always be viewed with skepticism. Lest the setgid and
setuid-root permissions allow lsof to read kernel name list or
memory files, declared with the -k and -m options, that the lsof
user can't normally access, lsof uses access(2) to establish its
real user's authority to read such files when it can't surrender
its power before opening them. This change was added at the
suggestion of Tim Ramsey.

Lsof surrenders setgid permission on most dialects when it has
gained access to the kernel's memory devices. There are exceptions
to this rule, and some lsof implementations need to run setuid-root.
(The Setgid Lsof Dialects and Setuid-root Lsof Dialects sections
contains a list of lsof implementations and the permissions
recommended in the distribution's Makefiles.)

The surrendering of setgid permission is controlled by the WILLDROPGID
definition in the dialect machine.h header files.

In the end you must judge for yourself and your installation the
risks that lsof presents and restrict access to it according to
your circumstances and judgement.

Run-time Warnings
=================

Lsof can issue warning messages when it runs -- e.g., about the
state of the device cache file, about an inability to access an
NFS file system, etc. Issuance of warnings are enabled by default
in the lsof distribution.

Issuance or warnings may be disabled by default by defining
WARNINGSTATE in the dialect's machine.h. The Customize script may
also be used to change the default warning message issuance state.
(See The Customize Script section.)

The ``-w'' option description of the ``-h'' option (help) output
will indicate the default warning issuance state. Whatever the
state may be, it can be reversed with ``-w''.

Device Access Warnings
======================

When lsof encounters a /dev (or /devices) directory, one of its
sub-directories, or one of their files that it cannot access with
opendir(3) or stat(2), it issues a warning message and continues.
Lsof will be more likely to issue such a warning when it has been
installed with setgid(<some group name>) permission; it won't have
trouble if it has been installed with setuid(root) permission or
is being run under the root login.

The lsof caller can inhibit or enable the warning with the -w
option, depending on the issuance state of run-time warnings. (See
the Run-time Warnings section.)

The warning messages do not appear when lsof obtains device
information from a device cache file that it has built and believes
to be current or when warning message issuance is disabled by
default. (See the "Caches -- Name and Device" section for more
information on the device cache file.)

The lsof builder can inhibit the warning by disabling the definition

of WARNDEVACCESS in the dialect's machine.h or disable all warnings
by defining WARNINGSTATE. WARNDEVACCESS is defined by default for
most dialects. However, some dialects have some device directory
elements that are private -- e.g., HP-UX -- and it is more convenient
for the lsof user if warning messages about them are inhibited.

Output from lsof's -h option indicates the status of WARNDEVACCESS.
If it was defined when lsof was compiled, this message will appear:

    /dev warnings = enabled

If WARNDEVACCESS was not defined when lsof was compiled, this
message will appear instead:

    /dev warnings = disabled

The Customize script, run by Configure after it has finished its
work, gives you the opportunity to change the WARNDEVACCESS
definition. (See The Customize Script section.)

NFS Blocks
==========

Lsof is susceptible to NFS blocks when it tries to lstat() mounted
file systems and when it does further processing -- lstat() and
readlink() -- on its optional file and file system arguments.

Lsof tries to avoid being stopped completely by NFS blocks by doing
the lstat() and readlink() functions in a child process, which
returns the function response via a pipe. The lsof parent limits
the wait for data to arrive in the pipe with a SIGALRM, and, if
the alarm trips, terminates the child process with a SIGINT and a
SIGKILL.

This is as reliable and portable a method for breaking NFS deadlocks
as I have found, although it still fails under some combinations
of NFS version, UNIX dialect, and NFS file system mount options.
It generally succeeds when the "intr" or "soft" mount options are
used; it generally fails when the "hard" mount option is used.

When lsof cannot kill the child process, a second timeout causes
it to stop waiting for the killed child to complete. While the
second timeout allows lsof to complete, it may leave behind a hung
child process. Unless warnings are inhibited by default or with
the -w option, lsof reports the possible hung child.

NFS block handling was updated with suggestions made by Andreas

Stolcke. Andreas suggested using the alternate device numbers that appear in the mount tables of some dialects when it is not possible to stat(2) the mount points.

The -b option was added to direct lsof to avoid the stat(2) and readlink(2) calls that might block on NFS mount points and always use the alternate device numbers. If warning message issuance is enabled and you don't want warning messages about what lsof is doing, use the -w option, too.

The -O option directs lsof to avoid doing the potentially blocking operations in child processes. Instead, when -O is specified, lsof does them directly. While this consumes far less system overhead, it can cause lsof to hang, so I advise you to use -O sparingly.

Caches -- Name and Device
==========================

Robert Ehrlich suggested that lsof obtain path name components for open files from the kernel's name cache. Where possible, lsof dialect implementations do that. The -C option inhibits kernel name cache examination.

Since AFS apparently does not use the kernel's name cache, where lsof supports AFS it is unable to identify AFS files with path name components.

Robert also suggested that lsof cache the information it obtains via stat(2) for nodes in /dev (or /devices) to reduce subsequent running time. Lsof does that, too.

In the default distribution the device cache file is stored in .lsof_hostname, mode 0600, in the home directory of the login of the user ID that executes lsof. The suffix, hostname, is the first component of the host's name returned by gethostname(2). If lsof is executed by a user ID whose home directory is NFS-mounted from several hosts, the user ID's home directory may collect several device cache files, one for each host from which it was executed.

Lsof senses accidental or malicious damage to the device cache file with extensive integrity checks, including the use of a 16 bit CRC. It also tries to sense changes in /dev (or /devices) that indicate the device cache file is out of date.

There are other options for forming the device cache file path. Methods the lsof builder can use to control and employ them are documented in the separate 00DCACHE file of the lsof distribution.

Raw Sockets
==========

On many UNIX systems raw sockets use a separate network control
block structure. Display of files for applications using raw
sockets -- ping, using ICMP, for example -- need special support
for displaying their information. This support is so dialect-specific
and information to provide it so difficult to find that not all
dialect revisions of lsof handle raw sockets completely.

Other Compile-time Definitions
=============================

The machine.h and dlsof.h header files for each dialect contains
definitions that affect the compilation of lsof. Check the
Definitions That Affect Compilation section of the 00PORTING file
of the lsof distribution for their descriptions. (Also see The
Customize Script section.)

The AFSConfig Script
===================

Lsof supports AFS on some combinations of UNIX dialect and AFS
version. See the AFS section of this document for a list of
supported combinations.

When configuring for dialects where AFS is supported, the Configure
script calls the AFSConfig script to determine the location of AFS
header files and the AFS version. Configure will not call AFSConfig,
even for the selected dialects, unless the file /usr/vice/etc/ThisCell
exists.

The AFS header file location is recorded in the AFSHeaders file;
version, AFSVersion. Once these values have been recorded, Configure
can be told to skip the calling of AFSConfig by specifying its
(Configure's) -n option.

The Inventory Script
===================

The lsof distribution contains a script, called Inventory, that
checks the distribution for completeness. It uses the file 00MANIFEST
in the distribution as a reference point.

After the Configure script has accepted the dialect abbreviation, it normally calls the Inventory script to make sure the distribution is complete.

After Inventory has run, it creates the file ".ck00MAN" in the top-level directory to record for itself the fact that the inventory has been check. Should Inventory be called again, it senses this file and asks the caller if another check is in order, or if the check should be skipped.

The -n option may be supplied to Configure to make it bypass the calling of the Inventory script. (The option also causes Configure to avoid calling the Customize script.)

The lsof power user may want to define (touch) the file ".neverInv". Configure avoids calling the Inventory script when ".neverInv" exists.

The Customize Script
====================

Normally when the Configure script has finished its work, it calls another shell script in the lsof distribution called Customize. (You can tell Configure to bypass Customize with its -n option.)

Customize leads you through the specification of these important compile-time definitions for the dialect's machine.h header file:

```
 HASDCACHE  device cache file control
    HASENVDC  device cache file environment
   variable name
    HASPERSDC  personal device cache file path
   format
    HASPERSDCPATH name of environment variable that
   provides an additional component
   of the personal device cache file
   path
    HASSYSDC  system-wide device cache file path
 HASKERNIDCK  the build-time to run-time kernel
   identity check
 HASSECURITY  the security option
 HASNOSOCKSECURITY the open socket listing option whe
    HASSECURITY is defined
 WARNDEVACCESS  /dev (or /devices) warning message
   control
 WARNINGSTATE  warning message issuance state
```

The Customize script accompanies its prompting for entry of new
values for these definitions with brief descriptions of each of
them. More information on these definitions may be found in this
file or in the 00DCACHE and 00FAQ files of the lsof distribution.

You don't need to run Customize after Configure. You can run it
later or you can edit machine.h directly.

The -n option may be supplied to Configure to make it bypass the
calling of the Customize script. (The option also causes Configure
to avoid calling the Inventory script.)

The lsof power user may want to define (touch) the file ".neverCust".
Configure avoids calling the Customize script when ".neverCust"
exists.

Customize CAUTION: the Customize script works best when it is
applied to a newly configured lsof source base -- i.e., the machine.h
header file has not been previously modified by the Customize
script. If you have previously configured lsof, and want to rerun
the Customize script, I recommend you clean out the previous
configuration and create a new one:

 $ Configure -clean
 $ Configure <dialect_abbreviation>
 ...
 Customize in response to the Customize script prompts.

Cautions
========

Lsof is a tool that is closely tied to the UNIX operating system
version. It uses header files that describe kernel structures and
reads kernel structures that typically change from OS version to
OS version, and even within a version as vendor patches are applied.

DON'T TRY TO USE AN LSOF BINARY, COMPILED FOR ONE UNIX OS VERSION,
ON ANOTHER. VENDOR PATCHES INFLUENCE THE VERSION IDENTITY.

On some UNIX dialects lsof versions may be even more restricted by
architecture type.

The bottom line is use lsof where you built it. If you intend to
use a common lsof binary on multiple systems, make sure all systems
run exactly the same OS version and have exactly the same patches.

Warranty
========

Lsof is provided as-is without any warranty of any kind, either
expressed or implied, including, but not limited to, the implied
warranties of merchantability and fitness for a particular purpose.
The entire risk as to the quality and performance of lsof is with
you. Should lsof prove defective, you assume the cost of all
necessary servicing, repair, or correction.

License
=======

Lsof has no license. Its use and distribution are subject to these
terms and conditions, found in each lsof source file. (The copyright
year in or format of the notice may vary slightly.)

```
 /*
  * Copyright 2002 Purdue Research Foundation, West Lafayette,
  * Indiana 47907.  All rights reserved.
  *
  * Written by Victor A. Abell
  *
  * This software is not subject to any license of the American
  * Telephone and Telegraph Company or the Regents of the
  * University of California.
  *
  * Permission is granted to anyone to use this software for
  * any purpose on any computer system, and to alter it and
  * redistribute it freely, subject to the following
  * restrictions:
  *
  * 1. Neither the authors nor Purdue University are responsible
  *    for any consequences of the use of this software.
  *
  * 2. The origin of this software must not be misrepresented,
  *    either by explicit claim or by omission.  Credit to the
  *    authors and Purdue University must appear in documentation
  *    and sources.
  *
  * 3. Altered versions must be plainly marked as such, and must
  *    not be misrepresented as being the original software.
  *
  * 4. This notice may not be removed or altered.
  */
```

Bug Reports
===========

Now that the obligatory disclaimer is out of the way, let me hasten to
add that I accept lsof bug reports and try hard to respond to them. I
will also consider and discuss requests for new features, ports to new
dialects, or ports to new OS versions.

PLEASE DON'T SEND BUG REPORTS ABOUT LSOF TO THE UNIX DIALECT OR DIALECT
OPTION VENDOR.

At worst such bug reports will confuse the vendor; at best, the vendor
will forward the bug report to me.

PLEASE DON'T SEND BUG REPORTS ABOUT LSOF BINARIES BUILT OR DISTRIBUTED
BY SOMEONE ELSE, BECAUSE I CAN'T SUPPORT THEM.

I do support binaries I built, obtained ONLY from lsof.itap.purdue.edu.
Before reporting a problem with a lsof.itap.purdue.edu binary, please
verify the correctness of the signatures found in its associated
CHECKSUMS file.

Before you send me a bug report, please do these things:

  * Make sure you try the latest lsof revision.

    + Download the latest revision from:

   ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof

    + Verify the signatures of what you have downloaded;

    + While connected to lsof.itap.purdue.edu, check for patches:

   ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/patches

    + If patches exist, install them in the latest revision
  you just downloaded. Then build the latest revision and
  see if it fixes your bug.

  * If you're having trouble compiling lsof with gcc, try the
     UNIX dialect vendor's compiler. I don't have access to gcc on
     all test systems, so my support for it is hit-and-miss, and so
     is my ability to respond to gcc compilation problem reports.

  * Check the lsof frequently asked questions file, 00FAQ,
     to see if there's a question and answer relevant to your

problem.

* Make sure you're running the lsof you think you are by
  checking the path to it with which(1). When in doubt, use an
  absolute path to lsof. Make sure that lsof binary has
  sufficient permissions to do what you ask, including internal
  permissions given it (e.g., restrictions on what files lsof may
  report for whom) during its build.

When you send a bug report, make sure you include output from your
running of lsof's Configure script. If you were able to compile a
running lsof, please also include:

* Output from which(1) that shows the absolute path to the
  lsof binary in question;

* Output from running lsof with its -h and -v options at
  lsof's absolute path;

* Output from "ls -l" directed to lsof's absolute path.

If you weren't able to compile a running lsof, please send me: the
compiler error output; identification of the lsof revision you're using
(contents of the lsof version.c file); identification of your system
(full uname output or output from whatever other tool identifies the
system); and compiler identification (e.g., gcc -v output).

Either set of output will help me understand how lsof was configured
and what UNIX dialect and lsof revision is involved.

Please send all bug reports, requests, etc. to me via e-mail at
<abe@purdue.edu>. Make sure "lsof" appears in the "Subject:" line so
my e-mail filter won't classify your letter as Spam.

The 00FAQ File
==============

The lsof distribution contains an extensive frequently asked
questions file on lsof features and problems. I recommend you
consult it before sending me e-mail. Use your favorite editor or
pager to search 00FAQ -- e.g., supplying as a search argument some
fixed text from an lsof error message.

The lsof-l Mailing List
=======================

Information about lsof, including notices about the availability
of new revisions, may be found in mailings of the lsof-l listserv.
For more information about it, including instructions on how to
subscribe, read the 00LSOF-L file of the lsof distribution.

Field Output Example Scripts
============================

Example AWK and Perl 4 or 5 scripts for post-processing lsof field
output are locate in the scripts sub-directory of the lsof distribution.
The scripts sub-directory contains a 00README file with information
about the scripts.

Field Output C Library
======================

The lsof test suite (See "Testing Lsof."), checks basic lsof
operations using field output. The test suite has its own library
of C functions for common test program operations, including
processing of field output. The library or selections of its
functions could be adapted for use by C programs that want to
process lsof field output. See the library in the file LTlib.c
in the tests/ sub-directory

Testing Lsof
============

Lsof has an automated test suite in the tests/ sub-directory that
can be used to test some basic lsof features -- once lsof has been
configured and made. Tests are arranged in three groups: basic
tests that should run on all dialects; standard tests that should
run on all dialects; and optional tests that may not run on all
dialects or may need special resources to run. See 00TEST for more
information.)

CAUTION!!! Before you attempt to use the test suite make sure that
the lsof you want to test can access the necessary kernel resources
-- e.g., /dev/mem, /dev/kmem, /proc, etc. Usually you want to test
the lsof you just built, so this is an important check. (See
00TEST.)

To run the basic and standard tests, using the lsof in the parent
directory of tests/, do this:

 $ cd tests

```
$ make test
  or $ make std
  or $ make standard
```

The basic and standard tests may be run as silently as possible,
using the lsof in the parent directory of tests/, with:

```
$ cd tests
$ make auto
```

This is the "automatic" test mode, designed for use by scripts that
build lsof. The caller is expected to test the make exit code to
determine if the tests succeeded. The caller should divert standard
output and standard error to /dev/null to suppress make's error
exit message.

The optional tests may be run, using the lsof in the parent directory
of tests/, with:

```
$ cd tests
$ make opt
  or $ make optional
```

It's possible to excute individual tests, too. See the 00TEST file
of this distribution for more informaiton on the tests, what they
do, and how to run and possibly customize each test.

It's possible to run the tests, using an lsof other than the one
in the parent directory of /tests, too. See 00TEST for information
about using the LT_LSOF_PATH environment variable to do that.


```
============
Dialect Notes
============
```


```
AFS
===
```

Lsof recognizes AFS files on the following combinations of UNIX
dialect and AFS versions:

```
AIX 4.1.4 (AFS 3.4a)
Linux 1.2.13 (AFS 3.3)
NEXTSTEP 3.2 (AFS 3.3) (untested on recent lsof revisions)
Solaris 2.6 (AFS 3.4a)
Ultrix 4.2 RISC (AFS 3.2b) (no longer available)
```

Lsof has not been tested under other combinations -- e.g. HP-UX
10.10 and AFS 3.4a -- and probably won't even compile there. Often
when a UNIX dialect version or AFS version changes, the new header
files come into conflict, causing compiler objections.

AIX
===

Specify the aix Configure abbreviation for AIX 4.1.[45], 4.2[.1],
4.3[.123], 5L, and 5.[123].

Specify aixgcc on AIX above 4.1 to use the gcc compiler. (Gcc can't be
used to compile lsof on AIX 4.1 and below because of kernel structure
alignment differences between it and xlc.) Gcc results sometimes
depend on the version of the gcc compiler that is used.

Compilation of lsof with gcc on AIX 4.3[.123], 5L, and 5.[123] has been
sparsely tested with varying degrees of success: it has been reported
to succeed on AIX 4.3.3 and 32 bit Power AIX 5.1; to fail on ia64 AIX
5.1 and 64 bit Power AIX 5.1; and to succeed on 32 and 64 bit Power AIX
5.2. Lsof compilation with gcc hasn't been tested on AIX 5.3.

At revision 4.61 and above lsof is configured and built to match the
bit size of the kernel of Power architecture AIX 5.1 systems. Lsof
binaries built for 32 and 64 bit kernels are not interchangeable. See
00FAQ for more information.

The Configure script uses /usr/bin/oslevel to determine the AIX version
for AIX less than 5 and ``uname -rv'' for AIX 5 and higher. If
/usr/bin/oslevel isn't executable on AIX less than 5, the Configure
script issues a warning message and uses ``uname -rv'' to determine the
AIX version.

When Configure must use ``uname -rv'' on AIX less than 5 to determine
the AIX version, the result will lack a correct third component --
e.g., the `4' of ``4.1.4''. If your AIX less than 5 system lacks lacks
an executable oslevel, I suggest you edit the Configure-produced
Makefile and complete the _AIXV definition in the CFGF string.

By default lsof avoids using the kernel's readx() function, causing
it to be unable to report information on some text and library file
references. The ``-X'' option allows the lsof user to ask for the
information readx() supplies.

Lsof avoids readx() to avoid the possibility of triggering a kernel
problem, known as the Stale Segment ID kernel bug. Kevin Ruderman

reported this bug to me. The bug shows up when the kernel's dir_search() function hangs, hanging the application process that called it so completely that the application process can neither be killed nor stopped. The hang is the consequence of another process (perhaps lsof) making legitimate use of the kernel's readx() function to access the kernel memory that dir_search() is examining. IBM has indicated they have no plans to fix the bug.

A fuller discussion of this bug may be found in the 00FAQ file of the lsof distribution. There you will find a description of the Stale Segment ID bug, the APAR on it, and a discussion of the sequence of events that exposes it.

I added the ``-X'' function so you can tell lsof to use readx(), but if you use ``-X'', you should be alert to its possibly serious side effects. Although readx() is normally disabled, its state is controlled with the HASXOPT, HASXOPT_ROOT, and HASXOPT_VALUE definitions in dialects/aix/machine.h, and you can change its default state by changing those definitions. You can also change HASXOPT_ROOT via the Customize script.

You can also compile lsof with readx() use permanently enabled or disabled -- see the comments about the definitions in the dialects/aix/machine.h header file. You may want to permanently disable lsof's use of readx() if you plan to make lsof publicly executable. You can also restrict -X to processes whose real UID is root by defining HASXOPT_ROOT.

I have never seen lsof cause the Stale Segment ID bug to occur and haven't had a report that it has, but I believe there is a possibility it could.

AFS support for AIX was added with help help from Bob Cook and Jan Tax who provided test systems.

Henry Grebler and David J. Wilson helped with lsof for AIX 4.2.

Bill Pemberton provided an AIX 4.3 test system. Andrew Kephart and Tom Weaver provided AIX 4.3 technical assistance. Niklas Edmundsson did 4.3.1 testing. Doug Crabill provided an AIX 4.3.2 test system. Jeff W. Stewart provided an AIX 4.3.3 test system.

The SMT file type for AIX 4.1.[45], 4.2[.1], and 4.3[.12] is my fabrication. See the 00FAQ file more information on it.

Loc Le and Nasser Momtaheni of IBM provided test systems for AIX 5L and 5.1. Lsof for AIX 5L and 5.1 needs setuid-root permission to process the -X option on systems whose architecture type is ia64.

Dale Talcott of Purdue provided AIX 5.1 and 5.2 test systems. Dale and
John Jackson of Purdue provided an AIX 5.3 test system.

Apple Darwin
============

The Apple Darwin port was provided by Allan Nathanson for version
1.2. Allan also arranged for access to a test system for maintenance
and regression testing. Dale Talcott provided a test system, too.

Allan supplied patches for updates to 1.4, 5.x, 6.x, 7.x and 8.x.

BSDI BSD/OS
===========

As of lsof revision 4.77 support for BSDI BSD/OS has been
discontinued. Lsof revision 4.76 with BSDI BSD/OS support may be found
on lsof.itap.purdue.edu in pub/tools/unix/lsof/src.

DEC OSF/1, Digital UNIX, Tru64 UNIX
===================================

Robert Benites, Dean Brock, Angel Li, Dwight McKay, Berkley Shands,
Ron Young and Steve Wilson have kindly provided test systems.
Jeffrey Mogul has provided technical assistance. Dave Morrison
and Lawrence MacIntyre did Digital UNIX V3.2 testing.

Lsof supports the ADVFS/MSFS layered file system product. Lsof
can locate all the open files of an ADVFS/MSFS file system when
its path is specified, provided the file system is listed in
/etc/fstab with an ``advfs'' type. (This /etc/fstab caveat applies
only to Digital UNIX 2.0.) At Digital UNIX 4.0 and Tru64 UNIX,
using code provided by David Brock, lsof 4.20 and above can locate
ADVFS file paths.

Testing of lsof on DEC OSF/1 and Digital UNIX 4.0 ended with lsof
revision 4.74. Hence, the lsof documentation has dropped the claim
that it works there. For a distribution of lsof 4.74 that was tested
on DEC OSF/1 and Digital UNIX 4.0, check pub/tools/unix/lsof/OLD/src
on the lsof ftp home, lsof.itap.purdue.edu.

Lsof revisions past 4.74 have only been tested on Tru64 UNIX 5.1.

FreeBSD
=======

Bill Bormann of Purdue University provided access to several FreeBSD
test systems. Ade Barkah, John Clear, Ralph Forsythe, Michael
Haro, Kurt Jaeger, and William McVey have also provided FreeBSD
test systems.

The FreeBSD distribution header files are augmented by header files
in the dialects/freebsd/include directory.

David O'Brien maintains the lsof FreeBSD port package.

HP-UX
=====

Lsof has two HP-UX bases: /dev/kmem for HP-UX 11.0 and earlier;
and PSTAT for HP-UX 11.11 and later. The lsof Configure script
will pick the appropriate base.

To use the CCITT x.25 socket support for HP-UX, you must have the
x.25 header files in /etc/conf/x25

Pasi Kaara helped with the HP-UX port, especially with its CCITT
x.25 socket support.

Richard Allen provided HP-UX 10.x and 11.x test systems, as did
Mark Bixby, and Elias Halldor Agustsson.   Marc Winkler helped test
the 10.20 port. Richard J. Rauenzahn provided a 64 bit HP-UX 11
test system and an HP-UX 11.11 development system.

AFS support for HP-UX was added thanks to help from Chaskiel Moses
Grundman, who provided a test system.

The /dev/kmem-based HP-UX 11.00 support is extremely fragile. It
depends on privately developed kernel structure definitions. (See
.../dialects/hpux/hpux11 for the header files making the definitions.)
Those header files and their definitions will not be updated by
HP-UX 11.00 patches, making it likely that any patch changing a
kernel structure critical to lsof will break lsof in some way.

It's possible to build a 64 bit lsof for 64 bit HP-UX 11.00 with
gcc, but you must have a gcc compiler capable of producing 64 bit
executables. See the 00FAQ file for more information.

The PSTAT-based lsof for HP-UX 11.11 and later is much more solid.
I am indebted to the vision of HP for providing an lsof kernel API

through the PSTAT implementation. Specifically I appreciate the
help of HP staff members Carl Davidson, Louis Huemiller, Rich
Rauenzahn, and Sailu Yallapragada that made PSTAT-based HP-UX lsof
possible.

IPv6
====

Lsof has IPv6 support that has been tested for these UNIX dialects:
AIX 4.3.x; Apple Darwin 5.[12] and 6.0; the INRIA and KAME FreeBSD IPv6
implementations; PSTAT-based HP-UX; /proc-based Linux; the INRIA and
KAME NetBSD implementations; and Solaris 8 and 9. Lsof has IPv6
support that hasn't been tested for: OpenBSD (KAME); OpenUNIX 8; Tru64
Unix 5.[01]; and UnixWare 7.1.[34].

Please let me know if your UNIX dialect has IPv6 support and I'll
see if it can be supported by lsof.

Linux
=====

Tim Korb, Steve Logue, Joseph J. Nuspl Jr., and Jonathan Sergent
have provided Linux test systems.

Michael Shields helped add and test automatic handling of ELF/COFF
form names in /System.map, Marty Leisner and Keith Parks have helped
test many lsof revisions. Marty has provided valuable suggestions,
Linux hints, and code, too.

The 00FAQ file gives some Linux tips, including information on
coping with system map file problems.

To determine the state of the Linux 2.1.x C library lseek() function,
the lsof Configure script runs a test program that must have
permission to read /dev/kmem. The test determines if the lseek()
function properly handles kernel offsets, which appear to be negative
because their high order bit is set. If the lseek() test reveals
a faulty lseek(), Configure activates the use of a private lseek()
function for kernel offset positioning. See the Linux problems
section of the 00FAQ file of the lsof distribution for more
information.

NetBSD
======

Greg Earle and Paul Kranenburg have assisted with the NetBSD ports.
Paul has provided test systems. Ray Phillips provided a NetBSA
Alpha test system. Andrew Brown also provided a test system.

The NetBSD dialect version of lsof is compiled using the dialect
sources it shares with OpenBSD in the n+obsd dialect sub-directory.

NEXTSTEP and OPENSTEP
=====================

Virtual memory header files that allow lsof to display text references
were derived from the contents of /usr/include/vm of NEXTSTEP 2.0.
NeXT did not ship the virtual memory header files with other NEXTSTEP
or OPENSTEP versions.

You may use the RC_FLAGS environment variable to declare compiler
options outside the Makefile. A common use of this variable is to
define the architecture types to be included in a "fat" executable.
See the comments in dialects/next/Makefile for an example.

OpenBSD
=======

David Mazieres has provided OpenBSD test systems. The OpenBSD
dialect version of lsof is compiled using the dialect sources it
shares with NetBSD in the n+obsd dialect sub-directory.

Kenneth Stailey has provided OpenBSD testing and advice.

John Dzubera (Zube) reports, "lsof 4.33 compiles and runs on OpenBSD
2.3 for the pmax architecture (decstation 3100)."

I have not tested lsof on OpenBSD 3.8, but David Mazieres reports
revision 4.76 worked on OpenBSD 3.8.

Pyramid DC/OSx and Reliant UNIX
===============================

As of lsof revision 4.52 support for all Pyramid dialects has been
discontinued. Lsof revision 4.51 with Pyramid support may be
obtained upon request. Send the request to abe@purdue.edu.

These two UNIX dialects are very similar and share dialect-specific
source files from the pyramid sub-directory.

The Reliant Unix Pyramid C compiler issues warning messages that
I haven't found a convenient way to suppress. You can ignore
warning messages about casts and conversions that lose bits. The
message "warning: undefining __STDC__" is intentionally caused by
the lsof MkKernOpts configuration script to suppress warning messages
about cast and conversion problems in standard system header files,
such as <stdio.h> and <string.h>.

Bruce Beare and Kevin Smith provided test systems.

Caldera OpenUNIX
================

Larry Rosenman provided an OpenUNIX 8 test system. Matthew Thurmaier
provided technical assistance, along with these people from Caldera:
Jack Craig, Robert Lipe, and Bela Lubkin.

Robert Lipe supplied changes to lsof for OpenUNIX 8.0.1. Those
changes were also incorporated in UnixWare 7.1.3 when it became
the release name for OpenUNIX 8.0.1.

Support for lsof on OpenUNIX ended at lsof revision 4.74. The last
lsof revision, 4.74, tested on OpenUNIX, may be found at the lsof
"home" ftp site, lsof.itap.purdue.edu, in pub/tools/unix/lsof/OLD/src.

SCO OpenServer
==============

Dion Johnson, Bela Lubkin, and Nathan Peterson of SCO gave me copies
of SCO OpenServer and the SCO OpenServer Development System 3.0
and provided technical advice for the lsof port.

Hugh Dickins, Bela Lubkin, Craig B. Olofson, and Nathan Peterson
provided version 5.0 and gave technical advice for porting lsof to
it. Bela provided the 5.0.4 changes. D. Chris Daniels provided
a 5.0.4 test system, Lee Penn provided one for 5.0.5, and John
Dubois for 5.0.6.

The <netdb.h> header file was accidentally omitted from some SCO
OpenServer Development System releases. The Configure script will
sense its absence and substitute an equivalent from the BSD
distribution. The BSD <netdb.h> and the <sys/cdefs.h> header file
it includes are located in the dialects/os/include sub-directory
tree.

To compile lsof from its distribution sources you must have the

TCP/IP and NSF headers in /usr/include. While those are optional
OpenServer packages, I have access to no system that doesn't have
them, so I'm unable to build lsof for such a configuration. However,
it should be possible to modify the lsof Configure script and
sources so lsof would compile and work without those optional
packages.

If you have an OpenServer system configured without the TCP/IP and
NFS packages, and want to tackle the job of building lsof for it,
contact me via e-mail at <abe@purdue.edu>. I'll identify the
Configure script, header file, and source file changes you will
need to make. (Caution: this is not a simple task, or I would have
already done it.)

The optional osrgcc and scogcc Configure abbreviations construct
Makefiles for compiling lsof with gcc.

The UnixWare 7.1.4 sources are used for OpenServer Release 6.0.0.
Hence there is a separate Configure abbreviation for it, "osr6".
Richard of SCO provided a test system and technical assistance.

SCO|Caldera UnixWare
============

D. Chris Daniels, John Hughes, Ken Laing, Andrew Merril, Lee Penn, and
Matthew Thurmaier provided test systems. Bela Lubkin provided
technical assistance. Larry Rosenman provided 7.1.[34] test systems.

Solaris 2.x, 7, 8, 9 and 10
===========================

SEE THE CAUTIONS SECTION OF THIS DOCUMENT.

The latest Solaris revision of lsof 4 might work under Solaris
2.[1-4] and 2.5[.1] and 7 but hasn't been tested there. I have no
test systems for those Solaris versions.

Lsof will compile with gcc and the Sun C compiler under Solaris.
If you want to use the Sun compiler, use the solariscc Configure
abbreviation. If you use a gcc version less than 2.8 on Solaris,
make sure the gcc-specific includes have been updated for your
version of Solaris -- i.e., run the gcc fixincludes script.

Solaris 7, 8, 9 and 10 support for 64 bit kernels depends on a Sun
WorkShop or Forte C compiler version that supports the "-xarch=v9"
flag -- usually 5.0 or greater. Gcc versions 2.95 and above *may*

be configured and built for 64 bit support, but it takes some extra
work, the resulting compiler may be fragile, and the gcc developers
discourage it. I've built 64 bit capable gcc compilers for Solaris
7, 8 and 9 from gcc versions 2.95 through 3.0.1 and produced working
lsof executables with them. More information on 64 bit gcc for
Solaris may be found in the 00FAQ file.

Solaris 10 ZFS support is questionable, because Sun does not distribute
the ZFS kernel structure definition header files. The lsof Configure
script and source code use some risky work-arounds. ZFS file system
support was made possible with help from Horst Scheuermann.

Dave Curry and Steve Kirsch provided resources for Solaris 2.x
ports. Casper Dik and Gerry Singleton consulted and provided
valuable assistance.

Henry Katz, Joseph Kowalski, Charles Stephens, Mike Sullivan, and
Mike Tracy provided technical assistance.

AFS support was added to Solaris lsof with help from Curt Freeland,
Heidi Hornstein, Michael L. Lewis, Terry McCoy, Phillip Moore, and
Sushila R. Subramanian.

Casper Dik provided valuable assistance for the Solaris 8 support.

Sun has graciously provided me access to BETA versions of Solaris
2.5, 2.6, 7, 8, and 9.

John Dzubera provided Solaris 7 and 8 test systems.

Mike Miscevic provided Solaris 10 test systems.

Ultrix
======

As of lsof revision 4.52 support for Ultrix is no longer available,
because I no longer have an Ultrix test system.

Terry Friedrichsen, Dwight McKay, and Jeffrey Mogul helped me with
this port.

DECnet support was added to Ultrix lsof with the help of John
Beacom, who kindly provided a test system. The Configure script
decides that DECnet support is available if /usr/lib/libdnet.a and
/usr/include/netdnet/dn.h exist and are readable.

Veritas VxFS and VxVM
====================

Lsof supports some versions of Veritas VxFS and VxVM on some UNIX
dialects. Consult the lsof Configure script for the specific
dialect, and consult the lsof dialect-specific source files for
the UNIX dialect of interest. Veritas support will usually be
found in a source file named dnode[1-9].c.

Since Veritas rarely has a version number that can be extracted
with shell commands, lsof doesn't use it. Instead, when lsof
supports Veritas, the Configure script will form compile-time
definitions starting with HASVXFS.   Check the lsof 00PORTING
documentation file for more information.

Lsof Veritas support requires that the supporting Veritas header
files be installed -- e.g., in /usr/include/sys/fs. (The location
will depend in the dialect's header file conventions.)

Some information on lsof support for Veritas extensions may be
found in the lsof 00DIST file.

Chris Kordish and Andy Thomas have provided Solaris VxFS test
systems.

==============================
User-contributed Dialect Support
==============================

There are some user-contributed dialect versions of lsof; more
information on them can be found at:

 ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/contrib

Check the 00INDEX file there for details.

==========================
Dialects No Longer Supported
==========================

Because I don't have access to test systems, these UNIX dialects
are no longer supported by lsof:

 CDC EP/IX
 /dev/kmem-based Linux
 MIPS RISC/os

Motorola V/88

Pyramid DC/OSx

Pyramid Reliant UNIX

Sequent DYNIX

SGI IRIX

SunOS 4.x

Ultrix

UnixWare below 7.0

Remnants of the support lsof once provided for these dialects may
be found in:

 ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD/binaries
and
 ftp://lsof.itap.purdue.edu/pub/tools/unix/lsof/OLD/dialects

===============
Installing Lsof
===============

The distributed Makefiles do not have actions that will install
lsof. I've come to the conclusion there is no standard for installing
lsof or its man page, so I no longer distribute make rules for
installing them. You should adjust the Makefile for your local
preferences.

The Makefile does have an install rule that will cause lsof to
compile by virtue of its dependency clause. Some Makefiles also
have a dependency that causes the production of a man page that is
ready to install. However, the actions of the install rule will
not cause the lsof executable or its man page to be installed in
any UNIX system-wide directory.

Instead, after the compilation and optional man page production
are completed, the install rule will produce a brief description
of what actions you might add to the install rule. The description
will suggest the possible modes, ownerships, permissions, and
destinations your install rule might employ to install the lsof
executable and man page.

As you form your install rule, keep in mind that lsof usually needs
some type of special permission to do its job. That may be permission
to read memory devices such as /dev/kmem, /dev/mem, or /dev/swap,
or it may be authorization to read entries in the /proc file system.

Memory device access can usually be provided by setting the modes
of the lsof executable so that it's effective group identifier when

it runs is the same as the group that has permission to read the
memory devices -- i.e., it is setgid-group. The privileged group
is usually kmem, sys, or system.

Don't overlook using ACLs -- e.g., on AIX or Solaris 8 -- to give
lsof permission to access memory devices. ACLs, coupled to a
separate group like kmem, can be safer than giving lsof setgid
authorization to a commonly used system group.

When lsof needs to read /proc file system entries, it must be
installed with modes that make its effective user identifier root
when it runs -- i.e., it must be setuid-root. If lsof must be
installed setuid-root (only the AIX 5L, PSTAT-based HPUX, and
/proc-based Linux, ports need such power.), then access to memory
devices is automatic (or not needed in the case of /proc-based
Linux).

Your choice of permissions for lsof may also be affected by your
desire to allow anyone to use it or your need to restrict its usage
to specific individuals. You will have to be guided by local policy
and convention in this case.

The next two sections, Setgid Lsof Dialect Versions and Setuid-root
Lsof Dialect Versions, list recommended install permissions.

The system directory where you install the lsof executable is also
open to choice. A traditional place for a tool like lsof is
/usr/local/etc, but recent changes in directory structure organization
suggest that somewhere in /opt may be more suitable.

Bear one other factor in mind when choosing a location for the lsof
executable -- it usually is a shared executable, requiring access
to shared libraries. Thus, locations like /sbin or /usr/sbin are
probably unsuitable.

Once you've chosen a location for the executable you may find that
the location for the man page follows -- e.g., if the executable
goes in /usr/local/etc, then the man page goes in /usr/local/man.
If the executable location doesn't imply a location for the man
page, you'll have to let local custom guide you.

Setuid-root Lsof Dialect Versions
=================================

These dialect versions should be installed with setuid-root
permission -- i.e., the lsof binary should be owned by root and
its setuid execution bit (04000) should be set.

AIX 5L and above for full use of the -X option
Apple Darwin 8.x for Power Macintosh systems
PSTAT-based HP-UX 11.11 and 11.23
/proc-based Linux (generally 2.1.72 and above)

Setgid Lsof Dialect Versions

=============================

These dialect versions should be installed with setgid permission,
owned by the group that can read kernel memory devices such as
/dev/drum, /dev/kmem, /dev/ksyms, /dev/mem, /dev/swap. ACLs may
be another mechanism (e.g., under AIX or Solaris 8) you can use to
grant read permission to the kernel memory devices.

 AIX 4.1.[45], 4.2[.1], and 4.3[.123]
 Apple Darwin 7.x for Power Macintosh systems
 DEC OSF/1, Digital UNIX, Tru64 UNIX 2.0, 3.2, 4.0, and 5.[01]
 FreeBSD 2.1.6, 2.2[.x], 3.x, 4.x, 5.x and [67].x
 /dev/kmem-based 11.00
 NetBSD 1.[456], 2.x and 3.x
 NEXTSTEP 3.[13]
 OpenBSD 2.[89] and 3.[0-9]
 OPENSTEP 4.x
 Caldera OpenUNIX 8
 SCO OpenServer 5.0.[46]
 SCO UnixWare 7.0 and 7.1.[0134]
 Solaris 2.6, 8, 9 and 10
 Ultrix 4.2 (no longer available)

==================================
Porting lsof 4 to a New UNIX Dialect
==================================

If you're brave enough to consider this, look at the 00PORTING
file. Please contact me before you start. I might be able to help
you or even do the port myself.

Don't overlook the contrib/ directory in pub/tools/unix/lsof on my
ftp server, lsof.itap.purdue.edu. It contains user-contributed ports
of lsof to dialects I don't distribute, because I can't test new
revisions of lsof on them.

=========================
Quick Start to Using lsof
=========================

For information on how to get started quickly using lsof, consult
the 00QUICKSTART file of the lsof distribution. It cuts past the
formal density of the lsof man page to provide quick examples of
using lsof to solve common open file display problems.

======================
Cross-configuring Lsof
======================

Using environment variables it is possible to Configure (and possibly
build) lsof for one UNIX dialect on a different one -- e.g., you
are running Configure on a Linux 2.3 system and you want to Configure
and build lsof for Linux 2.4.

See the 00XCONFIG file of the lsof distribution for a discussion
of how to do this.

===
Environment Variables Affecting the Configure Script
===

Configure script actions can be modified by introducing values to
the script via environment variables. In many cases the environment
variable values take the place of test operations the Configure
script makes.

For more information on environment variables that can affect
Configure, consult the 00XCONFIG file of the lsof distribution.
See the General Environment Variables sections for descriptions of
ones that affect all dialects. Consult the Dialect-Specific
Environment Variables section for ones that might affect the dialect
you are trying to configure.

Vic Abell <abe@purdue.edu>
April 24, 2007

Found in path(s):
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/00README
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/00README
No license file was found, but licenses were detected in source scan.

/*
* Portions Copyright 2005 Apple Computer, Inc. All rights reserved.

Found in path(s):
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/darwin/libproc/machine.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/darwin/libproc/dsock.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/darwin/libproc/dstore.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/darwin/libproc/ddev.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/darwin/libproc/dproto.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/darwin/libproc/machine.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/darwin/libproc/ddev.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/darwin/libproc/dstore.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/darwin/libproc/dmnt.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-

tar/lsof_4.83_src/dialects/darwin/libproc/dproto.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/darwin/libproc/dmnt.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/darwin/libproc/dsock.c
No license file was found, but licenses were detected in source scan.

Found in path(s):
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/hpux/pstat/dfile.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/hpux/pstat/dsock.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/hpux/pstat/machine.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-
gz/lsof_4.83_src/dialects/hpux/pstat/dsock.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/hpux/pstat/dstore.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/hpux/pstat/dproto.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-
tar/lsof_4.83_src/dialects/hpux/pstat/dlsof.h

* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/pstat/dstore.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/hpux/pstat/dfile.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/pstat/dproto.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/pstat/machine.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/pstat/dlsof.h
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83_src/dialects/hpux/pstat/dproc.c
* /opt/cola/permits/1350150906_1655994764.9225438/0/lsof-4-83-r1-2-tar-gz/lsof_4.83/lsof-4-83-src-tar/lsof_4.83_src/dialects/hpux/pstat/dproc.c

1.9 pam 1.1.6

1.9.1 Available under license :

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1.10 libuv 1.7.4

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 */

#ifndef UV_BSD_H
#define UV_BSD_H

#define UV_PLATFORM_FS_EVENT_FIELDS   \
  uv__io_t event_watcher;   \

#define UV_IO_PRIVATE_PLATFORM_FIELDS   \

```
  int rcount;                                   \
  int wcount;                                   \

#define UV_HAVE_KQUEUE 1

#endif /* UV_BSD_H */
```
Files: *
========

Files: getopt.c
===============

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1.12 openssl 1.0.2n

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1.13 usbutils 0.86

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1.14 jdom b9

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Links to all available W3C DOM Java Bindings can be found at:

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Version 2.1, February 1999

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"Source code" for a work means the preferred form of the work for
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(For example, a function in a library to compute square roots has
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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object

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1.16 binutils 2.19.51

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with the Library, with the complete machine-readable "work that
uses the Library", as object code and/or source code, so that the
user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

b) Accompany the work with a written offer, valid for at
least three years, to give the same user the materials
specified in Subsection 6a, above, for a charge no more
than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
specified materials from the same place.

d) Verify that the user has already received a copy of these
materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the source code distributed need not include anything that is normally
distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

7. You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library
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library, provided that the separate distribution of the work based on
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 <signature of Ty Coon>, 1 April 1990
 Ty Coon, President of Vice

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In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

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A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work

which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

 "Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

 Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

 1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

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 2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

  a) The modified work must itself be a software library.

  b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

  c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

  d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses

the facility, other than as an argument passed when the facility
is invoked, then you must make a good faith effort to ensure that,
in the event an application does not supply such function or
table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
with the Library (or with a work based on the Library) on a volume of
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the scope of this License.

 3. You may opt to apply the terms of the ordinary GNU General Public
License instead of this License to a given copy of the Library. To do
this, you must alter all the notices that refer to this License, so
that they refer to the ordinary GNU General Public License, version 2,
instead of to this License. (If a newer version than version 2 of the
ordinary GNU General Public License has appeared, then you can specify
that version instead if you wish.) Do not make any other change in
these notices.

 Once this change is made in a given copy, it is irreversible for
that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of

the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also combine or
link a "work that uses the Library" with the Library to produce a

work containing portions of the Library, and distribute that work
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copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

  a) Accompany the work with the complete corresponding
  machine-readable source code for the Library including whatever
  changes were used in the work (which must be distributed under
  Sections 1 and 2 above); and, if the work is an executable linked
  with the Library, with the complete machine-readable "work that
  uses the Library", as object code and/or source code, so that the
  user can modify the Library and then relink to produce a modified
  executable containing the modified Library. (It is understood
  that the user who changes the contents of definitions files in the
  Library will not necessarily be able to recompile the application
  to use the modified definitions.)

  b) Use a suitable shared library mechanism for linking with the
  Library. A suitable mechanism is one that (1) uses at run time a
  copy of the library already present on the user's computer system,
  rather than copying library functions into the executable, and (2)
  will operate properly with a modified version of the library, if
  the user installs one, as long as the modified version is
  interface-compatible with the version that the work was made with.

  c) Accompany the work with a written offer, valid for at
  least three years, to give the same user the materials
  specified in Subsection 6a, above, for a charge no more
  than the cost of performing this distribution.

  d) If distribution of the work is made by offering access to copy
  from a designated place, offer equivalent access to copy the above
  specified materials from the same place.

  e) Verify that the user has already received a copy of these
  materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,

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normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
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accompany the operating system. Such a contradiction means you cannot
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  b) Give prominent notice with the combined library of the fact
  that part of it is a work based on the Library, and explaining
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a source language processor.

(This file is under construction.)   -*- text -*-

If you've contributed to gas and your name isn't listed here, it is
not meant as a slight. I just don't know about it. Email me,
nickc@redhat.com and I'll correct the situation.

This file will eventually be deleted: The general info will go into
the documentation, and info on specific files will go into an AUTHORS
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++++++++++++++++

Dean Elsner wrote the original gas for vax. [more details?]

Jay Fenlason maintained gas for a while, adding support for
gdb-specific debug information and the 68k series machines, most of
the preprocessing pass, and extensive changes in messages.c,
input-file.c, write.c.

K. Richard Pixley maintained gas for a while, adding various
enhancements and many bug fixes, including merging support for several
processors, breaking gas up to handle multiple object file format
backends (including heavy rewrite, testing, an integration of the coff
and b.out backends), adding configuration including heavy testing and
verification of cross assemblers and file splits and renaming,
converted gas to strictly ansi C including full prototypes, added
support for m680[34]0 & cpu32, considerable work on i960 including a
coff port (including considerable amounts of reverse engineering), a
sparc opcode file rewrite, decstation, rs6000, and hp300hpux host
ports, updated "know" assertions and made them work, much other
reorganization, cleanup, and lint.

Ken Raeburn wrote the high-level BFD interface code to replace most of
the code in format-specific I/O modules.

The original Vax-VMS support was contributed by David L. Kashtan. Eric Youngdale and Pat Rankin have done much work with it since.

The Intel 80386 machine description was written by Eliot Dresselhaus.

Minh Tran-Le at IntelliCorp contributed some AIX 386 support.

The Motorola 88k machine description was contributed by Devon Bowen of Buffalo University and Torbjorn Granlund of the Swedish Institute of Computer Science.

Keith Knowles at the Open Software Foundation wrote the original MIPS back end (tc-mips.c, tc-mips.h), and contributed Rose format support that hasn't been merged in yet. Ralph Campbell worked with the MIPS code to support a.out format.

Support for the Zilog Z8k and Hitachi H8/300, H8/500 and SH processors (tc-z8k, tc-h8300, tc-h8500, tc-sh), and IEEE 695 object file format (obj-ieee), was written by Steve Chamberlain of Cygnus Solutions. Steve also modified the COFF back end (obj-coffbfd) to use BFD for some low-level operations, for use with the Hitachi, 29k and Zilog targets.

John Gilmore built the AMD 29000 support, added .include support, and simplified the configuration of which versions accept which pseudo-ops. He updated the 68k machine description so that Motorola's opcodes always produced fixed-size instructions (e.g. jsr), while synthetic instructions remained shrinkable (jbsr). John fixed many bugs, including true tested cross-compilation support, and one bug in relaxation that took a week and required the proverbial one-bit fix.

Ian Lance Taylor of Cygnus Solutions merged the Motorola and MIT syntaxes for the 68k, completed support for some COFF targets (68k, i386 SVR3, and SCO Unix), wrote the ECOFF support based on Michael Meissner's mips-tfile program, wrote the PowerPC and RS/6000 support, and made a few other minor patches. He handled the binutils releases for versions 2.7 through 2.9.

David Edelsohn contributed fixes for the PowerPC and AIX support.

Steve Chamberlain made gas able to generate listings.

Support for the HP9000/300 was contributed by Glenn Engel of HP.

Support for ELF format files has been worked on by Mark Eichin of Cygnus Solutions (original, incomplete implementation), Pete Hoogenboom at the University of Utah (HPPA mainly), Michael Meissner of the Open Software Foundation (i386 mainly), and Ken Raeburn of

Cygnus Solutions (sparc, initial 64-bit support).

Several engineers at Cygnus Solutions have also provided many small
bug fixes and configuration enhancements.

The initial Alpha support was contributed by Carnegie-Mellon
University. Additional work was done by Ken Raeburn of Cygnus
Solutions. Richard Henderson then rewrote much of the Alpha support.

Ian Dall updated the support code for the National Semiconductor 32000
series, and added support for Mach 3 and NetBSD running on the PC532.

Klaus Kaempf ported the assembler and the binutils to openVMS/Alpha.

Steve Haworth contributed the support for the Texas Instruction c30
(tms320c30).

H.J. Lu has contributed many patches and much testing.

Alan Modra reworked much of the i386 backend, improving the error
checking, updating the code, and improving the 16 bit support, using
patches from the work of Martynas Kunigelis and H.J. Lu.

Many others have contributed large or small bugfixes and enhancements. If
you've contributed significant work and are not mentioned on this list, and
want to be, let us know. Some of the history has been lost; we aren't
intentionally leaving anyone out.

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1.17 libvirt 1.1.2

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1.18 coreutils 6.9

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1.19 libunwind 1.1

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1.20 libnsl 2.24

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1.21 glibc 2.12

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1.23 findutils 4.2.31

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1.24 libnl3 3.2.22

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to attach them to the start of each source file to most effectively
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the "copyright" line and a pointer to where the full notice is found.

    <one line to give the program's name and a brief idea of what it does.>
    Copyright (C) <year> <name of author>

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Also add information on how to contact you by electronic and paper mail.

 If the program does terminal interaction, make it output a short
notice like this when it starts in an interactive mode:

    <program> Copyright (C) <year> <name of author>
    This program comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
    This is free software, and you are welcome to redistribute it
    under certain conditions; type `show c' for details.

The hypothetical commands `show w' and `show c' should show the appropriate
parts of the General Public License. Of course, your program's commands
might be different; for a GUI interface, you would use an "about box".

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For more information on this, and how to apply and follow the GNU GPL, see
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the library. If this is what you want to do, use the GNU Lesser General
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1.25 sqlite 3.3.17

1.25.1 Available under license :

No license file was found, but licenses were detected in source scan.

<html>
<body bgcolor="white">
<h1 align="center">
Copyright Release for
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</h1>

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enhancements back to the SQLite website. This document concerns
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</p>

<p>
For the purposes of this document, "SQLite software" shall mean any
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other information that is published on the SQLite website,
http://www.sqlite.org/. Precompiled binaries are excluded from
the definition of "SQLite software" in this document because the
process of compiling the software may introduce information from
outside sources which is not properly a part of SQLite.
</p>

<p>
The header comments on the SQLite source files exhort the reader to
share freely and to never take more than one gives.
In the spirit of that exhortation I make the following declarations:
</p>

<p>
I dedicate to the public domain
any and all copyright interest in the SQLite software that
was publicly available on the SQLite website (http://www.sqlite.org/) prior
to the date of the signature below and any changes or enhancements to

the SQLite software
that I may cause to be published on that website in the future.
I make this dedication for the benefit of the public at large and
to the detriment of my heirs and successors. I intend this
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all present and future rights to the SQLite software under copyright
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To the best of my knowledge and belief, the changes and enhancements that
I have contributed to SQLite are either originally written by me
or are derived from prior works which I have verified are also
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<p>
To the best of my knowledge and belief, no individual, business, organization,
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in the SQLite software as it existed on the
SQLite website as of the date on the signature line below.
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I agree never to publish any additional information
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that information is an original work of authorship by me or is derived from
prior published versions of SQLite.
I agree never to copy and paste code into the SQLite code base from
other sources.
I agree never to publish on the SQLite website any information that
would violate a law or breach a contract.
</p>

<p>
<table width="100%" cellpadding="0" cellspacing="0">
<tr>
<td width="60%" valign="top">
Signature:
<p> </p>
<p> </p>
<p> </p>
</td><td valign="top" align="left">
Date:
</td></tr>
<td colspan=2>

Name (printed):
</td>
</tr>
</table>
</body>
</html>

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/www/copyright-release.html
No license file was found, but licenses were detected in source scan.

```
set rcsid {$Id: support.tcl,v 1.6 2005/12/05 22:22:40 drh Exp $}
source common.tcl
header {SQLite Support Options}
puts {
<h2>SQLite Support Options</h2>


<h3>Mailing List</h3>
<p>
A mailing list has been set up for asking questions and
for open discussion of problems
and issues by the SQLite user community.
To subscribe to the mailing list, send an email to
<a href="mailto:sqlite-users-subscribe@sqlite.org">
sqlite-users-subscribe@sqlite.org</a>.
If you would prefer to get digests rather than individual
emails, send a message to to
<a href="mailto:sqlite-users-digest-subscribe@sqlite.org">
sqlite-users-digest-subscribe@sqlite.org</a>.
For additional information about operating and using this
mailing list, send a message to
<a href="mailto:sqlite-users-help@sqlite.org">
sqlite-users-help@sqlite.org</a> and instructions will be
sent by to you by return email.
</p>

<p>
There are multiple archives of the mailing list:
</p>

<blockquote>
<a href="http://www.mail-archive.com/sqlite-users%40sqlite.org/">
http://www.mail-archive.com/sqlite-users%40sqlite.org</a><br>
<a href="http://marc.10east.com/?l=sqlite-users&r=1&w=2">
http://marc.10east.com/?l=sqlite-users&r=1&w=2</a><br>
<a href="http://news.gmane.org/gmane.comp.db.sqlite.general">
```

http://news.gmane.org/gmane.comp.db.sqlite.general
</blockquote>

</p>

<h3>Direct E-Mail To The Author</h3>

<p>
Use the mailing list.
Please do not send email directly to the author of SQLite
unless:

You have or intend to acquire a professional support contract
as described below, or
You are working on an open source project.

You are welcomed to use SQLite in closed source, proprietary, and/or
commerical projects and to ask questions about such use on the public
mailing list. But please do not ask to receive free direct technical
support. The software is free; direct technical support is not.
</p>

<h3>Professional Support</h3>

<p>
If you would like professional support for SQLite
or if you want custom modifications to SQLite performed by the
original author, these services are available for a modest fee.
For additional information visit

http://www.hwaci.com/sw/sqlite/prosupport.html or contact:</p>

<blockquote>
D. Richard Hipp
Hwaci - Applied Software Research
704.948.4565
drh@hwaci.com
</blockquote>

}
footer $rcsid

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/www/support.tcl
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Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/www/docs.tcl
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```
/*
* This code implements the MD5 message-digest algorithm.
* The algorithm is due to Ron Rivest.  This code was
* written by Colin Plumb in 1993, no copyright is claimed.
* This code is in the public domain; do with it what you wish.
*
* Equivalent code is available from RSA Data Security, Inc.
* This code has been tested against that, and is equivalent,
* except that you don't need to include two pages of legalese
* with every copy.
*
* To compute the message digest of a chunk of bytes, declare an
* MD5Context structure, pass it to MD5Init, call MD5Update as
* needed on buffers full of bytes, and then call MD5Final, which
* will fill a supplied 16-byte array with the digest.
*/
```

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/src/test_md5.c
No license file was found, but licenses were detected in source scan.

```
# 2006 September 14
#
# The author disclaims copyright to this source code.  In place of
# a legal notice, here is a blessing:
#
#    May you do good and not evil.
#    May you find forgiveness for yourself and forgive others.
#    May you share freely, never taking more than you give.
#
#***********************************************************************
# This file implements regression tests for SQLite library.  The
# focus of this script is testing the FTS1 module.
#
# $Id: fts1c.test,v 1.11 2006/10/04 17:35:28 drh Exp $
#

set testdir [file dirname $argv0]
source $testdir/tester.tcl

# If SQLITE_ENABLE_FTS1 is defined, omit this file.
ifcapable !fts1 {
```

```
 finish_test
 return
 }


# Create a table of sample email data.   The data comes from email
# archives of Enron executives that was published as part of the
# litigation against that company.
#
do_test fts1c-1.1 {
 db eval {
   CREATE VIRTUAL TABLE email USING fts1([from],[to],subject,body);
   BEGIN TRANSACTION;
```

INSERT INTO email([from],[to],subject,body) VALUES('savita.puthigai@enron.com', 'traders.eol@enron.com, traders.eol@enron.com', 'EnronOnline- Change to Autohedge', 'Effective Monday, October 22, 2001 the following changes will be made to the Autohedge functionality on EnronOnline.

The volume on the hedge will now respect the minimum volume and volume increment settings on the parent product. See rules below:

? If the transaction volume on the child is less than half of the parent"s minimum volume no hedge will occur.
? If the transaction volume on the child is more than half the parent"s minimum volume but less than half the volume increment on the parent, the hedge will volume will be the parent"s minimum volume.
? For all other volumes, the same rounding rules will apply based on the volume increment on the parent product.

Please see example below:

Parent"s Settings:
Minimum: 5000
Increment: 1000

Volume on Autohedge transaction   Volume Hedged
1   - 2499   0
2500 - 5499   5000
5500 - 6499   6000');

INSERT INTO email([from],[to],subject,body) VALUES('dana.davis@enron.com', 'laynie.east@enron.com, lisa.king@enron.com, lisa.best@enron.com,', 'Leaving Early', 'FYI:
If it"s ok with everyone"s needs, I would like to leave @4pm. If you think
you will need my assistance past the 4 o"clock hour just let me know; I"ll
be more than willing to stay.');

INSERT INTO email([from],[to],subject,body) VALUES('enron_update@concureworkplace.com', 'louise.kitchen@enron.com', '<<Concur Expense Document>> - CC02.06.02', 'The following expense report is ready for approval:

Employee Name: Christopher F. Calger
Status last changed by: Mollie E. Gustafson Ms
Expense Report Name: CC02.06.02
Report Total: $3,972.93
Amount Due Employee: $3,972.93

To approve this expense report, click on the following link for Concur Expense.
http://expensexms.enron.com');
INSERT INTO email([from],[to],subject,body) VALUES('jeff.duff@enron.com', 'julie.johnson@enron.com', 'Work request', 'Julie,

Could you print off the current work request report by 1:30 today?

Gentlemen,

I''d like to review this today at 1:30 in our office. Also, could you provide
me with your activity reports so I can have Julie enter this information.

JD');
INSERT INTO email([from],[to],subject,body) VALUES('v.weldon@enron.com', 'gary.l.carrier@usa.dupont.com,
scott.joyce@bankofamerica.com', 'Enron News', 'This could turn into something big....
http://biz.yahoo.com/rf/010129/n29305829.html');
INSERT INTO email([from],[to],subject,body) VALUES('mark.haedicke@enron.com', 'paul.simons@enron.com',
'Re: First Polish Deal!', 'Congrats! Things seem to be building rapidly now on the Continent. Mark');
INSERT INTO email([from],[to],subject,body) VALUES('e..carter@enron.com', 't..robinson@enron.com', 'FW:
Producers Newsletter 9-24-2001', '
The producer lumber pricing sheet.
-----Original Message-----
From: Johnson, Jay
Sent: Tuesday, October 16, 2001 3:42 PM
To: Carter, Karen E.
Subject: FW: Producers Newsletter 9-24-2001

-----Original Message-----
From: Daigre, Sergai
Sent: Friday, September 21, 2001 8:33 PM
Subject: Producers Newsletter 9-24-2001

');
INSERT INTO email([from],[to],subject,body) VALUES('david.delainey@enron.com', 'kenneth.lay@enron.com',
'Greater Houston Partnership', 'Ken, in response to the letter from Mr Miguel San Juan, my suggestion would
be to offer up the Falcon for their use; however, given the tight time frame
and your recent visit with Mr. Fox that it would be difficult for either you
or me to participate.

I spoke to Max and he agrees with this approach.

I hope this meets with your approval.

Regards

Delainey');
INSERT INTO email([from],[to],subject,body) VALUES('lachandra.fenceroy@enron.com',
'lindy.donoho@enron.com', 'FW: Bus Applications Meeting Follow Up', 'Lindy,

Here is the original memo we discussed earlier. Please provide any information that you may have.

Your cooperation is greatly appreciated.

Thanks,

lachandra.fenceroy@enron.com
713.853.3884
877.498.3401 Pager

-----Original Message-----
From: Bisbee, Joanne
Sent: Wednesday, September 26, 2001 7:50 AM
To: Fenceroy, LaChandra
Subject: FW: Bus Applications Meeting Follow Up

Lachandra, Please get with David Duff today and see what this is about. Who are our TW accounting business users?

-----Original Message-----
From: Koh, Wendy
Sent: Tuesday, September 25, 2001 2:41 PM
To: Bisbee, Joanne
Subject: Bus Applications Meeting Follow Up

Lisa brought up a TW change effective Nov 1. It involves eliminating a turnback surcharge. I have no other information, but you might check with the business folks for any system changes required.

Wendy');
INSERT INTO email([from],[to],subject,body) VALUES('danny.mccarty@enron.com', 'fran.fagan@enron.com',
'RE: worksheets', 'Fran,
   If Julie''s merit needs to be lump sum, just move it over to that column. Also, send me Eric Gadd''s sheets as well.
Thanks.
Dan

-----Original Message-----
From: Fagan, Fran
Sent: Thursday, December 20, 2001 11:10 AM
To: McCarty, Danny
Subject: worksheets

As discussed, attached are your sheets for bonus and merit.

Thanks,

Fran Fagan

Sr. HR Rep

713.853.5219

<< File: McCartyMerit.xls >> << File: mccartyBonusCommercial_UnP.xls >>

');
INSERT INTO email([from],[to],subject,body) VALUES('bert.meyers@enron.com', 'shift.dl-portland@enron.com', 'OCTOBER SCHEDULE', 'TEAM,

PLEASE SEND ME ANY REQUESTS THAT YOU HAVE FOR OCTOBER. SO FAR I HAVE THEM FOR LEAF. I WOULD LIKE TO HAVE IT DONE BY THE 15TH OF THE MONTH. ANY QUESTIONS PLEASE GIVE ME A CALL.

BERT');
INSERT INTO email([from],[to],subject,body) VALUES('errol.mclaughlin@enron.com', 'john.arnold@enron.com, bilal.bajwa@enron.com, john.griffith@enron.com,', 'TRV Notification: (NG - PROPT P/L - 09/27/2001)', 'The report named: NG - PROPT P/L <http://trv.corp.enron.com/linkFromExcel.asp?report_cd=11&report_name=NG+-+PROPT+P/L&category_cd=5&category_name=FINANCIAL&toc_hide=1&sTV1=5&TV1Exp=Y&current_efct_date=09/27/2001>, published as of 09/27/2001 is now available for viewing on the website.');
INSERT INTO email([from],[to],subject,body) VALUES('patrice.mims@enron.com', 'calvin.eakins@enron.com', 'Re: Small business supply assistance', 'Hi Calvin

I spoke with Rickey (boy, is he long-winded!!). Gave him the name of our credit guy, Russell Diamond.

Thank for your help!');
INSERT INTO email([from],[to],subject,body) VALUES('legal <.hall@enron.com>', 'stephanie.panus@enron.com', 'Termination update', 'City of Vernon and Salt River Project terminated their contracts. I will fax these notices to you.');
INSERT INTO email([from],[to],subject,body) VALUES('d..steffes@enron.com', 'richard.shapiro@enron.com', 'EES / ENA Government Affairs Staffing & Outside Services', 'Rick --

Here is the information on staffing and outside services. Call if you need anything else.

Jim

');
INSERT INTO email([from],[to],subject,body) VALUES('gelliott@industrialinfo.com', 'pcopello@industrialinfo.com', 'ECAAR (Gavin), WSCC (Diablo Canyon), & NPCC (Seabrook)', 'Dear Power Outage Database Customer,
Attached you will find an excel document. The outages contained within are forced or rescheduled outages. Your daily delivery will still contain these outages.
In addition to the two excel documents, there is a dbf file that is formatted like your daily deliveries you receive nightly. This will enable you to load the data into your regular database. Any questions please let me know. Thanks.

Greg Elliott

IIR, Inc.

713-783-5147 x 3481

outages@industrialinfo.com

- OUTAGE.dbf

- 111201R.xls

- 111201.xls ');

INSERT INTO email([from],[to],subject,body) VALUES('enron.announcements@enron.com', 'all_ena_egm_eim@enron.com', 'EWS Brown Bag', 'MARK YOUR LUNCH CALENDARS NOW !

You are invited to attend the EWS Brown Bag Lunch Series

Featuring: RAY BOWEN, COO

Topic: Enron Industrial Markets

Thursday, March 15, 2001

11:30 am - 12:30 pm

EB 5 C2

You bring your lunch,   Limited Seating

We provide drinks and dessert.   RSVP x 3-9610');

INSERT INTO email([from],[to],subject,body) VALUES('chris.germany@enron.com', 'ingrid.immer@williams.com', 'Re: About St Pauls', 'Sounds good to me. I bet this is next to the Warick?? Hotel.

"Immer, Ingrid" <Ingrid.Immer@Williams.com> on 12/21/2000 11:48:47 AM

To: ""chris.germany@enron.com"" <chris.germany@enron.com>

cc:

Subject: About St Pauls

<<About St Pauls.url>>

?

?http://www.stpaulshouston.org/about.html

Chris,

I like the looks of this place.? What do you think about going here Christmas
eve?? They have an 11:00 a.m. service and a candlelight service at 5:00 p.m.,
among others.

Let me know.?? ii

- About St Pauls.url

');
INSERT INTO email([from],[to],subject,body) VALUES('nas@cpuc.ca.gov', 'skatz@sempratrading.com,
kmccrea@sablaw.com, thompson@wrightlaw.com,', 'Reply Brief filed July 31, 2000', ' - CPUC01-#76371-v1-
Revised_Reply_Brief__Due_today_7_31_.doc');
INSERT INTO email([from],[to],subject,body) VALUES('gascontrol@aglresources.com', 'dscott4@enron.com,
lcampbel@enron.com', 'Alert Posted 10:00 AM November 20,2000: E-GAS Request Reminder', 'Alert Posted 10:00
AM November 20,2000: E-GAS Request Reminder
As discussed in the Winter Operations Meeting on Sept.29,2000,
E-Gas(Emergency Gas) will not be offered this winter as a service from AGLC.
Marketers and Poolers can receive gas via Peaking and IBSS nominations(daisy
chain) from other marketers up to the 6 p.m. Same Day 2 nomination cycle.
');
INSERT INTO email([from],[to],subject,body) VALUES('dutch.quigley@enron.com',
'rwolkwitz@powermerchants.com', '', '

Here is a goody for you');
INSERT INTO email([from],[to],subject,body) VALUES('ryan.o"rourke@enron.com', 'k..allen@enron.com,
randy.bhatia@enron.com, frank.ermis@enron.com,', 'TRV Notification: (West VaR - 11/07/2001)', 'The report
named: West VaR
<http://trv.corp.enron.com/linkFromExcel.asp?report_cd=36&report_name=West+VaR&category_cd=2&category_
name=WEST&toc_hide=1&sTV1=2&TV1Exp=Y&current_efct_date=11/07/2001>, published as of 11/07/2001 is
now available for viewing on the website.');
INSERT INTO email([from],[to],subject,body) VALUES('mjones7@txu.com', 'cstone1@txu.com,
ggreen2@txu.com, timpowell@txu.com,', 'Enron / HPL Actuals for July 10, 2000', 'Teco Tap   10.000 / Enron ;
110.000 / HPL IFERC

LS HPL LSK IC   30.000 / Enron
');
INSERT INTO email([from],[to],subject,body) VALUES('susan.pereira@enron.com', 'kkw816@aol.com', 'soccer
practice', 'Kathy-

Is it safe to assume that practice is cancelled for tonight??

Susan Pereira');
INSERT INTO email([from],[to],subject,body) VALUES('mark.whitt@enron.com', 'barry.tycholiz@enron.com',
'Huber Internal Memo', 'Please look at this. I didn"t know how deep to go with the desk. Do you think this works.

');
INSERT INTO email([from],[to],subject,body) VALUES('m..forney@enron.com', 'george.phillips@enron.com', '',
'George,

Give me a call and we will further discuss opportunities on the 13st floor.

Thanks,
JMForney
3-7160');
INSERT INTO email([from],[to],subject,body) VALUES('brad.mckay@enron.com', 'angusmcka@aol.com', 'Re: (no subject)', 'not yet');
INSERT INTO email([from],[to],subject,body) VALUES('adam.bayer@enron.com', 'jonathan.mckay@enron.com', 'FW: Curve Fetch File', 'Here is the curve fetch file sent to me. It has plenty of points in it. If you give me a list of which ones you need we may be able to construct a secondary worksheet to vlookup the values.

adam
35227

-----Original Message-----
From: Royed, Jeff
Sent: Tuesday, September 25, 2001 11:37 AM
To: Bayer, Adam
Subject: Curve Fetch File

Let me know if it works.   It may be required to have a certain version of Oracle for it to work properly.

Jeff Royed
Enron
Energy Operations
Phone: 713-853-5295');
INSERT INTO email([from],[to],subject,body) VALUES('matt.smith@enron.com', 'yan.wang@enron.com', 'Report Formats', 'Yan,

The merged reports look great. I believe the only orientation changes are to
"unmerge" the following six reports:

31 Keystone Receipts
15 Questar Pipeline
40 Rockies Production
22 West_2
23 West_3
25 CIG_WIC

The orientation of the individual reports should be correct. Thanks.

Mat

PS. Just a reminder to add the "*" by the title of calculated points.');
INSERT INTO email([from],[to],subject,body) VALUES('michelle.lokay@enron.com', 'jimboman@bigfoot.com',

'Egyptian Festival', '---------------------- Forwarded by Michelle Lokay/ET&S/Enron on 09/07/2000 10:08 AM --------------------------

"Karkour, Randa" <Randa.Karkour@COMPAQ.com> on 09/07/2000 09:01:04 AM
To: ""Agheb (E-mail)" <Agheb@aol.com>, "Leila Mankarious (E-mail)"
<Leila_Mankarious@mhhs.org>, ""Marymankarious (E-mail)"
<marymankarious@aol.com>, "Michelle lokay (E-mail)" <mlokay@enron.com>, "Ramy
Mankarious (E-mail)" <Mankarious@aol.com>
cc:

Subject: Egyptian Festival

<<Egyptian Festival.url>>

http://www.egyptianfestival.com/

- Egyptian Festival.url
');
INSERT INTO email([from],[to],subject,body) VALUES('errol.mclaughlin@enron.com',
'sherry.dawson@enron.com', 'Urgent!!! --- New EAST books', 'This has to be done.................................

Thanks
---------------------- Forwarded by Errol McLaughlin/Corp/Enron on 12/20/2000
08:39 AM --------------------------

 From: William Kelly @ ECT   12/20/2000 08:31 AM

To: Kam Keiser/HOU/ECT@ECT, Darron C Giron/HOU/ECT@ECT, David
Baumbach/HOU/ECT@ECT, Errol McLaughlin/Corp/Enron@ENRON
cc: Kimat Singla/HOU/ECT@ECT, Kulvinder Fowler/NA/Enron@ENRON, Kyle R
Lilly/HOU/ECT@ECT, Jeff Royed/Corp/Enron@ENRON, Alejandra
Chavez/NA/Enron@ENRON, Crystal Hyde/HOU/ECT@ECT

Subject: New EAST books

We have new book names in TAGG for our intramonth portfolios and it is
extremely important that any deal booked to the East is communicated quickly
to someone on my team. I know it will take some time for the new names to
sink in and I do not want us to miss any positions or P&L.

Thanks for your help on this.

New:

Scott Neal : East Northeast

Dick Jenkins: East Marketeast

WK
');
INSERT INTO email([from],[to],subject,body) VALUES('david.forster@enron.com', 'eol.wide@enron.com', 'Change to Stack Manager', 'Effective immediately, there is a change to the Stack Manager which will affect any Inactive Child.

An inactive Child with links to Parent products will not have their calculated prices updated until the Child product is Activated.

When the Child Product is activated, the price will be recalculated and updated BEFORE it is displayed on the web.

This means that if you are inputting a basis price on a Child product, you will not see the final, calculated price until you Activate the product, at which time the customer will also see it.

If you have any questions, please contact the Help Desk on:

Americas: 713 853 4357
Europe: + 44 (0) 20 7783 7783
Asia/Australia: +61 2 9229 2300

Dave');
INSERT INTO email([from],[to],subject,body) VALUES('vince.kaminski@enron.com', 'jhh1@email.msn.com', 'Re: Light reading - see pieces beginning on page 7', 'John,

I saw it. Very interesting.

Vince

"John H Herbert" <jhh1@email.msn.com> on 07/28/2000 08:38:08 AM
To: "Vince J Kaminski" <Vince_J_Kaminski@enron.com>
cc:
Subject: Light reading - see pieces beginning on page 7

Cheers and have a nice weekend,

JHHerbert

- gd000728.pdf

');
INSERT INTO email([from],[to],subject,body) VALUES('matthew.lenhart@enron.com',
'mmmarcantel@equiva.com', 'RE:', 'i will try to line up a pig for you ');
INSERT INTO email([from],[to],subject,body) VALUES('jae.black@enron.com', 'claudette.harvey@enron.com,
chaun.roberts@enron.com, judy.martinez@enron.com,', 'Disaster Recovery Equipment', 'As a reminder...there are
several pieces of equipment that are set up on the 30th Floor, as well as on our floor, for the Disaster Recovery
Team. PLEASE DO NOT TAKE, BORROW OR USE this equipment. Should you need to use another computer
system, other than yours, or make conference calls please work with your Assistant to help find or set up equipment
for you to use.

Thanks for your understanding in this matter.

T.Jae Black
East Power Trading
Assistant to Kevin Presto
off. 713-853-5800
fax 713-646-8272
cell 713-539-4760');
INSERT INTO email([from],[to],subject,body) VALUES('eric.bass@enron.com', 'dale.neuner@enron.com', '5 X
24', 'Dale,

Have you heard anything more on the 5 X 24s? We would like to get this
product out ASAP.

Thanks,

Eric');
INSERT INTO email([from],[to],subject,body) VALUES('messenger@smartreminders.com', 'm..tholt@enron.com',
'10% Coupon - PrintPal Printer Cartridges - 100% Guaranteed', '[IMAGE]
[IMAGE][IMAGE][IMAGE]
Dear SmartReminders Member,
    [IMAGE]   [IMAGE]   [IMAGE]   [IMAGE]   [IMAGE]   [IMAGE]   [IMAGE]   [IMAGE]

We respect your privacy and are a Certified Participant of the BBBOnLine

Privacy Program. To be removed from future offers,click here.

SmartReminders.com is a permission based service. To unsubscribe click here . ');

INSERT INTO email([from],[to],subject,body) VALUES('benjamin.rogers@enron.com',

'mark.bernstein@enron.com', '', 'The guy you are talking about left CIN under a "cloud of suspicion" sort of

speak. He was the one who got into several bad deals and PPA"s in California

for CIN, thus he left on a bad note. Let me know if you need more detail

than that, I felt this was the type of info you were looking for. Thanks!

Ben');

INSERT INTO email([from],[to],subject,body) VALUES('enron_update@concureworkplace.com',

'michelle.cash@enron.com', 'Expense Report Receipts Not Received', 'Employee Name: Michelle Cash

Report Name: Houston Cellular 8-11-01

Report Date: 12/13/01

Report ID: 594D37C9ED2111D5B452

Submitted On: 12/13/01

You are only allowed 2 reports with receipts outstanding. Your expense reports will not be paid until you meet this

requirement.');

INSERT INTO email([from],[to],subject,body) VALUES('susan.mara@enron.com', 'ray.alvarez@enron.com,

mark.palmer@enron.com, karen.denne@enron.com,', 'CAISO Emergency Motion -- to discontinue market-based

rates for', 'FYI. the latest broadside against the generators.

Sue Mara

Enron Corp.

Tel: (415) 782-7802

Fax:(415) 782-7854

----- Forwarded by Susan J Mara/NA/Enron on 06/08/2001 12:24 PM -----

 "Milner, Marcie" <MMilner@coral-energy.com> 06/08/2001 11:13 AM   To: ""smara@enron.com""

<smara@enron.com> cc: Subject: CAISO Emergency Motion

Sue, did you see this emergency motion the CAISO filed today? Apparently

they are requesting that FERC discontinue market-based rates immediately and

grant refunds plus interest on the difference between cost-based rates and market revenues received back to May 2000. They are requesting the commission act within 14 days. Have you heard anything about what they are doing?

Marcie

http://www.caiso.com/docs/2001/06/08/200106081005526469.pdf
');
INSERT INTO email([from],[to],subject,body) VALUES('fletcher.sturm@enron.com', 'eloy.escobar@enron.com', 'Re: General Brinks Position Meeting', 'Eloy,

Who is General Brinks?

Fletch');
INSERT INTO email([from],[to],subject,body) VALUES('nailia.dindarova@enron.com', 'richard.shapiro@enron.com', 'Documents for Mark Frevert (on EU developments and lessons from', 'Rick,

Here are the documents that Peter has prepared for Mark Frevert.

Nailia
---------------------- Forwarded by Nailia Dindarova/LON/ECT on 25/06/2001 16:36 --------------------------

Nailia Dindarova
25/06/2001 15:36
To: Michael Brown/Enron@EUEnronXGate
cc: Ross Sankey/Enron@EUEnronXGate, Eric Shaw/ENRON@EUEnronXGate, Peter Styles/LON/ECT@ECT

Subject: Documents for Mark Frevert (on EU developments and lessons from California)

Michael,

These are the documents that Peter promised to give to you for Mark Frevert. He has now handed them to him in person but asked me to transmit them electronically to you, as well as Eric and Ross.

Nailia

');

INSERT INTO email([from],[to],subject,body) VALUES('peggy.a.kostial@accenture.com', 'dave.samuels@enron.com', 'EOL-Accenture Deal Sheet', 'Dave -

Attached are our comments and suggested changes. Please call to review.

On the time line for completion, we have four critical steps to complete:
    Finalize market analysis to refine business case, specifically
    projected revenue stream
    Complete counterparty surveying, including targeting 3 CPs for letters
    of intent
    Review Enron asset base for potential reuse/ licensing
    Contract negotiations

Joe will come back to us with an updated time line, but it is my
expectation that we are still on the same schedule (we just begun week
three) with possibly a week or so slippage.....contract negotiations will
probably be the critical path.

We will send our cut at the actual time line here shortly. Thanks,

Peggy

(See attached file: accenture-dealpoints v2.doc)
- accenture-dealpoints v2.doc ');
INSERT INTO email([from],[to],subject,body) VALUES('thomas.martin@enron.com', 'thomas.martin@enron.com', 'Re: Guadalupe Power Partners LP', '---------------------- Forwarded by Thomas A Martin/HOU/ECT on 03/20/2001 03:49 PM --------------------------

Thomas A Martin
10/11/2000 03:55 PM
To: Patrick Wade/HOU/ECT@ECT
cc:
Subject: Re: Guadalupe Power Partners LP

The deal is physically served at Oasis Waha or Oasis Katy and is priced at
either HSC, Waha or Katytailgate GD at buyers option three days prior to
NYMEX close.

');
INSERT INTO email([from],[to],subject,body) VALUES('judy.townsend@enron.com', 'dan.junek@enron.com, chris.germany@enron.com', 'Columbia Distribution''s Capacity Available for Release - Sum', '----------------------
Forwarded by Judy Townsend/HOU/ECT on 03/09/2001 11:04
AM --------------------------

agoddard@nisource.com on 03/08/2001 09:16:57 AM
To: "   -   *Koch, Kent" <kkoch@nisource.com>, "   -

*Millar, Debra" <dmillar@nisource.com>, "   -   *Burke, Lynn"
<lburke@nisource.com>
cc: "   -   *Heckathorn, Tom" <theckathorn@nisource.com>
Subject: Columbia Distribution"s Capacity Available for Release - Sum

Attached is Columbia Distribution"s notice of capacity available for release
for
the summer of 2001 (Apr. 2001 through Oct. 2001).

Please note that the deadline for bids is 3:00pm EST on March 20, 2001.

If you have any questions, feel free to contact any of the representatives
listed
at the bottom of the attachment.

Aaron Goddard

- 2001Summer.doc
');
INSERT INTO email([from],[to],subject,body) VALUES('rhonda.denton@enron.com', 'tim.belden@enron.com,
dana.davis@enron.com, genia.fitzgerald@enron.com,', 'Split Rock Energy LLC', 'We have received the executed
EEI contract from this CP dated 12/12/2000.
Copies will be distributed to Legal and Credit.');
INSERT INTO email([from],[to],subject,body) VALUES('kerrymcelroy@dwt.com', 'jack.speer@alcoa.com,
crow@millernash.com, michaelearly@earthlink.net,', 'Oral Argument Request', ' - Oral Argument Request.doc');
INSERT INTO email([from],[to],subject,body) VALUES('mike.carson@enron.com', 'rlmichaelis@hormel.com', '',
'Did you come in town this wk end..... My new number at our house is :
713-668-3712...... my cell # is 281-381-7332

the kid');
INSERT INTO email([from],[to],subject,body) VALUES('cooper.richey@enron.com', 'trycooper@hotmail.com',
'FW: Contact Info', '

-----Original Message-----
From: Punja, Karim
Sent: Thursday, December 13, 2001 2:35 PM
To: Richey, Cooper
Subject: Contact Info

Cooper,

Its been a real pleasure working with you (even though it was for only a small amount of time)
I hope we can stay in touch.

Home# 234-0249
email: kpunja@hotmail.com

Take Care,

Karim.
 ');
INSERT INTO email([from],[to],subject,body) VALUES('bjm30@earthlink.net', 'mcguinn.k@enron.com,
mcguinn.ian@enron.com, mcguinn.stephen@enron.com,', 'email address change', 'Hello all.

I haven"t talked to many of you via email recently but I do want to give you
my new address for your email file:

   bjm30@earthlink.net

I hope all is well.

Brian McGuinn');
INSERT INTO email([from],[to],subject,body) VALUES('shelley.corman@enron.com', 'steve.hotte@enron.com',
'Flat Panels', 'Can you please advise what is going on with the flat panels that we had planned to distribute to our gas
logistics team. It was in the budget and we had the okay, but now I"m hearing there is some hold-up & the units are
stored on 44.

Shelley');
INSERT INTO email([from],[to],subject,body) VALUES('sara.davidson@enron.com',
'john.schwartzenburg@enron.com, scott.dieball@enron.com, recipients@enron.com,', '2001 Enron Law Conference
(Distribution List 2)', '   Enron Law Conference

San Antonio, Texas   May 2-4, 2001   Westin Riverwalk

          See attached memo for more details!!

? Registration for the law conference this year will be handled through an
Online RSVP Form on the Enron Law Conference Website at
http://lawconference.corp.enron.com. The website is still under construction
and will not be available until Thursday, March 15, 2001.

? We will send you another e-mail to confirm when the Law Conference Website
is operational.

? Please complete the Online RSVP Form as soon as it is available and submit
it no later than Friday, March 30th.

');
INSERT INTO email([from],[to],subject,body) VALUES('tori.kuykendall@enron.com',
'heath.b.taylor@accenture.com', 'Re:', 'hey - thats funny about john - he definitely remembers him - i"ll call pat
and let him know - we are coming on saturday - i just havent had a chance to
call you guys back -- looking forward to it -- i probably need the
directions again though');
INSERT INTO email([from],[to],subject,body) VALUES('darron.giron@enron.com', 'bryce.baxter@enron.com',
'Re: Feedback for Audrey Cook', 'Bryce,

I"ll get it done today.

DG   3-9573

From: Bryce Baxter   06/12/2000 07:15 PM

To: Darron C Giron/HOU/ECT@ECT
cc:
Subject: Feedback for Audrey Cook

You were identified as a reviewer for Audrey Cook. If possible, could you
complete her feedback by end of business Wednesday? It will really help me
in the PRC process to have your input. Thanks.

');
INSERT INTO email([from],[to],subject,body) VALUES('casey.evans@enron.com', 'stephanie.sever@enron.com',
'Gas EOL ID', 'Stephanie,

In conjunction with the recent movement of several power traders, they are changing the names of their gas books as
well. The names of the new gas books and traders are as follows:

PWR-NG-LT-SPP: Mike Carson
PWR-NG-LT-SERC: Jeff King

If you need to know their power desk to map their ID to their gas books, those desks are as follows:

EPMI-LT-SPP: Mike Carson
EPMI-LT-SERC: Jeff King

I will be in training this afternoon, but will be back when class is over. Let me know if you have any questions.

Thanks for your help!
Casey');
INSERT INTO email([from],[to],subject,body) VALUES('darrell.schoolcraft@enron.com',

'david.roensch@enron.com, kimberly.watson@enron.com, michelle.lokay@enron.com,', 'Postings', 'Please see the attached.

ds

');
INSERT INTO email([from],[to],subject,body) VALUES('mcominsky@aol.com', 'cpatman@bracepatt.com, james_derrick@enron.com', 'Jurisprudence Luncheon', 'Carrin & Jim --

It was an honor and a pleasure to meet both of you yesterday. I know we will
have fun working together on this very special event.

Jeff left the jurisprudence luncheon lists for me before he left on vacation.
I wasn"t sure whether he transmitted them to you as well. Would you please
advise me if you would like them sent to you? I can email the MS Excel files
or I can fax the hard copies to you.   Please advise what is most convenient.

I plan to be in town through the holidays and can be reached by phone, email,
or cell phone at any time. My cell phone number is 713/705-4829.

Thanks again for your interest in the ADL"s work. Martin.

Martin B. Cominsky
Director, Southwest Region
Anti-Defamation League
713/627-3490, ext. 122
713/627-2011 (fax)
MCominsky@aol.com');
INSERT INTO email([from],[to],subject,body) VALUES('phillip.love@enron.com', 'todagost@utmb.edu, gbsonnta@utmb.edu', 'New President', 'I had a little bird put a word in my ear. Is there any possibility for Ben Raimer to be Bush"s secretary of HHS? Just curious about that infamous UTMB
rumor mill. Hope things are well, happy holidays.
PL');
INSERT INTO email([from],[to],subject,body) VALUES('marie.heard@enron.com', 'ehamilton@fna.com', 'ISDA Master Agreement', 'Erin:

Pursuant to your request, attached are the Schedule to the ISDA Master Agreement, together with Paragraph 13 to the ISDA Credit Support Annex. Please let me know if you need anything else. We look forward to hearing your comments.

Marie

Marie Heard
Senior Legal Specialist

Enron North America Corp.

Phone: (713) 853-3907

Fax: (713) 646-3490

marie.heard@enron.com

      ');
INSERT INTO email([from],[to],subject,body) VALUES('andrea.ring@enron.com', 'beverly.beaty@enron.com', 'Re: Tennessee Buy - Louis Dreyfus', 'Beverly - once again thanks so much for your help on this.

                                    ');
INSERT INTO email([from],[to],subject,body) VALUES('karolyn.criado@enron.com', 'j..bonin@enron.com, felicia.case@enron.com, b..clapp@enron.com,', 'Price List week of Oct. 8-9, 2001', '
Please contact me if you have any questions regarding last weeks prices.

Thank you,
Karolyn Criado
3-9441

');
INSERT INTO email([from],[to],subject,body) VALUES('kevin.presto@enron.com', 'edward.baughman@enron.com, billy.braddock@enron.com', 'Associated', 'Please begin working on filling our Associated short position in 02.   I would like to take this risk off the books.

In addition, please find out what a buy-out of VEPCO would cost us.   With Rogers transitioning to run our retail risk management, I would like to clean up our customer positions.

We also need to continue to explore a JEA buy-out.

Thanks.');
INSERT INTO email([from],[to],subject,body) VALUES('stacy.dickson@enron.com', 'gregg.penman@enron.com', 'RE: Constellation TC 5-7-01', 'Gregg,

I am at home with a sick baby. (Lots of fun!) I will call you about this
tomorrow.

Stacy');
INSERT INTO email([from],[to],subject,body) VALUES('joe.quenet@enron.com', 'dfincher@utilicorp.com', '', 'hey big guy.....check this out.....

w ww.gorelieberman-2000.com/');
INSERT INTO email([from],[to],subject,body) VALUES('k..allen@enron.com', 'jacqestc@aol.com', '', 'Jacques,

I sent you a fax of Kevin Kolb''s comments on the release. The payoff on the note would be $36,248

($36090(principal) + $158 (accrued interest)).
This is assuming we wrap this up on Tuesday.

Please email to confirm that their changes are ok so I can set up a meeting on Tuesday to reach closure.

Phillip');
INSERT INTO email([from],[to],subject,body) VALUES('kourtney.nelson@enron.com',
'mike.swerzbin@enron.com', 'Adjusted L/R Balance', 'Mike,

I placed the adjusted L/R Balance on the Enronwest site. It is under the "Staff/Kourtney Nelson". There are two links:

1) "Adj L_R" is the same data/format from the weekly strategy meeting.
2) "New Gen 2001_2002" link has all of the supply side info that is used to calculate the L/R balance
 -Please note the Data Flag column, a value of "3" indicates the project was cancelled, on hold, etc and is not included in the calc.

Both of these sheets are interactive Excel spreadsheets and thus you can play around with the data as you please. Also, James Bruce is working to get his gen report on the web. That will help with your access to information on new gen.

Please let me know if you have any questions or feedback,

Kourtney

Kourtney Nelson
Fundamental Analysis
Enron North America
(503) 464-8280
kourtney.nelson@enron.com');
INSERT INTO email([from],[to],subject,body) VALUES('d..thomas@enron.com', 'naveed.ahmed@enron.com',
'FW: Current Enron TCC Portfolio', '

-----Original Message-----
From: Grace, Rebecca M.
Sent: Monday, December 17, 2001 9:44 AM
To: Thomas, Paul D.
Cc: Cashion, Jim; Allen, Thresa A.; May, Tom
Subject: RE: Current Enron TCC Portfolio

Paul,

I reviewed NY"s list. I agree with all of their contracts numbers and mw amounts.

Call if you have any more questions.

Rebecca

-----Original Message-----
From: Thomas, Paul D.
Sent: Monday, December 17, 2001 9:08 AM
To: Grace, Rebecca M.
Subject: FW: Current Enron TCC Portfolio

<< File: enrontccs.xls >>
Rebecca,
Let me know if you see any differences.

Paul
X 3-0403
-----Original Message-----
From: Thomas, Paul D.
Sent: Monday, December 17, 2001 9:04 AM
To: Ahmed, Naveed
Subject: FW: Current Enron TCC Portfolio

-----Original Message-----
From: Thomas, Paul D.
Sent: Thursday, December 13, 2001 10:01 AM
To: Baughman, Edward D.
Subject: Current Enron TCC Portfolio

');
INSERT INTO email([from],[to],subject,body) VALUES('stephanie.panus@enron.com',
'william.bradford@enron.com, debbie.brackett@enron.com,', 'Coastal Merchant Energy/El Paso Merchant Energy',
'Coastal Merchant Energy, L.P. merged with and into El Paso Merchant Energy,
L.P., effective February 1, 2001, with the surviving entity being El Paso
Merchant Energy, L.P. We currently have ISDA Master Agreements with both
counterparties. Please see the attached memo regarding the existing Masters
and let us know which agreement should be terminated.

Thanks,
Stephanie
');
INSERT INTO email([from],[to],subject,body) VALUES('kam.keiser@enron.com', 'c..kenne@enron.com', 'RE:
What about this too???', '

-----Original Message-----
From: Kenne, Dawn C.
Sent: Wednesday, February 06, 2002 11:50 AM
To: Keiser, Kam
Subject: What about this too???

<< File: Netco Trader Matrix.xls >>
');
INSERT INTO email([from],[to],subject,body) VALUES('chris.meyer@enron.com', 'joe.parks@enron.com',
'Centana', 'Talked to Chip. We do need Cash Committe approval given the netting feature of your deal, which
means Batch Funding Request. Please update per my previous e-mail and forward.

Thanks

chris
x31666');
INSERT INTO email([from],[to],subject,body) VALUES('debra.perlingiere@enron.com',
'jworman@academyofhealth.com', '', 'Have a great weekend!   Happy Fathers Day!

Debra Perlingiere
Enron North America Corp.
1400 Smith Street, EB 3885
Houston, Texas 77002
dperlin@enron.com
Phone 713-853-7658
Fax 713-646-3490');
INSERT INTO email([from],[to],subject,body) VALUES('outlook.team@enron.com', '', 'Demo by Martha Janousek
of Dashboard & Pipeline Profile / Julia &', 'CALENDAR ENTRY: APPOINTMENT

Description:
 Demo by Martha Janousek of Dashboard & Pipeline Profile / Julia & Dir Rpts. - 4102

Date: 1/5/2001
Time: 9:00 AM - 10:00 AM (Central Standard Time)

Chairperson: Outlook Migration Team

Detailed Description:');
INSERT INTO email([from],[to],subject,body) VALUES('diana.seifert@enron.com', 'mark.taylor@enron.com',
'Guest access Chile', 'Hello Mark,

Justin Boyd told me that your can help me with questions regarding Chile.
We got a request for guest access through MG.
The company is called Escondida and is a subsidiary of BHP Australia.

Please advise if I can set up a guest account or not.

F.Y.I.: MG is planning to put a "in w/h Chile" contract for Copper on-line as
soon as Enron has done the due diligence for this country.
Thanks !

Best regards

Diana Seifert
EOL PCG');
INSERT INTO email([from],[to],subject,body) VALUES('enron_update@concureworkplace.com',
'mark.whitt@enron.com', '<<Concur Expense Document>> - 121001', 'The Approval status has changed on the
following report:

Status last changed by: Barry L. Tycholiz
Expense Report Name: 121001
Report Total: $198.98
Amount Due Employee: $198.98
Amount Approved: $198.98
Amount Paid: $0.00
Approval Status: Approved
Payment Status: Pending

To review this expense report, click on the following link for Concur Expense.
http://expensexms.enron.com');
INSERT INTO email([from],[to],subject,body) VALUES('kevin.hyatt@enron.com', '', 'Technical Support', 'Outside
the U.S., please refer to the list below:

Australia:
1800 678-515
support@palm-au.com

Canada:
1905 305-6530
support@palm.com

New Zealand:
0800 446-398
support@palm-nz.com

U.K.:
0171 867 0108
eurosupport@palm.3com.com

Please refer to the Worldwide Customer Support card for a complete technical support contact list.');
INSERT INTO email([from],[to],subject,body) VALUES('geoff.storey@enron.com', 'dutch.quigley@enron.com',
'RE:', 'duke contact?

-----Original Message-----
From: Quigley, Dutch
Sent: Wednesday, October 31, 2001 10:14 AM
To: Storey, Geoff
Subject: RE:

bp corp Albert LaMore 281-366-4962

running the reports now

-----Original Message-----
From: Storey, Geoff
Sent: Wednesday, October 31, 2001 10:10 AM
To: Quigley, Dutch
Subject: RE:

give me a contact over there too
BP

-----Original Message-----
From: Quigley, Dutch
Sent: Wednesday, October 31, 2001 9:42 AM
To: Storey, Geoff
Subject:

Coral Jeff Whitnah 713-767-5374
Relaint Steve McGinn 713-207-4000');
INSERT INTO email([from],[to],subject,body) VALUES('pete.davis@enron.com', 'pete.davis@enron.com', 'Start
Date: 4/22/01; HourAhead hour: 3; <CODESITE>', 'Start Date: 4/22/01; HourAhead hour: 3; No ancillary
schedules awarded.
Variances detected.
Variances detected in Load schedule.

  LOG MESSAGES:

PARSING FILE -->> O:\Portland\WestDesk\California Scheduling\ISO Final
Schedules\2001042203.txt

---- Load Schedule ----
$$$ Variance found in table tblLoads.
   Details: (Hour: 3 / Preferred: 1.92 / Final: 1.89)
 TRANS_TYPE: FINAL
 LOAD_ID: PGE4
 MKT_TYPE: 2
 TRANS_DATE: 4/22/01
 SC_ID: EPMI

```
');
INSERT INTO email([from],[to],subject,body) VALUES('john.postlethwaite@enron.com',
'john.zufferli@enron.com', 'Reference', 'John, hope things are going well up there for you. The big day is almost
here for you and Jessica. I was wondering if I could use your name as a job reference if need be. I am just trying to
get everything in order just in case something happens.

John');
INSERT INTO email([from],[to],subject,body) VALUES('jeffrey.shankman@enron.com',
'lschiffm@jonesday.com', 'Re:', 'I saw you called on the cell this a.m.  Sorry I missed you.  (I was in the
shower).  I have had a shitty week--I suspect my silence (not only to you,
but others) after our phone call is a result of the week.  I''m seeing Glen at
11:15....talk to you');
INSERT INTO email([from],[to],subject,body) VALUES('litebytz@enron.com', '', 'Lite Bytz RSVP', '
This week''s Lite Bytz presentation will feature the following TOOLZ speaker:

Richard McDougall
Solaris 8
Thursday, June 7, 2001

If you have not already signed up, please RSVP via email to litebytz@enron.com by the end of the day Tuesday,
June 5, 2001.

*Remember: this is now a Brown Bag Event--so bring your lunch and we will provide cookies and drinks.

Click below for more details.

http://home.enron.com:84/messaging/litebytztoolzprint.jpg');
  COMMIT;
 }
} {}


##############################################################################
# Everything above just builds an interesting test database.  The actual
# tests come after this comment.
##############################################################################

do_test fts1c-1.2 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH 'mark'
 }
} {6 17 25 38 40 42 73 74}
do_test fts1c-1.3 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH 'susan'
 }
} {24 40}
do_test fts1c-1.4 {
```

```
   execsql {
     SELECT rowid FROM email WHERE email MATCH 'mark susan'
   }
} {40}
do_test fts1c-1.5 {
  execsql {
     SELECT rowid FROM email WHERE email MATCH 'susan mark'
   }
} {40}
do_test fts1c-1.6 {
  execsql {
     SELECT rowid FROM email WHERE email MATCH '"mark susan"'
   }
} {}
do_test fts1c-1.7 {
  execsql {
     SELECT rowid FROM email WHERE email MATCH 'mark -susan'
   }
} {6 17 25 38 42 73 74}
do_test fts1c-1.8 {
  execsql {
     SELECT rowid FROM email WHERE email MATCH '-mark susan'
   }
} {24}
do_test fts1c-1.9 {
  execsql {
     SELECT rowid FROM email WHERE email MATCH 'mark OR susan'
   }
} {6 17 24 25 38 40 42 73 74}

# Some simple tests of the automatic "offsets(email)" column.  In the sample
# data set above, only one message, number 20, contains the words
# "gas" and "reminder" in both body and subject.
#
do_test fts1c-2.1 {
  execsql {
     SELECT rowid, offsets(email) FROM email
      WHERE email MATCH 'gas reminder'
   }
} {20 {2 0 42 3 2 1 54 8 3 0 42 3 3 1 54 8 3 0 129 3 3 0 143 3 3 0 240 3}}
do_test fts1c-2.2 {
  execsql {
     SELECT rowid, offsets(email) FROM email
      WHERE email MATCH 'subject:gas reminder'
   }
} {20 {2 0 42 3 2 1 54 8 3 1 54 8}}
do_test fts1c-2.3 {
  execsql {
```

```
    SELECT rowid, offsets(email) FROM email
     WHERE email MATCH 'body:gas reminder'
 }
} {20 {2 1 54 8 3 0 42 3 3 1 54 8 3 0 129 3 3 0 143 3 3 0 240 3}}
do_test fts1c-2.4 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE subject MATCH 'gas reminder'
 }
} {20 {2 0 42 3 2 1 54 8}}
do_test fts1c-2.5 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE body MATCH 'gas reminder'
 }
} {20 {3 0 42 3 3 1 54 8 3 0 129 3 3 0 143 3 3 0 240 3}}

# Document 32 contains 5 instances of the world "child".  But only
# 3 of them are paired with "product".  Make sure only those instances
# that match the phrase appear in the offsets(email) list.
#
do_test fts1c-3.1 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE body MATCH 'child product' AND +rowid=32
 }
} {32 {3 0 94 5 3 0 114 5 3 0 207 5 3 1 213 7 3 0 245 5 3 1 251 7 3 0 409 5 3 1 415 7 3 1 493 7}}
do_test fts1c-3.2 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE body MATCH '"child product"'
 }
} {32 {3 0 207 5 3 1 213 7 3 0 245 5 3 1 251 7 3 0 409 5 3 1 415 7}}

# Snippet generator tests
#
do_test fts1c-4.1 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'subject:gas reminder'
 }
} {{Alert Posted 10:00 AM November 20,2000: E-<b>GAS</b> Request <b>Reminder</b>}}
do_test fts1c-4.2 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'christmas candlelight'
 }
} {{<b>...</b> place.? What do you think about going here <b>Christmas</b>
```

eve?? They have an 11:00 a.m. service and a candlelight service at 5:00 p.m.,
among others. ...}}

```
do_test fts1c-4.3 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'deal sheet potential reuse'
 }
} {{EOL-Accenture <b>Deal</b> <b>Sheet</b> <b>...</b> intent
   Review Enron asset base for <b>potential</b> <b>reuse</b>/ licensing
   Contract negotiations <b>...</b>}}
do_test fts1c-4.4 {
 execsql {
   SELECT snippet(email,'<<<','>>>',' ') FROM email
    WHERE email MATCH 'deal sheet potential reuse'
 }
} {{EOL-Accenture <<<Deal>>> <<<Sheet>>>  intent
   Review Enron asset base for <<<potential>>> <<<reuse>>>/ licensing
   Contract negotiations  }}
do_test fts1c-4.5 {
 execsql {
   SELECT snippet(email,'<<<','>>>',' ') FROM email
    WHERE email MATCH 'first things'
 }
} {{Re: <<<First>>> Polish Deal!  Congrats!  <<<Things>>> seem to be building rapidly now on the  }}
do_test fts1c-4.6 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'chris is here'
 }
} {{<b>chris</b>.germany@enron.com <b>...</b> Sounds good to me.  I bet this <b>is</b> next to the Warick??
Hotel. <b>...</b> place.? What do you think about going <b>here</b> Christmas
eve?? They have an 11:00 a.m. <b>...</b>}}
do_test fts1c-4.7 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH '"pursuant to"'
 }
} {{Erin:

<b>Pursuant</b> <b>to</b> your request, attached are the Schedule to <b>...</b>}}
do_test fts1c-4.8 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'ancillary load davis'
 }
} {{pete.<b>davis</b>@enron.com <b>...</b> Start Date: 4/22/01; HourAhead hour: 3;  No <b>ancillary</b>
schedules awarded.
```

Variances detected.
Variances detected in Load schedule.

LOG MESSAGES:

PARSING ...}}

Combinations of AND and OR operators:
#
do_test fts1c-5.1 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'questar enron OR com'
 }
} {{matt.smith@enron.com ... six reports:

31 Keystone Receipts
15 Questar Pipeline
40 Rockies Production
22 West_2 ...}}
do_test fts1c-5.2 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'enron OR com questar'
 }
} {{matt.smith@enron.com ... six reports:

31 Keystone Receipts
15 Questar Pipeline
40 Rockies Production
22 West_2 ...}}

finish_test

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/test/fts1c.test
No license file was found, but licenses were detected in source scan.

/opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/art/SQLite.eps: binary file matches

Found in path(s):
* /bin/grep
No license file was found, but licenses were detected in source scan.

set rcsid {$Id: copyright.tcl,v 1.6 2007/03/10 20:50:18 drh Exp $}
source common.tcl
header {SQLite Copyright}

```
puts {
<h2>SQLite Copyright</h2>

<table align="right" vspace="0" hspace="10" border="1" cellpadding="20">
<tr><td align="center">
<img src="nocopy.gif"><br>
SQLite is in the<br>
<a href="http://en.wikipedia.org/wiki/Public_Domain">Public Domain</a>
</td></tr>
</table>

<p>
All of the deliverable code in SQLite has been dedicated to the
<a href="http://en.wikipedia.org/wiki/Public_Domain">public domain</a>
by the authors.
All code authors, and representatives of the companies they work for,
have signed affidavits dedicating their contributions to
the public domain and originals of
those signed affidavits are stored in a firesafe at the main offices
of <a href="http://www.hwaci.com">Hwaci</a>.
Anyone is free to copy, modify, publish, use, compile, sell, or distribute
the original SQLite code, either in source code form or as a compiled binary,
for any purpose, commercial or non-commercial, and by any means.
</p>

<p>
The previous paragraph applies to the deliverable code in SQLite -
those parts of the SQLite library that you actually bundle and
ship with a larger application.  Portions of the documentation and
some code used as part of the build process might fall under
other licenses.  The details here are unclear.  We do not worry
about the licensing of the documentation and build code so much
because none of these things are part of the core deliverable
SQLite library.
</p>

<p>
All of the deliverable code in SQLite has been written from scratch.
No code has been taken from other projects or from the open
internet.  Every line of code can be traced back to its original
author, and all of those authors have public domain dedications
on file.  So the SQLite code base is clean and is
uncontaminated with licensed code from other projects.
</p>

<h2>Obtaining An Explicit License To Use SQLite</h2>

<p>
```

Even though SQLite is in the public domain and does not require
a license, some users want to obtain a license anyway. Some reasons
for obtaining a license include:
</p>

 You are using SQLite in a jurisdiction that does not recognize
    the public domain.
 You are using SQLite in a jurisdiction that does not recognize
    the right of an author to dedicate their work to the public
    domain.
 You want to hold a tangible legal document
    as evidence that you have the legal right to use and distribute
    SQLite.
 Your legal department tells you that you have to purchase a license.

<p>
If you feel like you really have to purchase a license for SQLite,
Hwaci, the company that employs
the architect and principal developers of SQLite, will sell you
one.
Please contact:
</p>

<blockquote>
D. Richard Hipp
Hwaci - Applied Software Research
704.948.4565
drh@hwaci.com
</blockquote>

<h2>Contributed Code</h2>

<p>
In order to keep SQLite completely free and unencumbered by copyright,
all new contributors to the SQLite code base are asked to dedicate
their contributions to the public domain.
If you want to send a patch or enhancement for possible inclusion in the
SQLite source tree, please accompany the patch with the following statement:
</p>

<blockquote><i>
The author or authors of this code dedicate any and all copyright interest
in this code to the public domain. We make this dedication for the benefit
of the public at large and to the detriment of our heirs and successors.
We intend this dedication to be an overt act of relinquishment in

perpetuity of all present and future rights this code under copyright law.
</i></blockquote>

<p>
We are not able to accept patches or changes to
SQLite that are not accompanied by a statement such as the above.
In addition, if you make
changes or enhancements as an employee, then a simple statement such as the
above is insufficient. You must also send by surface mail a copyright release
signed by a company officer.
A signed original of the copyright release should be mailed to:</p>

<blockquote>
Hwaci
6200 Maple Cove Lane
Charlotte, NC 28269
USA
</blockquote>

<p>
A template copyright release is available
in PDF or
HTML.
You can use this release to make future changes.
</p>
}
footer $rcsid

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/www/copyright.tcl
No license file was found, but licenses were detected in source scan.

public domain. No claim of ownership is made

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/www/faq.tcl
No license file was found, but licenses were detected in source scan.

2006 October 1
#
The author disclaims copyright to this source code. In place of
a legal notice, here is a blessing:
#
May you do good and not evil.
May you find forgiveness for yourself and forgive others.
May you share freely, never taking more than you give.
#
#***

```
# This file implements regression tests for SQLite library.  The
# focus of this script is testing the FTS1 module, and in particular
# the Porter stemmer.
#
# $Id: fts1porter.test,v 1.5 2006/10/03 19:37:37 drh Exp $
#

set testdir [file dirname $argv0]
source $testdir/tester.tcl

# If SQLITE_ENABLE_FTS1 is defined, omit this file.
ifcapable !fts1 {
 finish_test
 return
}

# Test data for the Porter stemmer.  The first word of each line
# is the input.  The second word is the desired output.
#
# This test data is taken from http://www.tartarus.org/martin/PorterStemmer/
# There is no claim of copyright made on that page, but you should
# probably contact the author (Martin Porter - the inventor of the
# Porter Stemmer algorithm) if you want to use this test data in a
# commerical product of some kind.  The stemmer code in FTS1 is a
# complete rewrite from scratch based on the algorithm specification
# and does not contain any code under copyright.
#
set porter_test_data {
    a              a
    aaron          aaron
    abaissiez       abaissiez
    abandon         abandon
    abandoned        abandon
    abase          abas
    abash          abash
    abate          abat
    abated         abat
    abatement        abat
    abatements       abat
    abates         abat
    abbess         abbess
    abbey          abbei
    abbeys         abbei
    abbominable       abbomin
    abbot          abbot
    abbots         abbot
    abbreviated       abbrevi
    abed           ab
```

abel	abel
aberga	aberga
abergavenny	abergavenni
abet	abet
abetting	abet
abhominable	abhomin
abhor	abhor
abhorr	abhorr
abhorred	abhor
abhorring	abhor
abhors	abhor
abhorson	abhorson
abide	abid
abides	abid
abilities	abil
ability	abil
abject	abject
abjectly	abjectli
abjects	abject
abjur	abjur
abjure	abjur
able	abl
abler	abler
aboard	aboard
abode	abod
aboded	abod
abodements	abod
aboding	abod
abominable	abomin
abominably	abomin
abominations	abomin
abortive	abort
abortives	abort
abound	abound
abounding	abound
about	about
above	abov
abr	abr
abraham	abraham
abram	abram
abreast	abreast
abridg	abridg
abridge	abridg
abridged	abridg
abridgment	abridg
abroach	abroach
abroad	abroad
abrogate	abrog

abrook	abrook
abrupt	abrupt
abruption	abrupt
abruptly	abruptli
absence	absenc
absent	absent
absey	absei
absolute	absolut
absolutely	absolut
absolv	absolv
absolver	absolv
abstains	abstain
abstemious	abstemi
abstinence	abstin
abstract	abstract
absurd	absurd
absyrtus	absyrtu
abundance	abund
abundant	abund
abundantly	abundantli
abus	abu
abuse	abus
abused	abus
abuser	abus
abuses	abus
abusing	abus
abutting	abut
aby	abi
abysm	abysm
ac	ac
academe	academ
academes	academ
accent	accent
accents	accent
accept	accept
acceptable	accept
acceptance	accept
accepted	accept
accepts	accept
access	access
accessary	accessari
accessible	access
accidence	accid
accident	accid
accidental	accident
accidentally	accident
accidents	accid
accite	accit

accited	accit
accites	accit
acclamations	acclam
accommodate	accommod
accommodated	accommod
accommodation	accommod
accommodations	accommod
accommodo	accommodo
accompanied	accompani
accompany	accompani
accompanying	accompani
accomplices	accomplic
accomplish	accomplish
accomplished	accomplish
accomplishing	accomplish
accomplishment	accomplish
accompt	accompt
accord	accord
accordant	accord
accorded	accord
accordeth	accordeth
according	accord
accordingly	accordingli
accords	accord
accost	accost
accosted	accost
account	account
accountant	account
accounted	account
accounts	account
accoutred	accoutr
accoutrement	accoutr
accoutrements	accoutr
accrue	accru
accumulate	accumul
accumulated	accumul
accumulation	accumul
accurs	accur
accursed	accurs
accurst	accurst
accus	accu
accusation	accus
accusations	accus
accusative	accus
accusativo	accusativo
accuse	accus
accused	accus
accuser	accus

accusers	accus
accuses	accus
accuseth	accuseth
accusing	accus
accustom	accustom
accustomed	accustom
ace	ac
acerb	acerb
ache	ach
acheron	acheron
aches	ach
achiev	achiev
achieve	achiev
achieved	achiev
achievement	achiev
achievements	achiev
achiever	achiev
achieves	achiev
achieving	achiev
achilles	achil
aching	ach
achitophel	achitophel
acknowledg	acknowledg
acknowledge	acknowledg
acknowledged	acknowledg
acknowledgment	acknowledg
acknown	acknown
acold	acold
aconitum	aconitum
acordo	acordo
acorn	acorn
acquaint	acquaint
acquaintance	acquaint
acquainted	acquaint
acquaints	acquaint
acquir	acquir
acquire	acquir
acquisition	acquisit
acquit	acquit
acquittance	acquitt
acquittances	acquitt
acquitted	acquit
acre	acr
acres	acr
across	across
act	act
actaeon	actaeon
acted	act

acting	act
action	action
actions	action
actium	actium
active	activ
actively	activ
activity	activ
actor	actor
actors	actor
acts	act
actual	actual
acture	actur
acute	acut
acutely	acut
ad	ad
adage	adag
adallas	adalla
adam	adam
adamant	adam
add	add
added	ad
adder	adder
adders	adder
addeth	addeth
addict	addict
addicted	addict
addiction	addict
adding	ad
addition	addit
additions	addit
addle	addl
address	address
addressing	address
addrest	addrest
adds	add
adhere	adher
adheres	adher
adieu	adieu
adieus	adieu
adjacent	adjac
adjoin	adjoin
adjoining	adjoin
adjourn	adjourn
adjudg	adjudg
adjudged	adjudg
adjunct	adjunct
administer	administ
administration	administr

admir	admir
admirable	admir
admiral	admir
admiration	admir
admire	admir
admired	admir
admirer	admir
admiring	admir
admiringly	admiringli
admission	admiss
admit	admit
admits	admit
admittance	admitt
admitted	admit
admitting	admit
admonish	admonish
admonishing	admonish
admonishment	admonish
admonishments	admonish
admonition	admonit
ado	ado
adonis	adoni
adopt	adopt
adopted	adopt
adoptedly	adoptedli
adoption	adopt
adoptious	adopti
adopts	adopt
ador	ador
adoration	ador
adorations	ador
adore	ador
adorer	ador
adores	ador
adorest	adorest
adoreth	adoreth
adoring	ador
adorn	adorn
adorned	adorn
adornings	adorn
adornment	adorn
adorns	adorn
adown	adown
adramadio	adramadio
adrian	adrian
adriana	adriana
adriano	adriano
adriatic	adriat

adsum	adsum
adulation	adul
adulterate	adulter
adulterates	adulter
adulterers	adulter
adulteress	adulteress
adulteries	adulteri
adulterous	adulter
adultery	adulteri
adultress	adultress
advanc	advanc
advance	advanc
advanced	advanc
advancement	advanc
advancements	advanc
advances	advanc
advancing	advanc
advantage	advantag
advantageable	advantag
advantaged	advantag
advantageous	advantag
advantages	advantag
advantaging	advantag
advent	advent
adventur	adventur
adventure	adventur
adventures	adventur
adventuring	adventur
adventurous	adventur
adventurously	adventur
adversaries	adversari
adversary	adversari
adverse	advers
adversely	advers
adversities	advers
adversity	advers
advertis	adverti
advertise	advertis
advertised	advertis
advertisement	advertis
advertising	advertis
advice	advic
advis	advi
advise	advis
advised	advis
advisedly	advisedli
advises	advis
advisings	advis

advocate	advoc
advocation	advoc
aeacida	aeacida
aeacides	aeacid
aedile	aedil
aediles	aedil
aegeon	aegeon
aegion	aegion
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banister	banist

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barbermonger	barbermong
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bargains	bargain
barge	barg
bargulus	bargulu
baring	bare
bark	bark
barking	bark

barkloughly	barkloughli
barks	bark
barky	barki
barley	barlei
barm	barm
barn	barn
barnacles	barnacl
barnardine	barnardin
barne	barn
barnes	barn
barnet	barnet
barns	barn
baron	baron
barons	baron
barony	baroni
barr	barr
barrabas	barraba
barrel	barrel
barrels	barrel
barren	barren
barrenly	barrenli
barrenness	barren
barricado	barricado
barricadoes	barricado
barrow	barrow
bars	bar
barson	barson
barter	barter
bartholomew	bartholomew
bas	ba
basan	basan
base	base
baseless	baseless
basely	base
baseness	base
baser	baser
bases	base
basest	basest
bashful	bash
bashfulness	bash
basilisco	basilisco
basilisk	basilisk
basilisks	basilisk
basimecu	basimecu
basin	basin
basingstoke	basingstok
basins	basin
basis	basi

bask	bask
basket	basket
baskets	basket
bass	bass
bassanio	bassanio
basset	basset
bassianus	bassianu
basta	basta
bastard	bastard
bastardizing	bastard
bastardly	bastardli
bastards	bastard
bastardy	bastardi
basted	bast
bastes	bast
bastinado	bastinado
basting	bast
bat	bat
batailles	batail
batch	batch
bate	bate
bated	bate
bates	bate
bath	bath
bathe	bath
bathed	bath
bathing	bath
baths	bath
bating	bate
batler	batler
bats	bat
batt	batt
battalia	battalia
battalions	battalion
batten	batten
batter	batter
battering	batter
batters	batter
battery	batteri
battle	battl
battled	battl
battlefield	battlefield
battlements	battlement
battles	battl
batty	batti
bauble	baubl
baubles	baubl
baubling	baubl

baulk	baulk
bavin	bavin
bawcock	bawcock
bawd	bawd
bawdry	bawdri
bawds	bawd
bawdy	bawdi
bawl	bawl
bawling	bawl
bay	bai
baying	bai
baynard	baynard
bayonne	bayonn
bays	bai
be	be
beach	beach
beached	beach
beachy	beachi
beacon	beacon
bead	bead
beaded	bead
beadle	beadl
beadles	beadl
beads	bead
beadsmen	beadsmen
beagle	beagl
beagles	beagl
beak	beak
beaks	beak
beam	beam
beamed	beam
beams	beam
bean	bean
beans	bean
bear	bear
beard	beard
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beardless	beardless
beards	beard
bearer	bearer
bearers	bearer
bearest	bearest
beareth	beareth
bearing	bear
bears	bear
beast	beast
beastliest	beastliest
beastliness	beastli

beastly	beastli
beasts	beast
beat	beat
beated	beat
beaten	beaten
beating	beat
beatrice	beatric
beats	beat
beau	beau
beaufort	beaufort
beaumond	beaumond
beaumont	beaumont
beauteous	beauteou
beautied	beauti
beauties	beauti
beautified	beautifi
beautiful	beauti
beautify	beautifi
beauty	beauti
beaver	beaver
beavers	beaver
became	becam
because	becaus
bechanc	bechanc
bechance	bechanc
bechanced	bechanc
beck	beck
beckon	beckon
beckons	beckon
becks	beck
becom	becom
become	becom
becomed	becom
becomes	becom
becoming	becom
becomings	becom
bed	bed
bedabbled	bedabbl
bedash	bedash
bedaub	bedaub
bedazzled	bedazzl
bedchamber	bedchamb
bedclothes	bedcloth
bedded	bed
bedeck	bedeck
bedecking	bedeck
bedew	bedew
bedfellow	bedfellow

bedfellows	bedfellow
bedford	bedford
bedlam	bedlam
bedrench	bedrench
bedrid	bedrid
beds	bed
bedtime	bedtim
bedward	bedward
bee	bee
beef	beef
beefs	beef
beehives	beehiv
been	been
beer	beer
bees	bee
beest	beest
beetle	beetl
beetles	beetl
beeves	beev
befall	befal
befallen	befallen
befalls	befal
befell	befel
befits	befit
befitted	befit
befitting	befit
befor	befor
before	befor
beforehand	beforehand
befortune	befortun
befriend	befriend
befriended	befriend
befriends	befriend
beg	beg
began	began
beget	beget
begets	beget
begetting	beget
begg	begg
beggar	beggar
beggared	beggar
beggarly	beggarli
beggarman	beggarman
beggars	beggar
beggary	beggari
begging	beg
begin	begin
beginners	beginn

beginning	begin
beginnings	begin
begins	begin
begnawn	begnawn
begone	begon
begot	begot
begotten	begotten
begrimed	begrim
begs	beg
beguil	beguil
beguile	beguil
beguiled	beguil
beguiles	beguil
beguiling	beguil
begun	begun
behalf	behalf
behalfs	behalf
behav	behav
behaved	behav
behavedst	behavedst
behavior	behavior
behaviors	behavior
behaviour	behaviour
behaviours	behaviour
behead	behead
beheaded	behead
beheld	beheld
behest	behest
behests	behest
behind	behind
behold	behold
beholder	behold
beholders	behold
beholdest	beholdest
beholding	behold
beholds	behold
behoof	behoof
behooffull	behoofful
behooves	behoov
behove	behov
behoves	behov
behowls	behowl
being	be
bel	bel
belarius	belariu
belch	belch
belching	belch
beldam	beldam

beldame	beldam
beldams	beldam
belee	bele
belgia	belgia
belie	beli
belied	beli
belief	belief
beliest	beliest
believ	believ
believe	believ
believed	believ
believes	believ
believest	believest
believing	believ
belike	belik
bell	bell
bellario	bellario
belle	bell
bellied	belli
bellies	belli
bellman	bellman
bellona	bellona
bellow	bellow
bellowed	bellow
bellowing	bellow
bellows	bellow
bells	bell
belly	belli
bellyful	belly
belman	belman
belmont	belmont
belock	belock
belong	belong
belonging	belong
belongings	belong
belongs	belong
belov	belov
beloved	belov
beloving	belov
below	below
belt	belt
belzebub	belzebub
bemadding	bemad
bemet	bemet
bemete	bemet
bemoan	bemoan
bemoaned	bemoan
bemock	bemock

bemoil	bemoil
bemonster	bemonst
ben	ben
bench	bench
bencher	bencher
benches	bench
bend	bend
bended	bend
bending	bend
bends	bend
bene	bene
beneath	beneath
benedicite	benedicit
benedick	benedick
benediction	benedict
benedictus	benedictu
benefactors	benefactor
benefice	benefic
beneficial	benefici
benefit	benefit
benefited	benefit
benefits	benefit
benetted	benet
benevolence	benevol
benevolences	benevol
benied	beni
benison	benison
bennet	bennet
bent	bent
bentii	bentii
bentivolii	bentivolii
bents	bent
benumbed	benumb
benvolio	benvolio
bepaint	bepaint
bepray	beprai
bequeath	bequeath
bequeathed	bequeath
bequeathing	bequeath
bequest	bequest
ber	ber
berard	berard
berattle	berattl
beray	berai
bere	bere
bereave	bereav
bereaved	bereav
bereaves	bereav

bereft	bereft
bergamo	bergamo
bergomask	bergomask
berhym	berhym
berhyme	berhym
berkeley	berkelei
bermoothes	bermooth
bernardo	bernardo
berod	berod
berowne	berown
berri	berri
berries	berri
berrord	berrord
berry	berri
bertram	bertram
berwick	berwick
bescreen	bescreen
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beseeched	beseech
beseechers	beseech
beseeching	beseech
beseek	beseek
beseem	beseem
beseemeth	beseemeth
beseeming	beseem
beseems	beseem
beset	beset
beshrew	beshrew
beside	besid
besides	besid
besieg	besieg
besiege	besieg
besieged	besieg
beslubber	beslubb
besmear	besmear
besmeared	besmear
besmirch	besmirch
besom	besom
besort	besort
besotted	besot
bespake	bespak
bespeak	bespeak
bespice	bespic
bespoke	bespok
bespotted	bespot
bess	bess
bessy	bessi
best	best

bestained	bestain
bested	best
bestial	bestial
bestir	bestir
bestirr	bestirr
bestow	bestow
bestowed	bestow
bestowing	bestow
bestows	bestow
bestraught	bestraught
bestrew	bestrew
bestrid	bestrid
bestride	bestrid
bestrides	bestrid
bet	bet
betake	betak
beteem	beteem
bethink	bethink
bethought	bethought
bethrothed	bethroth
bethump	bethump
betid	betid
betide	betid
betideth	betideth
betime	betim
betimes	betim
betoken	betoken
betook	betook
betossed	betoss
betray	betrai
betrayed	betrai
betraying	betrai
betrays	betrai
betrims	betrim
betroth	betroth
betrothed	betroth
betroths	betroth
bett	bett
betted	bet
better	better
bettered	better
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betters	better
betting	bet
bettre	bettr
between	between
betwixt	betwixt
bevel	bevel

beverage	beverag
bevis	bevi
bevy	bevi
bewail	bewail
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bewailing	bewail
bewails	bewail
beware	bewar
bewasted	bewast
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bewept	bewept
bewet	bewet
bewhored	bewhor
bewitch	bewitch
bewitched	bewitch
bewitchment	bewitch
bewray	bewrai
beyond	beyond
bezonian	bezonian
bezonians	bezonian
bianca	bianca
bianco	bianco
bias	bia
bibble	bibbl
bickerings	bicker
bid	bid
bidden	bidden
bidding	bid
biddings	bid
biddy	biddi
bide	bide
bides	bide
biding	bide
bids	bid
bien	bien
bier	bier
bifold	bifold
big	big
bigamy	bigami
biggen	biggen
bigger	bigger
bigness	big
bigot	bigot
bilberry	bilberri
bilbo	bilbo
bilboes	bilbo
bilbow	bilbow
bill	bill

billeted	billet
billets	billet
billiards	billiard
billing	bill
billow	billow
billows	billow
bills	bill
bin	bin
bind	bind
bindeth	bindeth
binding	bind
binds	bind
biondello	biondello
birch	birch
bird	bird
birding	bird
birdlime	birdlim
birds	bird
birnam	birnam
birth	birth
birthday	birthdai
birthdom	birthdom
birthplace	birthplac
birthright	birthright
birthrights	birthright
births	birth
bis	bi
biscuit	biscuit
bishop	bishop
bishops	bishop
bisson	bisson
bit	bit
bitch	bitch
bite	bite
biter	biter
bites	bite
biting	bite
bits	bit
bitt	bitt
bitten	bitten
bitter	bitter
bitterest	bitterest
bitterly	bitterli
bitterness	bitter
blab	blab
blabb	blabb
blabbing	blab
blabs	blab

black	black
blackamoor	blackamoor
blackamoors	blackamoor
blackberries	blackberri
blackberry	blackberri
blacker	blacker
blackest	blackest
blackfriars	blackfriar
blackheath	blackheath
blackmere	blackmer
blackness	black
blacks	black
bladder	bladder
bladders	bladder
blade	blade
bladed	blade
blades	blade
blains	blain
blam	blam
blame	blame
blamed	blame
blameful	blame
blameless	blameless
blames	blame
blanc	blanc
blanca	blanca
blanch	blanch
blank	blank
blanket	blanket
blanks	blank
blaspheme	blasphem
blaspheming	blasphem
blasphemous	blasphem
blasphemy	blasphemi
blast	blast
blasted	blast
blasting	blast
blastments	blastment
blasts	blast
blaz	blaz
blaze	blaze
blazes	blaze
blazing	blaze
blazon	blazon
blazoned	blazon
blazoning	blazon
bleach	bleach
bleaching	bleach

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blear	blear
bleared	blear
bleat	bleat
bleated	bleat
bleats	bleat
bled	bled
bleed	bleed
bleedest	bleedest
bleedeth	bleedeth
bleeding	bleed
bleeds	bleed
blemish	blemish
blemishes	blemish
blench	blench
blenches	blench
blend	blend
blended	blend
blent	blent
bless	bless
blessed	bless
blessedly	blessedli
blessedness	blessed
blesses	bless
blesseth	blesseth
blessing	bless
blessings	bless
blest	blest
blew	blew
blind	blind
blinded	blind
blindfold	blindfold
blinding	blind
blindly	blindli
blindness	blind
blinds	blind
blink	blink
blinking	blink
bliss	bliss
blist	blist
blister	blister
blisters	blister
blithe	blith
blithild	blithild
bloat	bloat
block	block
blockish	blockish
blocks	block

blois	bloi
blood	blood
blooded	blood
bloodhound	bloodhound
bloodied	bloodi
bloodier	bloodier
bloodiest	bloodiest
bloodily	bloodili
bloodless	bloodless
bloods	blood
bloodshed	bloodsh
bloodshedding	bloodshed
bloodstained	bloodstain
bloody	bloodi
bloom	bloom
blooms	bloom
blossom	blossom
blossoming	blossom
blossoms	blossom
blot	blot
blots	blot
blotted	blot
blotting	blot
blount	blount
blow	blow
blowed	blow
blowers	blower
blowest	blowest
blowing	blow
blown	blown
blows	blow
blowse	blows
blubb	blubb
blubber	blubber
blubbering	blubber
blue	blue
bluecaps	bluecap
bluest	bluest
blunt	blunt
blunted	blunt
blunter	blunter
bluntest	bluntest
blunting	blunt
bluntly	bluntli
bluntness	blunt
blunts	blunt
blur	blur
blurr	blurr

blurs	blur
blush	blush
blushes	blush
blushest	blushest
blushing	blush
blust	blust
bluster	bluster
blusterer	bluster
blusters	bluster
bo	bo
boar	boar
board	board
boarded	board
boarding	board
boards	board
boarish	boarish
boars	boar
boast	boast
boasted	boast
boastful	boast
boasting	boast
boasts	boast
boat	boat
boats	boat
boatswain	boatswain
bob	bob
bobb	bobb
boblibindo	boblibindo
bobtail	bobtail
bocchus	bocchu
bode	bode
boded	bode
bodements	bodement
bodes	bode
bodg	bodg
bodied	bodi
bodies	bodi
bodiless	bodiless
bodily	bodili
boding	bode
bodkin	bodkin
body	bodi
bodykins	bodykin
bog	bog
boggle	boggl
boggler	boggler
bogs	bog
bohemia	bohemia

bohemian	bohemian
bohun	bohun
boil	boil
boiling	boil
boils	boil
boist	boist
boisterous	boister
boisterously	boister
boitier	boitier
bold	bold
bolden	bolden
bolder	bolder
boldest	boldest
boldly	boldli
boldness	bold
bolds	bold
bolingbroke	bolingbrok
bolster	bolster
bolt	bolt
bolted	bolt
bolter	bolter
bolters	bolter
bolting	bolt
bolts	bolt
bombard	bombard
bombards	bombard
bombast	bombast
bon	bon
bona	bona
bond	bond
bondage	bondag
bonded	bond
bondmaid	bondmaid
bondman	bondman
bondmen	bondmen
bonds	bond
bondslave	bondslav
bone	bone
boneless	boneless
bones	bone
bonfire	bonfir
bonfires	bonfir
bonjour	bonjour
bonne	bonn
bonnet	bonnet
bonneted	bonnet
bonny	bonni
bonos	bono

bonto	bonto
bonville	bonvil
bood	bood
book	book
bookish	bookish
books	book
boon	boon
boor	boor
boorish	boorish
boors	boor
boot	boot
booted	boot
booties	booti
bootless	bootless
boots	boot
booty	booti
bor	bor
bora	bora
borachio	borachio
bordeaux	bordeaux
border	border
bordered	border
borderers	border
borders	border
bore	bore
boreas	borea
bores	bore
boring	bore
born	born
borne	born
borough	borough
boroughs	borough
borrow	borrow
borrowed	borrow
borrower	borrow
borrowing	borrow
borrows	borrow
bosko	bosko
boskos	bosko
bosky	boski
bosom	bosom
bosoms	bosom
boson	boson
boss	boss
bosworth	bosworth
botch	botch
botcher	botcher
botches	botch

botchy	botchi
both	both
bots	bot
bottle	bottl
bottled	bottl
bottles	bottl
bottom	bottom
bottomless	bottomless
bottoms	bottom
bouciqualt	bouciqualt
bouge	boug
bough	bough
boughs	bough
bought	bought
bounce	bounc
bouncing	bounc
bound	bound
bounded	bound
bounden	bounden
boundeth	boundeth
bounding	bound
boundless	boundless
bounds	bound
bounteous	bounteou
bounteously	bounteous
bounties	bounti
bountiful	bounti
bountifully	bountifulli
bounty	bounti
bourbier	bourbier
bourbon	bourbon
bourchier	bourchier
bourdeaux	bourdeaux
bourn	bourn
bout	bout
bouts	bout
bove	bove
bow	bow
bowcase	bowcas
bowed	bow
bowels	bowel
bower	bower
bowing	bow
bowl	bowl
bowler	bowler
bowling	bowl
bowls	bowl
bows	bow

bowsprit	bowsprit
bowstring	bowstr
box	box
boxes	box
boy	boi
boyet	boyet
boyish	boyish
boys	boi
brabant	brabant
brabantio	brabantio
brabble	brabbl
brabbler	brabbler
brac	brac
brace	brace
bracelet	bracelet
bracelets	bracelet
brach	brach
bracy	braci
brag	brag
bragg	bragg
braggardism	braggard
braggards	braggard
braggart	braggart
braggarts	braggart
bragged	brag
bragging	brag
bragless	bragless
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braid	braid
braided	braid
brain	brain
brained	brain
brainford	brainford
brainish	brainish
brainless	brainless
brains	brain
brainsick	brainsick
brainsickly	brainsickli
brake	brake
brakenbury	brakenburi
brakes	brake
brambles	brambl
bran	bran
branch	branch
branches	branch
branchless	branchless
brand	brand
branded	brand

brandish	brandish
brandon	brandon
brands	brand
bras	bra
brass	brass
brassy	brassi
brat	brat
brats	brat
brav	brav
brave	brave
braved	brave
bravely	brave
braver	braver
bravery	braveri
braves	brave
bravest	bravest
braving	brave
brawl	brawl
brawler	brawler
brawling	brawl
brawls	brawl
brawn	brawn
brawns	brawn
bray	brai
braying	brai
braz	braz
brazen	brazen
brazier	brazier
breach	breach
breaches	breach
bread	bread
breadth	breadth
break	break
breaker	breaker
breakfast	breakfast
breaking	break
breaks	break
breast	breast
breasted	breast
breasting	breast
breastplate	breastplat
breasts	breast
breath	breath
breathe	breath
breathed	breath
breather	breather
breathers	breather
breathes	breath

breathest	breathest
breathing	breath
breathless	breathless
breaths	breath
brecknock	brecknock
bred	bred
breech	breech
breeches	breech
breeching	breech
breed	breed
breeder	breeder
breeders	breeder
breeding	breed
breeds	breed
breese	brees
breeze	breez
breff	breff
bretagne	bretagn
brethen	brethen
bretheren	bretheren
brethren	brethren
brevis	brevi
brevity	breviti
brew	brew
brewage	brewag
brewer	brewer
brewers	brewer
brewing	brew
brews	brew
briareus	briareu
briars	briar
brib	brib
bribe	bribe
briber	briber
bribes	bribe
brick	brick
bricklayer	bricklay
bricks	brick
bridal	bridal
bride	bride
bridegroom	bridegroom
bridegrooms	bridegroom
brides	bride
bridge	bridg
bridgenorth	bridgenorth
bridges	bridg
bridget	bridget
bridle	bridl

bridled	bridl
brief	brief
briefer	briefer
briefest	briefest
briefly	briefli
briefness	brief
brier	brier
briers	brier
brigandine	brigandin
bright	bright
brighten	brighten
brightest	brightest
brightly	brightli
brightness	bright
brim	brim
brimful	brim
brims	brim
brimstone	brimston
brinded	brind
brine	brine
bring	bring
bringer	bringer
bringeth	bringeth
bringing	bring
bringings	bring
brings	bring
brinish	brinish
brink	brink
brisk	brisk
brisky	briski
bristle	bristl
bristled	bristl
bristly	bristli
bristol	bristol
bristow	bristow
britain	britain
britaine	britain
britaines	britain
british	british
briton	briton
britons	briton
brittany	brittani
brittle	brittl
broach	broach
broached	broach
broad	broad
broader	broader
broadsides	broadsid

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brogues	brogu
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brokenly	brokenli
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brooch	brooch
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brooded	brood
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brook	brook
brooks	brook
broom	broom
broomstaff	broomstaff
broth	broth
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brother	brother
brotherhood	brotherhood
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brotherly	brotherli
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browner	browner
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brows	brow
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bruit	bruit
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brundusium	brundusium
brunt	brunt

brush	brush
brushes	brush
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brutish	brutish
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bubble	bubbl
bubbles	bubbl
bubbling	bubbl
bubukles	bubukl
buck	buck
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bucking	buck
buckingham	buckingham
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bullcalf	bullcalf

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bullet	bullet
bullets	bullet
bullocks	bullock
bulls	bull
bully	bulli
bulmer	bulmer
bulwark	bulwark
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bumbast	bumbast
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bunch	bunch
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bundle	bundl
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bungle	bungl
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burbolt	burbolt
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burgher	burgher
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burglary	burglari
burgomasters	burgomast
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burgundy	burgundi
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buttery	butteri
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buttonhole	buttonhol
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by	by
bye	bye
byzantium	byzantium
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cabbage	cabbag
cabileros	cabilero
cabin	cabin
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cable	cabl
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caddis	caddi
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cadmus	cadmu
caduceus	caduceu
cadwal	cadwal
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calamities	calam
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calchas	calcha
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calendar	calendar
calendars	calendar
calf	calf
caliban	caliban
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calipolis	calipoli
cality	caliti
caliver	caliv
call	call
callat	callat
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callet	callet
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calls	call
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calumniate	calumni
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calumnious	calumni
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cam	cam
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cannon	cannon
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catalogue	catalogu
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catechising	catechis
catechism	catech
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caterwauling	caterwaul
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cautions	caution
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caveto	caveto
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cavilling	cavil
cawdor	cawdor
cawdron	cawdron
cawing	caw
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cedius	cediu
celebrate	celebr
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centuries	centuri
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cerberus	cerberu
cerecloth	cerecloth
cerements	cerement
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ceremonies	ceremoni
ceremonious	ceremoni
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certificate	certif
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chafing	chafe
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chair	chair
chairs	chair
chalic	chalic
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chalks	chalk
chalky	chalki
challeng	challeng
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challenger	challeng
challengers	challeng
challenges	challeng
cham	cham
chamber	chamber
chamberers	chamber
chamberlain	chamberlain
chamberlains	chamberlain
chambermaid	chambermaid
chambermaids	chambermaid
chambers	chamber
chameleon	chameleon
champ	champ
champagne	champagn
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champion	champion
champions	champion
chanc	chanc
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chancellor	chancellor
chances	chanc
chandler	chandler
chang	chang
change	chang
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changeful	chang
changeling	changel
changelings	changel
changer	changer
changes	chang
changest	changest
changing	chang
channel	channel
channels	channel
chanson	chanson
chant	chant
chanticleer	chanticl
chanting	chant
chantries	chantri
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chants	chant
chaos	chao
chap	chap
chape	chape
chapel	chapel
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chaplains	chaplain
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chaplet	chaplet
chapmen	chapmen
chaps	chap
chapter	chapter
character	charact
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characterless	characterless
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characts	charact
charbon	charbon

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chariot	chariot
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charles	charl
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charmeth	charmeth
charmian	charmian
charming	charm
charmingly	charmingli
charms	charm
charneco	charneco
charnel	charnel
charolois	charoloi
charon	charon
charter	charter
charters	charter
chartreux	chartreux
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charybdis	charybdi
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chase	chase
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chatt	chatt
chattels	chattel
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chickens	chicken
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chiefest	chiefest
chiefly	chiefli
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childhoods	childhood
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childlike	childlik
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chilling	chill
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chimney	chimnei
chimneypiece	chimneypiec
chimneys	chimnei
chimurcho	chimurcho
chin	chin
china	china
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chipp	chipp
chipper	chipper
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chiron	chiron
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chirrah	chirrah
chirurgeonly	chirurgeonli
chisel	chisel
chitopher	chitoph
chivalrous	chivalr
chivalry	chivalri
choice	choic
choicely	choic
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choir	choir
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chok	chok
choke	choke
choked	choke
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cholers	choler
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choose	choos
chooser	chooser
chooses	choos
chooseth	chooseth
choosing	choos
chop	chop
chopine	chopin
choplogic	choplog
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choppy	choppi
chops	chop
chopt	chopt
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choristers	chorist
chorus	choru
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christen	christen
christendom	christendom
christendoms	christendom
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christenings	christen
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christians	christian
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christom	christom
christopher	christoph
christophero	christophero
chronicle	chronicl
chronicled	chronicl
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chroniclers	chronicl
chronicles	chronicl
chrysolite	chrysolit
chuck	chuck
chucks	chuck
chud	chud
chuffs	chuff
church	church
churches	church
churchman	churchman

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churchyard	churchyard
churchyards	churchyard
churl	churl
churlish	churlish
churlishly	churlishli
churls	churl
churn	churn
chus	chu
cicatrice	cicatric
cicatrices	cicatric
cicely	cice
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cincture	cinctur
cinders	cinder
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cinna	cinna
cinque	cinqu
cipher	cipher
ciphers	cipher
circa	circa
circe	circ
circle	circl
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circlets	circlet
circling	circl
circuit	circuit
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circumference	circumfer
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circumscription	circumscript
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circumstance	circumst
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citadel	citadel
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civilly	civilli
clack	clack
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claiming	claim
claims	claim
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clamor	clamor
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claret	claret
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clasps	clasp
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claud	claud
claudio	claudio
claudius	claudiu
clause	claus

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clawed	claw
clawing	claw
claws	claw
clay	clai
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clean	clean
cleanliest	cleanliest
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clear	clear
clearer	clearer
clearest	clearest
clearly	clearli
clearness	clear
clears	clear
cleave	cleav
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clef	clef
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cleitus	cleitu
clemency	clemenc
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cleomenes	cleomen
cleopatpa	cleopatpa
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clergy	clergi
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clergymen	clergymen
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clerks	clerk
clew	clew
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clients	client
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clifford	clifford
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firstlings	firstl
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flirt	flirt
float	float
floated	float
floating	float
flock	flock
flocks	flock
flood	flood
floodgates	floodgat
floods	flood
floor	floor
flora	flora
florence	florenc
florentine	florentin
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florentius	florentiu
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floulish	floulish
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flourish	flourish

flourishes	flourish
flourisheth	flourisheth
flourishing	flourish
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flouting	flout
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flowers	flower
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fluellen	fluellen
fluent	fluent
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flushing	flush
fluster	fluster
flute	flute
flutes	flute
flutter	flutter
flux	flux
fluxive	fluxiv
fly	fly
flying	fly
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foal	foal
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foamy	foami
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fodder	fodder
foe	foe
foeman	foeman
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fog	fog
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foh	foh
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fold	fold
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folio	folio
folk	folk
folks	folk
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fondness	fond
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fontibell	fontibel
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fool	fool
fooleries	fooleri
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foolhardy	foolhardi
fooling	fool
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football	footbal
footboy	footboi
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footfall	footfal

footing	foot
footman	footman
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forage	forag
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forecast	forecast
forefather	forefath
forefathers	forefath
forefinger	forefing
forego	forego
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forehand	forehand
forehead	forehead
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foreigners	foreign
foreknowing	foreknow
foreknowledge	foreknowledg
foremost	foremost
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forenoon	forenoon
forerun	forerun
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foreward	foreward
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forfeit	forfeit
forfeited	forfeit
forfeiters	forfeit
forfeiting	forfeit
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forspoke	forspok
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forthcoming	forthcom
forthlight	forthlight
forthright	forthright
forthwith	forthwith
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forum	forum
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forwarding	forward
forwardness	forward
forwards	forward
forwearied	forweari
fosset	fosset
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fouler	fouler
foulest	foulest
foully	foulli
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found	found
foundation	foundat

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fount	fount
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fountains	fountain
founts	fount
four	four
fourscore	fourscor
fourteen	fourteen
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fowl	fowl
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fowling	fowl
fowls	fowl
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foxship	foxship
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freehearted	freeheart
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freely	freeli
freeman	freeman
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frequents	frequent
fresh	fresh

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freshes	fresh
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freshly	freshli
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friday	fridai
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frosts	frost
frosty	frosti
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froward	froward
frown	frown
frowning	frown
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fructify	fructifi
frugal	frugal
fruit	fruit
fruiterer	fruiter
fruitful	fruit
fruitfully	fruitfulli
fruitfulness	fruit
fruition	fruition
fruitless	fruitless
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fubb	fubb
fuel	fuel
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full	full
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fully	fulli
fulness	ful
fulsome	fulsom
fulvia	fulvia
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fun	fun
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funeral	funer
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fur	fur
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furlongs	furlong
furnace	furnac
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furtherance	further
furtherer	further
furthermore	furthermor
furthest	furthest
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gaging	gage
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galathe	galath
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gallops	gallop
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galls	gall
gallus	gallu
gam	gam
gambol	gambol
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gamboys	gamboi
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gangren	gangren
ganymede	ganymed
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gaoler	gaoler
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gauntlet	gauntlet
gauntlets	gauntlet
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gazers	gazer
gazes	gaze
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gent	gent
gentilhomme	gentilhomm
gentility	gentil
gentle	gentl

gentlefolks	gentlefolk
gentleman	gentleman
gentlemanlike	gentlemanlik
gentlemen	gentlemen
gentleness	gentl
gentler	gentler
gentles	gentl
gentlest	gentlest
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gentlewomen	gentlewomen
gently	gentli
gentry	gentri
george	georg
gerard	gerard
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getter	getter
getting	get
ghastly	ghastli
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ghosts	ghost
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giant	giant
giantess	giantess
giantlike	giantlik
giants	giant
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gibbets	gibbet
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giglets	giglet
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girl	girl
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giving	give
givings	give
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gladly	gladli
gladness	glad
glamis	glami
glanc	glanc
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glories	glori
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gnaws	gnaw
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goads	goad
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goatish	goatish
goats	goat
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goblins	goblin
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godden	godden
goddess	goddess
goddesses	goddess
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godfather	godfath
godfathers	godfath
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godlike	godlik
godliness	godli
godly	godli
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goers	goer
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gogs	gog
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golgotha	golgotha
goliases	golias
goliath	goliath
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gonzalo	gonzalo
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goodlier	goodlier
goodliest	goodliest
goodly	goodli
goodman	goodman
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goods	good
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goodwill	goodwil
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goosequills	goosequil
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gorgeous	gorgeou
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gorgon	gorgon
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gory	gori
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gospel	gospel
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gossips	gossip
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governess	gover
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graff	graff
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gramercy	gramerci
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grandame	grandam
grandchild	grandchild
grande	grand

grandeur	grandeur
grandfather	grandfath
grandjurors	grandjuror
grandmother	grandmoth
grandpre	grandpr
grandsir	grandsir
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grapples	grappl
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grasped	grasp
grasps	grasp
grass	grass
grasshoppers	grasshopp
grassy	grassi
grate	grate
grated	grate
grateful	grate
grates	grate
gratiano	gratiano
gratify	gratifi
gratii	gratii
gratillity	gratil
grating	grate
gratis	grati
gratitude	gratitud
gratulate	gratul
grav	grav
grave	grave
gravediggers	gravedigg
gravel	gravel
graveless	graveless
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gravely	grave
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graveness	grave
graver	graver
graves	grave
gravest	gravest

gravestone	graveston
gravities	graviti
gravity	graviti
gravy	gravi
gray	grai
graymalkin	graymalkin
graz	graz
graze	graze
grazed	graze
grazing	graze
grease	greas
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greasily	greasili
greasy	greasi
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greater	greater
greatest	greatest
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greeks	greek
green	green
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greenly	greenli
greens	green
greensleeves	greensleev
greenwich	greenwich
greenwood	greenwood
greet	greet
greeted	greet
greeting	greet
greetings	greet
greets	greet
greg	greg
gregory	gregori
gremio	gremio
grew	grew
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greybeard	greybeard
greybeards	greybeard
greyhound	greyhound
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grief	grief
griefs	grief
griev	griev
grievance	grievanc
grievances	grievanc
grieve	griev
grieved	griev
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grievingly	grievingli
grievous	grievou
grievously	grievous
griffin	griffin
griffith	griffith
grim	grim
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grindstone	grindston
grinning	grin
grip	grip
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grissel	grissel
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grumbling	grumbl
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grund	grund
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gualtier	gualtier
guard	guard
guardage	guardag
guardant	guardant
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guardian	guardian
guardians	guardian
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guardsman	guardsman
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gudgeon	gudgeon
guerdon	guerdon
guerra	guerra
guess	guess
guesses	guess

guessingly	guessingli
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guiled	guil
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guilfords	guilford
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guiltily	guiltili
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guilty	guilti
guinea	guinea
guinever	guinev
guise	guis
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gun	gun
gunner	gunner
gunpowder	gunpowd
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gurnet	gurnet
gurney	gurnei

gust	gust
gusts	gust
gusty	gusti
guts	gut
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guy	gui
guynes	guyn
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haberdasher	haberdash
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hacket	hacket
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haeres	haer
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hagar	hagar
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hailstone	hailston
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hair	hair
hairless	hairless
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hairy	hairi
hal	hal
halberd	halberd
halberds	halberd

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haled	hale
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half	half
halfcan	halfcan
halfpence	halfpenc
halfpenny	halfpenni
halfpennyworth	halfpennyworth
halfway	halfwai
halidom	halidom
hall	hall
halloa	halloa
halloing	hallo
hallond	hallond
halloo	halloo
hallooing	halloo
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hallowmas	hallowma
hallown	hallown
hals	hal
halt	halt
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halves	halv
ham	ham
hames	hame
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hammer	hammer
hammered	hammer
hammering	hammer
hammers	hammer
hamper	hamper
hampton	hampton
hams	ham
hamstring	hamstr
hand	hand
handed	hand
handful	hand
handicraft	handicraft
handicraftsmen	handicraftsmen
handing	hand
handiwork	handiwork
handkercher	handkerch
handkerchers	handkerch

handkerchief	handkerchief
handle	handl
handled	handl
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handless	handless
handlest	handlest
handling	handl
handmaid	handmaid
handmaids	handmaid
hands	hand
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handsome	handsom
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handsomeness	handsom
handwriting	handwrit
handy	handi
hang	hang
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hangings	hang
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hangs	hang
hannibal	hannib
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haply	hapli
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happies	happi
happiest	happiest
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haps	hap
harbinger	harbing
harbingers	harbing
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harbour	harbour
harbourage	harbourag
harbouring	harbour
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hardly	hardli
hardness	hard
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hares	hare
harfleur	harfleur
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harlot	harlot
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harlots	harlot
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harrow	harrow
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harshness	harsh
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haughty	haughti
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hautboy	hautboi
hautboys	hautboi
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havior	havior
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hawks	hawk
hawthorn	hawthorn

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heady	headi
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healths	health
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healthy	healthi
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heartbreaking	heartbreak
hearted	heart
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hearths	hearth
heartily	heartili
heartiness	hearti
heartless	heartless
heartlings	heartl
heartly	heartli
hearts	heart
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heartstrings	heartstr
hearty	hearti
heat	heat
heated	heat
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heathen	heathen
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heating	heat
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heauties	heauti
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heaven	heaven
heavenly	heavenli
heavens	heaven
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heavier	heavier
heaviest	heaviest
heavily	heavili
heaviness	heavi
heaving	heav
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heavy	heavi
hebona	hebona
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hector	hector
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hecuba	hecuba
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hedgehog	hedgehog
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heedfull	heedful
heedfully	heedfulli
heedless	heedless
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helias	helia
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helping	help
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helps	help
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hem	hem

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hempen	hempen
hems	hem
hen	hen
hence	henc
henceforth	henceforth
henceforward	henceforward
henchman	henchman
henri	henri
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hens	hen
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herald	herald
heraldry	heraldri
heralds	herald
herb	herb
herbert	herbert
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herculean	herculean
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herd	herd
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herdsman	herdsman
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hereafter	hereaft
hereby	herebi
hereditary	hereditari
hereford	hereford
herefordshire	herefordshir
herein	herein
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heresies	heresi
heresy	heresi
heretic	heret
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hereto	hereto
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heritage	heritag

heritier	heriti
hermes	herm
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hero	hero
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heyday	heydai
hibocrates	hibocr
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hiccups	hiccup
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highly	highli
highmost	highmost
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highway	highwai
highways	highwai
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hildings	hild
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hillo	hillo
hilloa	hilloa
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hilts	hilt
hily	hili
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hinckley	hincklei
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hisperia	hisperia
hiss	hiss
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history	histori
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hitherto	hitherto
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hobbididence	hobbidid
hobby	hobbi
hobbyhorse	hobbyhors
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holds	hold

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holidame	holidam
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holidays	holidai
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hollowly	hollowli
hollowness	hollow
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holmedon	holmedon
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holy	holi
homage	homag
homager	homag
home	home
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homespuns	homespun
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hommes	homm
homo	homo
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honeysuckle	honeysuckl

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hoodwink	hoodwink
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horace	horac
horatio	horatio
horizon	horizon
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hornbook	hornbook

horned	horn
horner	horner
horning	horn
hornpipes	hornpip
horns	horn
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horrible	horribl
horribly	horribl
horrid	horrid
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horridly	horridli
horror	horror
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horse	hors
horseback	horseback
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horsehairs	horsehair
horseman	horseman
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horseway	horsewai
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hotspur	hotspur
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hourly	hourli

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housewives	housew
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hovering	hover
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howlet	howlet
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howsoe	howso
howsoever	howsoev
howsome	howsom
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hubert	hubert
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huddling	huddl
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hugely	huge
hugeness	huge
hugg	hugg
hugger	hugger

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hugs	hug
hujus	huju
hulk	hulk
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humanely	human
humanity	human
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humbleness	humbl
humbler	humbler
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humblest	humblest
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hume	hume
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humidity	humid
humility	humil
humming	hum
humor	humor
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humors	humor
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humourists	humourist
humours	humour
humphrey	humphrei
humphry	humphri
hums	hum
hundred	hundr
hundreds	hundr
hundredth	hundredth
hung	hung
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hungary	hungari
hunger	hunger
hungerford	hungerford
hungerly	hungerli
hungry	hungri
hunt	hunt
hunted	hunt
hunter	hunter

hunters	hunter
hunteth	hunteth
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huntington	huntington
huntress	huntress
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huntsmen	huntsmen
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hurl	hurl
hurling	hurl
hurls	hurl
hurly	hurli
hurlyburly	hurlyburli
hurricano	hurricano
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hurries	hurri
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hurtless	hurtless
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huswifes	huswif
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hybla	hybla
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hymen	hymen
hymenaeus	hymenaeu
hymn	hymn
hymns	hymn
hyperboles	hyperbol
hyperbolical	hyperbol
hyperion	hyperion
hypocrisy	hypocrisi

hypocrite	hypocrit
hypocrites	hypocrit
hyrcan	hyrcan
hyrcania	hyrcania
hyrcanian	hyrcanian
hyssop	hyssop
hysterica	hysterica
i	i
iachimo	iachimo
iaculis	iaculi
iago	iago
iament	iament
ibat	ibat
icarus	icaru
ice	ic
iceland	iceland
ici	ici
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icicles	icicl
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idea	idea
ideas	idea
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idiot	idiot
idiots	idiot
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idleness	idl
idles	idl
idly	idli
idol	idol
idolatrous	idolatr
idolatry	idolatri
ield	ield
if	if
ifs	if
ignis	igni
ignoble	ignobl
ignobly	ignobl
ignominious	ignomini
ignominy	ignomini
ignomy	ignomi
ignorance	ignor
ignorant	ignor
ii	ii
iii	iii
iiii	iiii

il	il
ilbow	ilbow
ild	ild
ilion	ilion
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lace	lace
laced	lace
lacedaemon	lacedaemon
laces	lace
lacies	laci
lack	lack
lackbeard	lackbeard
lacked	lack
lackey	lackei
lackeying	lackei
lackeys	lackei
lacking	lack
lacks	lack
lad	lad
ladder	ladder
ladders	ladder
lade	lade
laden	laden
ladies	ladi
lading	lade
lads	lad
lady	ladi
ladybird	ladybird
ladyship	ladyship
ladyships	ladyship
laer	laer
laertes	laert
lafeu	lafeu
lag	lag
lagging	lag
laid	laid
lain	lain
laissez	laissez
lake	lake
lakes	lake
lakin	lakin
lam	lam
lamb	lamb
lambert	lambert

lambkin	lambkin
lambkins	lambkin
lambs	lamb
lame	lame
lamely	lame
lameness	lame
lament	lament
lamentable	lament
lamentably	lament
lamentation	lament
lamentations	lament
lamented	lament
lamenting	lament
lamentings	lament
laments	lament
lames	lame
laming	lame
lammas	lamma
lammastide	lammastid
lamound	lamound
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lampass	lampass
lamps	lamp
lanc	lanc
lancaster	lancast
lance	lanc
lances	lanc
lanceth	lanceth
lanch	lanch
land	land
landed	land
landing	land
landless	landless
landlord	landlord
landmen	landmen
lands	land
lane	lane
lanes	lane
langage	langag
langley	langlei
langton	langton
language	languag
languageless	languageless
languages	languag
langues	langu
languish	languish
languished	languish
languishes	languish

languishing	languish
languishings	languish
languishment	languish
languor	languor
lank	lank
lantern	lantern
lanterns	lantern
lanthorn	lanthorn
lap	lap
lapis	lapi
lapland	lapland
lapp	lapp
laps	lap
lapse	laps
lapsed	laps
lapsing	laps
lapwing	lapw
laquais	laquai
larded	lard
larder	larder
larding	lard
lards	lard
large	larg
largely	larg
largeness	larg
larger	larger
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lark	lark
larks	lark
larron	larron
lartius	lartiu
larum	larum
larums	larum
las	la
lascivious	lascivi
lash	lash
lass	lass
lasses	lass
last	last
lasted	last
lasting	last
lastly	lastli
lasts	last
latch	latch
latches	latch
late	late
lated	late

lately	late
later	later
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lath	lath
latin	latin
latten	latten
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lattice	lattic
laud	laud
laudable	laudabl
laudis	laudi
laugh	laugh
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laughed	laugh
laugher	laugher
laughest	laughest
laughing	laugh
laughs	laugh
laughter	laughter
launce	launc
launcelot	launcelot
launces	launc
launch	launch
laund	laund
laundress	laundress
laundry	laundri
laur	laur
laura	laura
laurel	laurel
laurels	laurel
laurence	laurenc
laus	lau
lavache	lavach
lave	lave
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lavender	lavend
lavina	lavina
lavinia	lavinia
lavish	lavish
lavishly	lavishli
lavolt	lavolt
lavoltas	lavolta
law	law
lawful	law
lawfully	lawfulli
lawless	lawless
lawlessly	lawlessli
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lawns	lawn
lawrence	lawrenc
laws	law
lawyer	lawyer
lawyers	lawyer
lay	lai
layer	layer
layest	layest
laying	lai
lays	lai
lazar	lazar
lazars	lazar
lazarus	lazaru
lazy	lazi
lc	lc
ld	ld
ldst	ldst
le	le
lead	lead
leaden	leaden
leader	leader
leaders	leader
leadest	leadest
leading	lead
leads	lead
leaf	leaf
leagu	leagu
league	leagu
leagued	leagu
leaguer	leaguer
leagues	leagu
leah	leah
leak	leak
leaky	leaki
lean	lean
leander	leander
leaner	leaner
leaning	lean
leanness	lean
leans	lean
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leaped	leap
leaping	leap
leaps	leap
leapt	leapt
lear	lear
learn	learn
learned	learn

learnedly	learnedli
learning	learn
learnings	learn
learns	learn
learnt	learnt
leas	lea
lease	leas
leases	leas
leash	leash
leasing	leas
least	least
leather	leather
leathern	leathern
leav	leav
leave	leav
leaven	leaven
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leaver	leaver
leaves	leav
leaving	leav
leavy	leavi
lecher	lecher
lecherous	lecher
lechers	lecher
lechery	lecheri
lecon	lecon
lecture	lectur
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led	led
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left	left
leg	leg
legacies	legaci
legacy	legaci
legate	legat
legatine	legatin
lege	lege
legerity	leger

leges	lege
legg	legg
legion	legion
legions	legion
legitimate	legitim
legitimation	legitim
legs	leg
leicester	leicest
leicestershire	leicestershir
leiger	leiger
leigers	leiger
leisure	leisur
leisurely	leisur
leisures	leisur
leman	leman
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lena	lena
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length	length
lengthen	lengthen
lengthens	lengthen
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lentus	lentu
leo	leo
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leonardo	leonardo
leonati	leonati
leonato	leonato
leonatus	leonatu
leontes	leont
leopard	leopard
leopards	leopard
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lepidus	lepidu
leprosy	leprosi
lequel	lequel
lers	ler
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less	less

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lessons	lesson
lest	lest
lestrake	lestrak
let	let
lethargied	lethargi
lethargies	lethargi
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lethe	leth
lets	let
lett	lett
letter	letter
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lettuce	lettuc
leur	leur
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leviathans	leviathan
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levies	levi
levity	leviti
levy	levi
levying	levi
lewd	lewd
lewdly	lewdli
lewdness	lewd
lewdsters	lewdster
lewis	lewi
liable	liabl
liar	liar
liars	liar
libbard	libbard
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libels	libel
liberal	liber
liberality	liber
liberte	libert

liberties	liberti
libertine	libertin
libertines	libertin
liberty	liberti
library	librari
libya	libya
licence	licenc
licens	licen
license	licens
licentious	licenti
lichas	licha
licio	licio
lick	lick
licked	lick
licker	licker
lictors	lictor
lid	lid
lids	lid
lie	lie
lied	li
lief	lief
liefest	liefest
liege	lieg
liegeman	liegeman
liegemen	liegemen
lien	lien
lies	li
liest	liest
lieth	lieth
lieu	lieu
lieutenant	lieuten
lieutenantry	lieutenantri
lieutenants	lieuten
lieve	liev
life	life
lifeblood	lifeblood
lifeless	lifeless
lifelings	lifel
lift	lift
lifted	lift
lifter	lifter
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lifting	lift
lifts	lift
lig	lig
ligarius	ligariu
liggens	liggen
light	light

lighted	light
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lighter	lighter
lightest	lightest
lightly	lightli
lightness	light
lightning	lightn
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lights	light
lik	lik
like	like
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likelihoods	likelihood
likely	like
likeness	like
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likes	like
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likewise	likewis
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lily	lili
lim	lim
limander	limand
limb	limb
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limbecks	limbeck
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limehouse	limehous
limekilns	limekiln
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limping	limp
limps	limp
lin	lin
lincoln	lincoln

lincolnshire	lincolnshir
line	line
lineal	lineal
lineally	lineal
lineament	lineament
lineaments	lineament
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linen	linen
linens	linen
lines	line
ling	ling
lingare	lingar
linger	linger
lingered	linger
lingers	linger
linguist	linguist
lining	line
link	link
links	link
linsey	linsei
linstock	linstock
linta	linta
lion	lion
lionel	lionel
lioness	lioness
lions	lion
lip	lip
lipp	lipp
lips	lip
lipsbury	lipsburi
liquid	liquid
liquor	liquor
liquorish	liquorish
liquors	liquor
lirra	lirra
lisbon	lisbon
lisp	lisp
lisping	lisp
list	list
listen	listen
listening	listen
lists	list
literatured	literatur
lither	lither
litter	litter
little	littl
littlest	littlest
liv	liv

live	live
lived	live
livelier	liveli
livelihood	livelihood
livelong	livelong
lively	live
liver	liver
liveries	liveri
livers	liver
livery	liveri
lives	live
livest	livest
liveth	liveth
livia	livia
living	live
livings	live
lizard	lizard
lizards	lizard
ll	ll
lll	lll
llous	llou
lnd	lnd
lo	lo
loa	loa
loach	loach
load	load
loaden	loaden
loading	load
loads	load
loaf	loaf
loam	loam
loan	loan
loath	loath
loathe	loath
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loathes	loath
loathing	loath
loathly	loathli
loathness	loath
loathsome	loathsom
loathsomeness	loathsom
loathsomest	loathsomest
loaves	loav
lob	lob
lobbies	lobbi
lobby	lobbi
local	local

lochaber	lochab
lock	lock
locked	lock
locking	lock
lockram	lockram
locks	lock
locusts	locust
lode	lode
lodg	lodg
lodge	lodg
lodged	lodg
lodgers	lodger
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lodging	lodg
lodgings	lodg
lodovico	lodovico
lodowick	lodowick
lofty	lofti
log	log
logger	logger
loggerhead	loggerhead
loggerheads	loggerhead
loggets	logget
logic	logic
logs	log
loins	loin
loiter	loiter
loiterer	loiter
loiterers	loiter
loitering	loiter
lolling	loll
lolls	loll
lombardy	lombardi
london	london
londoners	london
lone	lone
loneliness	loneli
lonely	lone
long	long
longaville	longavil
longboat	longboat
longed	long
longer	longer
longest	longest
longeth	longeth
longing	long
longings	long
longly	longli

longs	long
longtail	longtail
loo	loo
loof	loof
look	look
looked	look
looker	looker
lookers	looker
lookest	lookest
looking	look
looks	look
loon	loon
loop	loop
loos	loo
loose	loos
loosed	loos
loosely	loos
loosen	loosen
loosing	loos
lop	lop
lopp	lopp
loquitur	loquitur
lord	lord
lorded	lord
lording	lord
lordings	lord
lordliness	lordli
lordly	lordli
lords	lord
lordship	lordship
lordships	lordship
lorenzo	lorenzo
lorn	lorn
lorraine	lorrain
lorship	lorship
los	lo
lose	lose
loser	loser
losers	loser
loses	lose
losest	losest
loseth	loseth
losing	lose
loss	loss
losses	loss
lost	lost
lot	lot
lots	lot

lott	lott
lottery	lotteri
loud	loud
louder	louder
loudly	loudli
lour	lour
loureth	loureth
louring	lour
louse	lous
louses	lous
lousy	lousi
lout	lout
louted	lout
louts	lout
louvre	louvr
lov	lov
love	love
loved	love
lovedst	lovedst
lovel	lovel
lovelier	loveli
loveliness	loveli
lovell	lovel
lovely	love
lover	lover
lovered	lover
lovers	lover
loves	love
lovest	lovest
loveth	loveth
loving	love
lovingly	lovingli
low	low
lowe	low
lower	lower
lowest	lowest
lowing	low
lowliness	lowli
lowly	lowli
lown	lown
lowness	low
loyal	loyal
loyally	loyal
loyalties	loyalti
loyalty	loyalti
lozel	lozel
lt	lt
lubber	lubber

lubberly	lubberli
luc	luc
luccicos	luccico
luce	luce
lucentio	lucentio
luces	luce
lucetta	lucetta
luciana	luciana
lucianus	lucianu
lucifer	lucif
lucifier	lucifi
lucilius	luciliu
lucina	lucina
lucio	lucio
lucius	luciu
luck	luck
luckier	luckier
luckiest	luckiest
luckily	luckili
luckless	luckless
lucky	lucki
lucre	lucr
lucrece	lucrec
lucretia	lucretia
lucullius	luculliu
lucullus	lucullu
lucy	luci
lud	lud
ludlow	ludlow
lug	lug
lugg	lugg
luggage	luggag
luke	luke
lukewarm	lukewarm
lull	lull
lulla	lulla
lullaby	lullabi
lulls	lull
lumbert	lumbert
lump	lump
lumpish	lumpish
luna	luna
lunacies	lunaci
lunacy	lunaci
lunatic	lunat
lunatics	lunat
lunes	lune
lungs	lung

lupercal	luperc
lurch	lurch
lure	lure
lurk	lurk
lurketh	lurketh
lurking	lurk
lurks	lurk
luscious	lusciou
lush	lush
lust	lust
lusted	lust
luster	luster
lustful	lust
lustier	lustier
lustiest	lustiest
lustig	lustig
lustihood	lustihood
lustily	lustili
lustre	lustr
lustrous	lustrou
lusts	lust
lusty	lusti
lute	lute
lutes	lute
lutestring	lutestr
lutheran	lutheran
luxurious	luxuri
luxuriously	luxuri
luxury	luxuri
ly	ly
lycaonia	lycaonia
lycurguses	lycurgus
lydia	lydia
lye	lye
lyen	lyen
lying	ly
lym	lym
lymoges	lymog
lynn	lynn
lysander	lysand
m	m
ma	ma
maan	maan
mab	mab
macbeth	macbeth
maccabaeus	maccabaeu
macdonwald	macdonwald
macduff	macduff

mace	mace
macedon	macedon
maces	mace
machiavel	machiavel
machination	machin
machinations	machin
machine	machin
mack	mack
macmorris	macmorri
maculate	macul
maculation	macul
mad	mad
madam	madam
madame	madam
madams	madam
madcap	madcap
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made	made
madeira	madeira
madly	madli
madman	madman
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madness	mad
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mads	mad
maecenas	maecena
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magic	magic
magical	magic
magician	magician
magistrate	magistr
magistrates	magistr
magnanimity	magnanim
magnanimous	magnanim
magni	magni
magnifi	magnifi
magnificence	magnific
magnificent	magnific
magnifico	magnifico
magnificoes	magnifico
magnus	magnu
mahomet	mahomet
mahu	mahu
maid	maid
maiden	maiden

maidenhead   maidenhead
maidenheads   maidenhead
maidenhood   maidenhood
maidenhoods   maidenhood
maidenliest   maidenliest
maidenly   maidenli
maidens   maiden
maidhood   maidhood
maids   maid
mail   mail
mailed   mail
mails   mail
maim   maim
maimed   maim
maims   maim
main   main
maincourse   maincours
maine   main
mainly   mainli
mainmast   mainmast
mains   main
maintain   maintain
maintained   maintain
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maintenance   mainten
mais   mai
maison   maison
majestas   majesta
majestee   majeste
majestic   majest
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majestically   majest
majesties   majesti
majesty   majesti
major   major
majority   major
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make   make
makeless   makeless
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makers   maker
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making   make
makings   make
mal   mal
mala   mala

maladies	maladi
malady	maladi
malapert	malapert
malcolm	malcolm
malcontent	malcont
malcontents	malcont
male	male
maledictions	maledict
malefactions	malefact
malefactor	malefactor
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malevolent	malevol
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malicious	malici
maliciously	malici
malign	malign
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malkin	malkin
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mammet	mammet
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manage	manag
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manager	manag
managing	manag
manakin	manakin
manchus	manchu
mandate	mandat
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mandrake	mandrak

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mane	mane
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manfully	manfulli
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manhood	manhood
manhoods	manhood
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manifests	manifest
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manifoldly	manifoldli
manka	manka
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manlike	manlik
manly	manli
mann	mann
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manner	manner
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manners	manner
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mans	man
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mansionry	mansionri
mansions	mansion
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mantle	mantl
mantled	mantl
mantles	mantl
mantua	mantua
mantuan	mantuan
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manure	manur
manured	manur
manus	manu
many	mani
map	map
mapp	mapp

maps	map
mar	mar
marble	marbl
marbled	marbl
marcade	marcad
marcellus	marcellu
march	march
marches	march
marcheth	marcheth
marching	march
marchioness	marchio
marchpane	marchpan
marcians	marcian
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marcus	marcu
mardian	mardian
mare	mare
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margarelon	margarelon
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margent	margent
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maries	mari
marigold	marigold
mariner	marin
mariners	marin
maritime	maritim
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marketplace	marketplac
markets	market
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markman	markman
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marl	marl
marle	marl
marmoset	marmoset
marquess	marquess
marquis	marqui
marr	marr

marriage	marriag
marriages	marriag
married	marri
marries	marri
marring	mar
marrow	marrow
marrowless	marrowless
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marry	marri
marrying	marri
mars	mar
marseilles	marseil
marsh	marsh
marshal	marshal
marshalsea	marshalsea
marshalship	marshalship
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martem	martem
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martial	martial
martin	martin
martino	martino
martius	martiu
martlemas	martlema
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marullus	marullu
marv	marv
marvel	marvel
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marvellous	marvel
marvellously	marvel
marvels	marvel
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mas	ma
masculine	masculin
masham	masham
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masker	masker
maskers	masker
masking	mask
masks	mask
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masonry	masonri

masons	mason
masque	masqu
masquers	masquer
masques	masqu
masquing	masqu
mass	mass
massacre	massacr
massacres	massacr
masses	mass
massy	massi
mast	mast
mastcr	mastcr
master	master
masterdom	masterdom
masterest	masterest
masterless	masterless
masterly	masterli
masterpiece	masterpiec
masters	master
mastership	mastership
mastic	mastic
mastiff	mastiff
mastiffs	mastiff
masts	mast
match	match
matches	match
matcheth	matcheth
matching	match
matchless	matchless
mate	mate
mated	mate
mater	mater
material	materi
mates	mate
mathematics	mathemat
matin	matin
matron	matron
matrons	matron
matter	matter
matters	matter
matthew	matthew
mattock	mattock
mattress	mattress
mature	matur
maturity	matur
maud	maud
maudlin	maudlin
maugre	maugr

maul	maul
maund	maund
mauri	mauri
mauritania	mauritania
mauvais	mauvai
maw	maw
maws	maw
maxim	maxim
may	mai
mayday	maydai
mayest	mayest
mayor	mayor
maypole	maypol
mayst	mayst
maz	maz
maze	maze
mazed	maze
mazes	maze
mazzard	mazzard
me	me
meacock	meacock
mead	mead
meadow	meadow
meadows	meadow
meads	mead
meagre	meagr
meal	meal
meals	meal
mealy	meali
mean	mean
meanders	meander
meaner	meaner
meanest	meanest
meaneth	meaneth
meaning	mean
meanings	mean
meanly	meanli
means	mean
meant	meant
meantime	meantim
meanwhile	meanwhil
measles	measl
measur	measur
measurable	measur
measure	measur
measured	measur
measureless	measureless
measures	measur

measuring	measur
meat	meat
meats	meat
mechanic	mechan
mechanical	mechan
mechanicals	mechan
mechanics	mechan
mechante	mechant
med	med
medal	medal
meddle	meddl
meddler	meddler
meddling	meddl
mede	mede
medea	medea
media	media
mediation	mediat
mediators	mediat
medice	medic
medicinal	medicin
medicine	medicin
medicines	medicin
meditate	medit
meditates	medit
meditating	medit
meditation	medit
meditations	medit
mediterranean	mediterranean
mediterraneum	mediterraneum
medlar	medlar
medlars	medlar
meed	meed
meeds	meed
meek	meek
meekly	meekli
meekness	meek
meet	meet
meeter	meeter
meetest	meetest
meeting	meet
meetings	meet
meetly	meetli
meetness	meet
meets	meet
meg	meg
mehercle	mehercl
meilleur	meilleur
meiny	meini

meisen	meisen
melancholies	melancholi
melancholy	melancholi
melford	melford
mell	mell
mellifluous	melliflu
mellow	mellow
mellowing	mellow
melodious	melodi
melody	melodi
melt	melt
melted	melt
melteth	melteth
melting	melt
melts	melt
melun	melun
member	member
members	member
memento	memento
memorable	memor
memorandums	memorandum
memorial	memori
memorials	memori
memories	memori
memoriz	memoriz
memorize	memor
memory	memori
memphis	memphi
men	men
menac	menac
menace	menac
menaces	menac
menaphon	menaphon
menas	mena
mend	mend
mended	mend
mender	mender
mending	mend
mends	mend
menecrates	menecr
menelaus	menelau
menenius	meneniu
mental	mental
menteith	menteith
mention	mention
mentis	menti
menton	menton
mephostophilus	mephostophilu

mer	mer
mercatante	mercatant
mercatio	mercatio
mercenaries	mercenari
mercenary	mercenari
mercer	mercer
merchandise	merchandis
merchandized	merchand
merchant	merchant
merchants	merchant
mercies	merci
merciful	merci
mercifully	mercifulli
merciless	merciless
mercurial	mercuri
mercuries	mercuri
mercury	mercuri
mercutio	mercutio
mercy	merci
mere	mere
mered	mere
merely	mere
merest	merest
meridian	meridian
merit	merit
merited	merit
meritorious	meritori
merits	merit
merlin	merlin
mermaid	mermaid
mermaids	mermaid
merops	merop
merrier	merrier
merriest	merriest
merrily	merrili
merriman	merriman
merriment	merriment
merriments	merriment
merriness	merri
merry	merri
mervailous	mervail
mes	me
mesh	mesh
meshes	mesh
mesopotamia	mesopotamia
mess	mess
message	messag
messages	messag

messala	messala
messaline	messalin
messenger	messeng
messengers	messeng
messes	mess
messina	messina
met	met
metal	metal
metals	metal
metamorphis	metamorphi
metamorphoses	metamorphos
metaphor	metaphor
metaphysical	metaphys
metaphysics	metaphys
mete	mete
metellus	metellu
meteor	meteor
meteors	meteor
meteyard	meteyard
metheglin	metheglin
metheglins	metheglin
methink	methink
methinks	methink
method	method
methods	method
methought	methought
methoughts	methought
metre	metr
metres	metr
metropolis	metropoli
mette	mett
mettle	mettl
mettled	mettl
meus	meu
mew	mew
mewed	mew
mewling	mewl
mexico	mexico
mi	mi
mice	mice
michael	michael
michaelmas	michaelma
micher	micher
miching	mich
mickle	mickl
microcosm	microcosm
mid	mid
midas	mida

middest	middest
middle	middl
middleham	middleham
midnight	midnight
midriff	midriff
midst	midst
midsummer	midsumm
midway	midwai
midwife	midwif
midwives	midwiv
mienne	mienn
might	might
mightful	might
mightier	mightier
mightiest	mightiest
mightily	mightili
mightiness	mighti
mightst	mightst
mighty	mighti
milan	milan
milch	milch
mild	mild
milder	milder
mildest	mildest
mildew	mildew
mildews	mildew
mildly	mildli
mildness	mild
mile	mile
miles	mile
milford	milford
militarist	militarist
military	militari
milk	milk
milking	milk
milkmaid	milkmaid
milks	milk
milksops	milksop
milky	milki
mill	mill
mille	mill
miller	miller
milliner	millin
million	million
millioned	million
millions	million
mills	mill
millstones	millston

milo	milo
mimic	mimic
minc	minc
mince	minc
minces	minc
mincing	minc
mind	mind
minded	mind
minding	mind
mindless	mindless
minds	mind
mine	mine
mineral	miner
minerals	miner
minerva	minerva
mines	mine
mingle	mingl
mingled	mingl
mingling	mingl
minikin	minikin
minim	minim
minime	minim
minimo	minimo
minimus	minimu
mining	mine
minion	minion
minions	minion
minist	minist
minister	minist
ministers	minist
ministration	ministr
minnow	minnow
minnows	minnow
minola	minola
minority	minor
minos	mino
minotaurs	minotaur
minstrel	minstrel
minstrels	minstrel
minstrelsy	minstrelsi
mint	mint
mints	mint
minute	minut
minutely	minut
minutes	minut
minx	minx
mio	mio
mir	mir

mirable	mirabl
miracle	miracl
miracles	miracl
miraculous	miracul
miranda	miranda
mire	mire
mirror	mirror
mirrors	mirror
mirth	mirth
mirthful	mirth
miry	miri
mis	mi
misadventur	misadventur
misadventure	misadventur
misanthropos	misanthropo
misapplied	misappli
misbecame	misbecam
misbecom	misbecom
misbecome	misbecom
misbegot	misbegot
misbegotten	misbegotten
misbeliever	misbeliev
misbelieving	misbeliev
misbhav	misbhav
miscall	miscal
miscalled	miscal
miscarried	miscarri
miscarries	miscarri
miscarry	miscarri
miscarrying	miscarri
mischance	mischanc
mischances	mischanc
mischief	mischief
mischiefs	mischief
mischievous	mischiev
misconceived	misconceiv
misconst	misconst
misconster	misconst
misconstruction	misconstruct
misconstrued	misconstru
misconstrues	misconstru
miscreant	miscreant
miscreate	miscreat
misdeed	misde
misdeeds	misde
misdemean	misdemean
misdemeanours	misdemeanour
misdoubt	misdoubt

misdoubteth	misdoubteth
misdoubts	misdoubt
misenum	misenum
miser	miser
miserable	miser
miserably	miser
misericorde	misericord
miseries	miseri
misers	miser
misery	miseri
misfortune	misfortun
misfortunes	misfortun
misgive	misgiv
misgives	misgiv
misgiving	misgiv
misgoverned	misgovern
misgovernment	misgovern
misgraffed	misgraf
misguide	misguid
mishap	mishap
mishaps	mishap
misheard	misheard
misinterpret	misinterpret
mislead	mislead
misleader	mislead
misleaders	mislead
misleading	mislead
misled	misl
mislike	mislik
misord	misord
misplac	misplac
misplaced	misplac
misplaces	misplac
mispris	mispri
misprised	mispris
misprision	mispris
misprizing	mispriz
misproud	misproud
misquote	misquot
misreport	misreport
miss	miss
missed	miss
misses	miss
misshap	misshap
misshapen	misshapen
missheathed	missheath
missing	miss
missingly	missingli

missions	mission
missive	missiv
missives	missiv
misspoke	misspok
mist	mist
mista	mista
mistak	mistak
mistake	mistak
mistaken	mistaken
mistakes	mistak
mistaketh	mistaketh
mistaking	mistak
mistakings	mistak
mistemp	mistemp
mistempered	mistemp
misterm	misterm
mistful	mist
misthink	misthink
misthought	misthought
mistletoe	mistleto
mistook	mistook
mistreadings	mistread
mistress	mistress
mistresses	mistress
mistresss	mistresss
mistriship	mistriship
mistrust	mistrust
mistrusted	mistrust
mistrustful	mistrust
mistrusting	mistrust
mists	mist
misty	misti
misus	misu
misuse	misus
misused	misus
misuses	misus
mites	mite
mithridates	mithrid
mitigate	mitig
mitigation	mitig
mix	mix
mixed	mix
mixture	mixtur
mixtures	mixtur
mm	mm
mnd	mnd
moan	moan
moans	moan

moat	moat
moated	moat
mobled	mobl
mock	mock
mockable	mockabl
mocker	mocker
mockeries	mockeri
mockers	mocker
mockery	mockeri
mocking	mock
mocks	mock
mockvater	mockvat
mockwater	mockwat
model	model
modena	modena
moderate	moder
moderately	moder
moderation	moder
modern	modern
modest	modest
modesties	modesti
modestly	modestli
modesty	modesti
modicums	modicum
modo	modo
module	modul
moe	moe
moi	moi
moiety	moieti
moist	moist
moisten	moisten
moisture	moistur
moldwarp	moldwarp
mole	mole
molehill	molehil
moles	mole
molest	molest
molestation	molest
mollification	mollif
mollis	molli
molten	molten
molto	molto
mome	mome
moment	moment
momentary	momentari
moming	mome
mon	mon
monachum	monachum

monarch	monarch
monarchies	monarchi
monarchize	monarch
monarcho	monarcho
monarchs	monarch
monarchy	monarchi
monast	monast
monastery	monasteri
monastic	monast
monday	mondai
monde	mond
money	monei
moneys	monei
mong	mong
monger	monger
mongers	monger
monging	mong
mongrel	mongrel
mongrels	mongrel
mongst	mongst
monk	monk
monkey	monkei
monkeys	monkei
monks	monk
monmouth	monmouth
monopoly	monopoli
mons	mon
monsieur	monsieur
monsieurs	monsieur
monster	monster
monsters	monster
monstrous	monstrou
monstrously	monstrous
monstrousness	monstrous
monstruosity	monstruos
montacute	montacut
montage	montag
montague	montagu
montagues	montagu
montano	montano
montant	montant
montez	montez
montferrat	montferrat
montgomery	montgomeri
month	month
monthly	monthli
months	month
montjoy	montjoi

monument	monument
monumental	monument
monuments	monument
mood	mood
moods	mood
moody	moodi
moon	moon
moonbeams	moonbeam
moonish	moonish
moonlight	moonlight
moons	moon
moonshine	moonshin
moonshines	moonshin
moor	moor
moorfields	moorfield
moors	moor
moorship	moorship
mop	mop
mope	mope
moping	mope
mopping	mop
mopsa	mopsa
moral	moral
moraler	moral
morality	moral
moralize	moral
mordake	mordak
more	more
moreover	moreov
mores	more
morgan	morgan
mori	mori
morisco	morisco
morn	morn
morning	morn
mornings	morn
morocco	morocco
morris	morri
morrow	morrow
morrows	morrow
morsel	morsel
morsels	morsel
mort	mort
mortal	mortal
mortality	mortal
mortally	mortal
mortals	mortal
mortar	mortar

mortgaged	mortgag
mortified	mortifi
mortifying	mortifi
mortimer	mortim
mortimers	mortim
mortis	morti
mortise	mortis
morton	morton
mose	mose
moss	moss
mossgrown	mossgrown
most	most
mote	mote
moth	moth
mother	mother
mothers	mother
moths	moth
motion	motion
motionless	motionless
motions	motion
motive	motiv
motives	motiv
motley	motlei
mots	mot
mought	mought
mould	mould
moulded	mould
mouldeth	mouldeth
moulds	mould
mouldy	mouldi
moult	moult
moulten	moulten
mounch	mounch
mounseur	mounseur
mounsieur	mounsieur
mount	mount
mountain	mountain
mountaineer	mountain
mountaineers	mountain
mountainous	mountain
mountains	mountain
mountant	mountant
mountanto	mountanto
mountebank	mountebank
mountebanks	mountebank
mounted	mount
mounteth	mounteth
mounting	mount

mounts	mount
mourn	mourn
mourned	mourn
mourner	mourner
mourners	mourner
mournful	mourn
mournfully	mournfulli
mourning	mourn
mourningly	mourningli
mournings	mourn
mourns	mourn
mous	mou
mouse	mous
mousetrap	mousetrap
mousing	mous
mouth	mouth
mouthed	mouth
mouths	mouth
mov	mov
movables	movabl
move	move
moveable	moveabl
moveables	moveabl
moved	move
mover	mover
movers	mover
moves	move
moveth	moveth
moving	move
movingly	movingli
movousus	movousu
mow	mow
mowbray	mowbrai
mower	mower
mowing	mow
mows	mow
moy	moi
moys	moi
moyses	moys
mrs	mr
much	much
muck	muck
mud	mud
mudded	mud
muddied	muddi
muddy	muddi
muffins	muffin
muffl	muffl

muffle	muffl
muffled	muffl
muffler	muffler
muffling	muffl
mugger	mugger
mugs	mug
mulberries	mulberri
mulberry	mulberri
mule	mule
mules	mule
muleteers	mulet
mulier	mulier
mulieres	mulier
muliteus	muliteu
mull	mull
mulmutius	mulmutiu
multiplied	multipli
multiply	multipli
multiplying	multipli
multipotent	multipot
multitude	multitud
multitudes	multitud
multitudinous	multitudin
mum	mum
mumble	mumbl
mumbling	mumbl
mummers	mummer
mummy	mummi
mun	mun
munch	munch
muniments	muniment
munition	munit
murd	murd
murder	murder
murdered	murder
murderer	murder
murderers	murder
murdering	murder
murderous	murder
murders	murder
mure	mure
murk	murk
murkiest	murkiest
murky	murki
murmur	murmur
murmurers	murmur
murmuring	murmur
murrain	murrain

murray	murrai
murrion	murrion
murther	murther
murtherer	murther
murtherers	murther
murthering	murther
murtherous	murther
murthers	murther
mus	mu
muscadel	muscadel
muscovites	muscovit
muscovits	muscovit
muscovy	muscovi
muse	muse
muses	muse
mush	mush
mushrooms	mushroom
music	music
musical	music
musician	musician
musicians	musician
musics	music
musing	muse
musings	muse
musk	musk
musket	musket
muskets	musket
muskos	musko
muss	muss
mussel	mussel
mussels	mussel
must	must
mustachio	mustachio
mustard	mustard
mustardseed	mustardse
muster	muster
mustering	muster
musters	muster
musty	musti
mutability	mutabl
mutable	mutabl
mutation	mutat
mutations	mutat
mute	mute
mutes	mute
mutest	mutest
mutine	mutin
mutineer	mutin

mutineers	mutin
mutines	mutin
mutinies	mutini
mutinous	mutin
mutiny	mutini
mutius	mutiu
mutter	mutter
muttered	mutter
mutton	mutton
muttons	mutton
mutual	mutual
mutualities	mutual
mutually	mutual
muzzl	muzzl
muzzle	muzzl
muzzled	muzzl
mv	mv
mww	mww
my	my
mynheers	mynheer
myrmidon	myrmidon
myrmidons	myrmidon
myrtle	myrtl
myself	myself
myst	myst
mysteries	mysteri
mystery	mysteri
n	n
nag	nag
nage	nage
nags	nag
naiads	naiad
nail	nail
nails	nail
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naked	nake
nakedness	naked
nal	nal
nam	nam
name	name
named	name
nameless	nameless
namely	name
names	name
namest	namest
naming	name
nan	nan
nance	nanc

nap	nap
nape	nape
napes	nape
napkin	napkin
napkins	napkin
naples	napl
napless	napless
napping	nap
naps	nap
narbon	narbon
narcissus	narcissu
narines	narin
narrow	narrow
narrowly	narrowli
naso	naso
nasty	nasti
nathaniel	nathaniel
natifs	natif
nation	nation
nations	nation
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nativity	nativ
natur	natur
natural	natur
naturalize	natur
naturally	natur
nature	natur
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natures	natur
natus	natu
naught	naught
naughtily	naughtili
naughty	naughti
navarre	navarr
nave	nave
navel	navel
navigation	navig
navy	navi
nay	nai
nayward	nayward
nayword	nayword
nazarite	nazarit
ne	ne
neaf	neaf
neamnoins	neamnoin
neanmoins	neanmoin
neapolitan	neapolitan
neapolitans	neapolitan

near	near
nearer	nearer
nearest	nearest
nearly	nearli
nearness	near
neat	neat
neatly	neatli
neb	neb
nebour	nebour
nebuchadnezzar	nebuchadnezzar
nec	nec
necessaries	necessari
necessarily	necessarili
necessary	necessari
necessitied	necess
necessities	necess
necessity	necess
neck	neck
necklace	necklac
necks	neck
nectar	nectar
ned	ned
nedar	nedar
need	need
needed	need
needer	needer
needful	need
needfull	needful
needing	need
needle	needl
needles	needl
needless	needless
needly	needli
needs	need
needy	needi
neer	neer
neeze	neez
nefas	nefa
negation	negat
negative	neg
negatives	neg
neglect	neglect
neglected	neglect
neglecting	neglect
neglectingly	neglectingli
neglection	neglect
negligence	neglig
negligent	neglig

negotiate	negoti
negotiations	negoti
negro	negro
neigh	neigh
neighbors	neighbor
neighbour	neighbour
neighbourhood	neighbourhood
neighbouring	neighbour
neighbourly	neighbourli
neighbours	neighbour
neighing	neigh
neighs	neigh
neither	neither
nell	nell
nemean	nemean
nemesis	nemesi
neoptolemus	neoptolemu
nephew	nephew
nephews	nephew
neptune	neptun
ner	ner
nereides	nereid
nerissa	nerissa
nero	nero
neroes	nero
ners	ner
nerve	nerv
nerves	nerv
nervii	nervii
nervy	nervi
nessus	nessu
nest	nest
nestor	nestor
nests	nest
net	net
nether	nether
netherlands	netherland
nets	net
nettle	nettl
nettled	nettl
nettles	nettl
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neutral	neutral
nev	nev
never	never
nevil	nevil
nevils	nevil
new	new

newborn	newborn
newer	newer
newest	newest
newgate	newgat
newly	newli
newness	new
news	new
newsmongers	newsmong
newt	newt
newts	newt
next	next
nibbling	nibbl
nicanor	nicanor
nice	nice
nicely	nice
niceness	nice
nicer	nicer
nicety	niceti
nicholas	nichola
nick	nick
nickname	nicknam
nicks	nick
niece	niec
nieces	niec
niggard	niggard
niggarding	niggard
niggardly	niggardli
nigh	nigh
night	night
nightcap	nightcap
nightcaps	nightcap
nighted	night
nightgown	nightgown
nightingale	nightingal
nightingales	nightingal
nightly	nightli
nightmare	nightmar
nights	night
nightwork	nightwork
nihil	nihil
nile	nile
nill	nill
nilus	nilu
nimble	nimbl
nimbleness	nimbl
nimbler	nimbler
nimbly	nimbl
nine	nine

nineteen	nineteen
ning	ning
ningly	ningli
ninny	ninni
ninth	ninth
ninus	ninu
niobe	niob
niobes	niob
nip	nip
nipp	nipp
nipping	nip
nipple	nippl
nips	nip
nit	nit
nly	nly
nnight	nnight
nnights	nnight
no	no
noah	noah
nob	nob
nobility	nobil
nobis	nobi
noble	nobl
nobleman	nobleman
noblemen	noblemen
nobleness	nobl
nobler	nobler
nobles	nobl
noblesse	nobless
noblest	noblest
nobly	nobli
nobody	nobodi
noces	noce
nod	nod
nodded	nod
nodding	nod
noddle	noddl
noddles	noddl
noddy	noddi
nods	nod
noes	noe
nointed	noint
nois	noi
noise	nois
noiseless	noiseless
noisemaker	noisemak
noises	nois
noisome	noisom

nole	nole
nominate	nomin
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poorly	poorli
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posting	post
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praiseworthy	praiseworthi
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pregnancy	pregnanc
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sermon	sermon
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severely	sever
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sly	sly
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sob	sob

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sober	sober
soberly	soberli
sobriety	sobrieti
sobs	sob
sociable	sociabl
societies	societi
society	societi
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softly	softli
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soit	soit
sojourn	sojourn
sol	sol
sola	sola
solace	solac
solanio	solanio
sold	sold
soldat	soldat
solder	solder
soldest	soldest
soldier	soldier
soldiers	soldier
soldiership	soldiership
sole	sole
solely	sole
solem	solem
solemn	solemn
solemness	solem
solemnities	solemn
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soles	sole
solicit	solicit
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solid	solid
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solidity	solid
solinus	solinu
solitary	solitari
solomon	solomon
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some	some
somebody	somebodi
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somerset	somerset
somerville	somervil
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sometime	sometim
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somewhat	somewhat
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soothing	sooth

soothsay	soothsai
soothsayer	soothsay
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sophister	sophist
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sophy	sophi
sops	sop
sorcerer	sorcer
sorcerers	sorcer
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soundly	soundli
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southam	southam
southampton	southampton
southerly	southerli
southern	southern
southward	southward
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southwell	southwel
souviendrai	souviendrai
sov	sov
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sovereignest	sovereignest
sovereignly	sovereignli
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spirits	spirit
spiritual	spiritu
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stanze	stanz
stanzo	stanzo
stanzos	stanzo
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starlight	starlight
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stench	stench
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stephen	stephen
stepmothers	stepmoth
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sterile	steril
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stew	stew
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stitchery	stitcheri
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stratagem	stratagem
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stratford	stratford
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strawberries	strawberri
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submission	submiss
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sumptuous	sumptuou
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superior	superior
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susan	susan
suspect	suspect
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suspend	suspend
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suspicious	suspici
suspiration	suspir
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sustaining	sustain
sutler	sutler
sutton	sutton
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swabber	swabber
swaddling	swaddl
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swagger	swagger
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symbols	symbol
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telamon	telamon
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tetchy	tetchi
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tevil	tevil
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text	text
tgv	tgv
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thaes	thae
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thane	thane
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thank	thank
thanked	thank
thankful	thank
thankfully	thankfulli
thankfulness	thank
thanking	thank
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thankless	thankless
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thenceforth	thenceforth
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thirteen	thirteen
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thou	thou
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threaden	threaden
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threefold	threefold
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through	through
throughfare	throughfar
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tonight	tonight
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tools	tool
tooth	tooth
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trivial	trivial
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troilus	troilu
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trojan	trojan
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troll	troll
tromperies	tromperi
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troyan	troyan
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truant	truant
truce	truce
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trudge	trudg
true	true
trueborn	trueborn
truepenny	truepenni
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truly	truli
trump	trump
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tuesday	tuesdai
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tumble	tumbl
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turlygod	turlygod
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unadvisedly	unadvisedli
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unappeas	unappea
unapproved	unapprov
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unbated	unbat
unbatter	unbatt
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unbefitting	unbefit
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unchain	unchain
unchanging	unchang
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unclew	unclew
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uncourteous	uncourt
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uncuckolded	uncuckold
uncurable	uncur
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uncurls	uncurl
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underground	underground
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underlings	underl
undermine	undermin
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underprop	underprop
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understandings	understand
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undertake	undertak
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undo	undo
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undone	undon
undoubted	undoubt
undoubtedly	undoubtedli
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vraiment	vraiment
vulcan	vulcan
vulgar	vulgar
vulgarly	vulgarli
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vulnerable	vulner
vulture	vultur
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wainscot	wainscot
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wakest	wakest
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wales	wale
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watchword	watchword
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waterdrops	waterdrop
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wealthiest	wealthiest
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weights	weight
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well	well
wells	well
welsh	welsh
welshman	welshman
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welshwomen	welshwomen
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wenches	wench
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yedward	yedward
yell	yell
yellow	yellow
yellowed	yellow
yellowing	yellow
yellowness	yellow
yellows	yellow
yells	yell
yelping	yelp
yeoman	yeoman
yeomen	yeomen
yerk	yerk
yes	ye
yesterday	yesterdai
yesterdays	yesterdai
yesternight	yesternight
yesty	yesti
yet	yet
yew	yew
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yield	yield
yielded	yield
yielder	yielder
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yielding	yield
yields	yield
yok	yok
yoke	yoke
yoked	yoke
yokefellow	yokefellow
yokes	yoke
yoketh	yoketh
yon	yon
yond	yond
yonder	yonder
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yore            yore
yorick           yorick
york            york
yorkists          yorkist
yorks           york
yorkshire          yorkshir
you             you
young            young
younger           younger
youngest           youngest
youngling          youngl
younglings          youngl
youngly           youngli
younker           younker
your            your
yours           your
yourself           yourself
yourselves          yourselv
youth            youth
youthful           youth
youths           youth
youtli           youtli
zanies           zani
zany            zani
zeal            zeal
zealous           zealou
zeals            zeal
zed             zed
zenelophon         zenelophon
zenith           zenith
zephyrs           zephyr
zir             zir
zo              zo
zodiac           zodiac
zodiacs           zodiac
zone            zone
zounds           zound
zwagger           zwagger
}

# Create a full-text index to use for testing the stemmer.
#
db close
sqlite3 db :memory:
db eval {
 CREATE VIRTUAL TABLE t1 USING fts1(word, tokenize Porter);
}
```

```
foreach {pfrom pto} $porter_test_data {
 do_test fts1porter-$pfrom {
   execsql {
     DELETE FROM t1_term;
     DELETE FROM t1_content;
     INSERT INTO t1(word) VALUES($pfrom);
     SELECT term FROM t1_term;
   }
 } $pto
}

finish_test
```

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/test/fts1porter.test
No license file was found, but licenses were detected in source scan.

```
%define name sqlite
%define version SQLITE_VERSION
%define release 1

Name: %{name}
Summary: SQLite is a C library that implements an embeddable SQL database engine
Version: %{version}
Release: %{release}
Source: %{name}-%{version}.tar.gz
Group: System/Libraries
URL: http://www.hwaci.com/sw/sqlite/
License: Public Domain
BuildRoot: %{_tmppath}/%{name}-%{version}-root

%description
SQLite is a C library that implements an embeddable SQL database engine.
Programs that link with the SQLite library can have SQL database access
without running a separate RDBMS process. The distribution comes with a
standalone command-line access program (sqlite) that can be used to
administer an SQLite database and which serves as an example of how to
use the SQLite library.

%package -n %{name}-devel
Summary: Header files and libraries for developing apps which will use sqlite
Group: Development/C
Requires: %{name} = %{version}-%{release}

%description -n %{name}-devel
The sqlite-devel package contains the header files and libraries needed
to develop programs that use the sqlite database library.
```

```
%prep
%setup -q -n %{name}

%build
CFLAGS="%optflags -DNDEBUG=1" CXXFLAGS="%optflags -DNDEBUG=1" ./configure --prefix=%{_prefix}

make
make doc

%install
install -d $RPM_BUILD_ROOT/%{_prefix}
install -d $RPM_BUILD_ROOT/%{_prefix}/bin
install -d $RPM_BUILD_ROOT/%{_prefix}/include
install -d $RPM_BUILD_ROOT/%{_prefix}/lib
make install prefix=$RPM_BUILD_ROOT/%{_prefix}

%clean
rm -fr $RPM_BUILD_ROOT

%files
%defattr(-, root, root)
%{_libdir}/*.so*
%{_bindir}/*

%files -n %{name}-devel
%defattr(-, root, root)
%{_libdir}/pkgconfig/sqlite3.pc
%{_libdir}/*.a
%{_libdir}/*.la
%{_includedir}/*
%doc doc/*
```

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/spec.template
No license file was found, but licenses were detected in source scan.

```
# 2006 September 14
#
# The author disclaims copyright to this source code.  In place of
# a legal notice, here is a blessing:
#
#    May you do good and not evil.
#    May you find forgiveness for yourself and forgive others.
#    May you share freely, never taking more than you give.
#
#*************************************************************************
# This file implements regression tests for SQLite library.  The
# focus of this script is testing the FTS2 module.
```

```
#
# $Id: fts2c.test,v 1.1 2006/10/19 23:36:26 shess Exp $
#

set testdir [file dirname $argv0]
source $testdir/tester.tcl

# If SQLITE_ENABLE_FTS2 is defined, omit this file.
ifcapable !fts2 {
 finish_test
 return
}

# Create a table of sample email data.  The data comes from email
# archives of Enron executives that was published as part of the
# litigation against that company.
#
do_test fts2c-1.1 {
 db eval {
   CREATE VIRTUAL TABLE email USING fts2([from],[to],subject,body);
   BEGIN TRANSACTION;
INSERT INTO email([from],[to],subject,body) VALUES('savita.puthigai@enron.com', 'traders.eol@enron.com,
traders.eol@enron.com', 'EnronOnline- Change to Autohedge', 'Effective Monday, October 22, 2001 the following
changes will be made to the Autohedge functionality on EnronOnline.

The volume on the hedge will now respect the minimum volume and volume increment settings on the parent
product. See rules below:

? If the transaction volume on the child is less than half of the parent"s minimum volume no hedge will occur.
? If the transaction volume on the child is more than half the parent"s minimum volume but less than half the volume
increment on the parent, the hedge will volume will be the parent"s minimum volume.
? For all other volumes, the same rounding rules will apply based on the volume increment on the parent product.

Please see example below:

Parent"s Settings:
Minimum:  5000
Increment:  1000

Volume on Autohedge transaction   Volume Hedged
1     - 2499      0
2500 - 5499       5000
5500 - 6499       6000');
INSERT INTO email([from],[to],subject,body) VALUES('dana.davis@enron.com', 'laynie.east@enron.com,
lisa.king@enron.com, lisa.best@enron.com,', 'Leaving Early', 'FYI:
If it"s ok with everyone"s needs, I would like to leave @4pm. If you think
you will need my assistance past the 4 o"clock hour just let me know;  I"ll
be more than willing to stay.');
```

INSERT INTO email([from],[to],subject,body) VALUES('enron_update@concureworkplace.com', 'louise.kitchen@enron.com', '<<Concur Expense Document>> - CC02.06.02', 'The following expense report is ready for approval:

Employee Name: Christopher F. Calger
Status last changed by: Mollie E. Gustafson Ms
Expense Report Name: CC02.06.02
Report Total: $3,972.93
Amount Due Employee: $3,972.93

To approve this expense report, click on the following link for Concur Expense.
http://expensexms.enron.com');
INSERT INTO email([from],[to],subject,body) VALUES('jeff.duff@enron.com', 'julie.johnson@enron.com', 'Work request', 'Julie,

Could you print off the current work request report by 1:30 today?

Gentlemen,

I''d like to review this today at 1:30 in our office. Also, could you provide
me with your activity reports so I can have Julie enter this information.

JD');
INSERT INTO email([from],[to],subject,body) VALUES('v.weldon@enron.com', 'gary.l.carrier@usa.dupont.com, scott.joyce@bankofamerica.com', 'Enron News', 'This could turn into something big....
http://biz.yahoo.com/rf/010129/n29305829.html');
INSERT INTO email([from],[to],subject,body) VALUES('mark.haedicke@enron.com', 'paul.simons@enron.com', 'Re: First Polish Deal!', 'Congrats! Things seem to be building rapidly now on the Continent. Mark');
INSERT INTO email([from],[to],subject,body) VALUES('e..carter@enron.com', 't..robinson@enron.com', 'FW: Producers Newsletter 9-24-2001', '
The producer lumber pricing sheet.
-----Original Message-----
From: Johnson, Jay
Sent: Tuesday, October 16, 2001 3:42 PM
To: Carter, Karen E.
Subject: FW: Producers Newsletter 9-24-2001

-----Original Message-----
From: Daigre, Sergai
Sent: Friday, September 21, 2001 8:33 PM
Subject: Producers Newsletter 9-24-2001

');
INSERT INTO email([from],[to],subject,body) VALUES('david.delainey@enron.com', 'kenneth.lay@enron.com', 'Greater Houston Partnership', 'Ken, in response to the letter from Mr Miguel San Juan, my suggestion would

be to offer up the Falcon for their use; however, given the tight time frame
and your recent visit with Mr. Fox that it would be difficult for either you
or me to participate.

I spoke to Max and he agrees with this approach.

I hope this meets with your approval.

Regards
Delainey');
INSERT INTO email([from],[to],subject,body) VALUES('lachandra.fenceroy@enron.com',
'lindy.donoho@enron.com', 'FW: Bus Applications Meeting Follow Up', 'Lindy,

Here is the original memo we discussed earlier. Please provide any information that you may have.

Your cooperation is greatly appreciated.

Thanks,

lachandra.fenceroy@enron.com
713.853.3884
877.498.3401 Pager

-----Original Message-----
From: Bisbee, Joanne
Sent: Wednesday, September 26, 2001 7:50 AM
To: Fenceroy, LaChandra
Subject: FW: Bus Applications Meeting Follow Up

Lachandra, Please get with David Duff today and see what this is about. Who are our TW accounting business
users?

-----Original Message-----
From: Koh, Wendy
Sent: Tuesday, September 25, 2001 2:41 PM
To: Bisbee, Joanne
Subject: Bus Applications Meeting Follow Up

Lisa brought up a TW change effective Nov 1. It involves eliminating a turnback surcharge. I have no other
information, but you might check with the business folks for any system changes required.

Wendy');
INSERT INTO email([from],[to],subject,body) VALUES('danny.mccarty@enron.com', 'fran.fagan@enron.com',
'RE: worksheets', 'Fran,
   If Julie''s merit needs to be lump sum, just move it over to that column. Also, send me Eric Gadd''s sheets as well.
Thanks.
Dan

-----Original Message-----
From: Fagan, Fran
Sent: Thursday, December 20, 2001 11:10 AM
To: McCarty, Danny
Subject: worksheets

As discussed, attached are your sheets for bonus and merit.

Thanks,

Fran Fagan
Sr. HR Rep
713.853.5219

<< File: McCartyMerit.xls >> << File: mccartyBonusCommercial_UnP.xls >>

');
INSERT INTO email([from],[to],subject,body) VALUES('bert.meyers@enron.com', 'shift.dl-portland@enron.com',
'OCTOBER SCHEDULE', 'TEAM,

PLEASE SEND ME ANY REQUESTS THAT YOU HAVE FOR OCTOBER. SO FAR I HAVE THEM FOR
LEAF. I WOULD LIKE TO HAVE IT DONE BY THE 15TH OF THE MONTH. ANY QUESTIONS PLEASE
GIVE ME A CALL.

BERT');
INSERT INTO email([from],[to],subject,body) VALUES('errol.mclaughlin@enron.com', 'john.arnold@enron.com,
bilal.bajwa@enron.com, john.griffith@enron.com,', 'TRV Notification: (NG - PROPT P/L - 09/27/2001)', 'The
report named: NG - PROPT P/L <http://trv.corp.enron.com/linkFromExcel.asp?report_cd=11&report_name=NG+-
+PROPT+P/L&category_cd=5&category_name=FINANCIAL&toc_hide=1&sTV1=5&TV1Exp=Y&current_efct_d
ate=09/27/2001>, published as of 09/27/2001 is now available for viewing on the website.');
INSERT INTO email([from],[to],subject,body) VALUES('patrice.mims@enron.com', 'calvin.eakins@enron.com',
'Re: Small business supply assistance', 'Hi Calvin

I spoke with Rickey (boy, is he long-winded!!). Gave him the name of our
credit guy, Russell Diamond.

Thank for your help!');
INSERT INTO email([from],[to],subject,body) VALUES('legal <.hall@enron.com>', 'stephanie.panus@enron.com',
'Termination update', 'City of Vernon and Salt River Project terminated their contracts. I will fax these notices to
you.');
INSERT INTO email([from],[to],subject,body) VALUES('d..steffes@enron.com', 'richard.shapiro@enron.com',
'EES / ENA Government Affairs Staffing & Outside Services', 'Rick --

Here is the information on staffing and outside services. Call if you need anything else.

Jim

');
INSERT INTO email([from],[to],subject,body) VALUES('gelliott@industrialinfo.com',
'pcopello@industrialinfo.com', 'ECAAR (Gavin), WSCC (Diablo Canyon), & NPCC (Seabrook)', 'Dear Power
Outage Database Customer,

Attached you will find an excel document. The outages contained within are forced or rescheduled outages. Your
daily delivery will still contain these outages.

In addition to the two excel documents, there is a dbf file that is formatted like your daily deliveries you receive
nightly. This will enable you to load the data into your regular database. Any questions please let me know. Thanks.

Greg Elliott

IIR, Inc.

713-783-5147 x 3481

outages@industrialinfo.com

THE INFORMATION CONTAINED IN THIS E-MAIL IS LEGALLY PRIVILEGED AND CONFIDENTIAL
INFORMATION INTENDED ONLY FOR THE USE OF THE INDIVIDUAL OR ENTITY NAMED ABOVE.
YOU ARE HEREBY NOTIFIED THAT ANY DISSEMINATION, DISTRIBUTION, OR COPY OF THIS E-
MAIL TO UNAUTHORIZED ENTITIES IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS
E-MAIL IN ERROR, PLEASE DELETE IT.

- OUTAGE.dbf

- 111201R.xls

- 111201.xls ');
INSERT INTO email([from],[to],subject,body) VALUES('enron.announcements@enron.com',
'all_ena_egm_eim@enron.com', 'EWS Brown Bag', 'MARK YOUR LUNCH CALENDARS NOW !

You are invited to attend the EWS Brown Bag Lunch Series

Featuring: RAY BOWEN, COO

Topic: Enron Industrial Markets

Thursday, March 15, 2001
11:30 am - 12:30 pm
EB 5 C2

You bring your lunch,   Limited Seating
We provide drinks and dessert.   RSVP x 3-9610');
INSERT INTO email([from],[to],subject,body) VALUES('chris.germany@enron.com',
'ingrid.immer@williams.com', 'Re: About St Pauls', 'Sounds good to me. I bet this is next to the Warick?? Hotel.

"Immer, Ingrid" <Ingrid.Immer@Williams.com> on 12/21/2000 11:48:47 AM
To: ""chris.germany@enron.com"" <chris.germany@enron.com>
cc:
Subject: About St Pauls

<<About St Pauls.url>>

?

?http://www.stpaulshouston.org/about.html

Chris,

I like the looks of this place.? What do you think about going here Christmas
eve?? They have an 11:00 a.m. service and a candlelight service at 5:00 p.m.,
among others.

Let me know.?? ii

- About St Pauls.url

');
INSERT INTO email([from],[to],subject,body) VALUES('nas@cpuc.ca.gov', 'skatz@sempratrading.com,
kmccrea@sablaw.com, thompson@wrightlaw.com,', 'Reply Brief filed July 31, 2000', ' - CPUC01-#76371-v1-
Revised_Reply_Brief__Due_today_7_31_.doc');
INSERT INTO email([from],[to],subject,body) VALUES('gascontrol@aglresources.com', 'dscott4@enron.com,
lcampbel@enron.com', 'Alert Posted 10:00 AM November 20,2000: E-GAS Request Reminder', 'Alert Posted 10:00
AM November 20,2000: E-GAS Request Reminder
As discussed in the Winter Operations Meeting on Sept.29,2000,
E-Gas(Emergency Gas) will not be offered this winter as a service from AGLC.
Marketers and Poolers can receive gas via Peaking and IBSS nominations(daisy
chain) from other marketers up to the 6 p.m. Same Day 2 nomination cycle.
');
INSERT INTO email([from],[to],subject,body) VALUES('dutch.quigley@enron.com',
'rwolkwitz@powermerchants.com', '', '

Here is a goody for you');
INSERT INTO email([from],[to],subject,body) VALUES('ryan.o"rourke@enron.com', 'k..allen@enron.com,
randy.bhatia@enron.com, frank.ermis@enron.com,', 'TRV Notification: (West VaR - 11/07/2001)', 'The report
named: West VaR
<http://trv.corp.enron.com/linkFromExcel.asp?report_cd=36&report_name=West+VaR&category_cd=2&category_
name=WEST&toc_hide=1&sTV1=2&TV1Exp=Y&current_efct_date=11/07/2001>, published as of 11/07/2001 is
now available for viewing on the website.');
INSERT INTO email([from],[to],subject,body) VALUES('mjones7@txu.com', 'cstone1@txu.com,
ggreen2@txu.com, timpowell@txu.com,', 'Enron / HPL Actuals for July 10, 2000', 'Teco Tap   10.000 / Enron ;
110.000 / HPL IFERC

LS HPL LSK IC   30.000 / Enron
');
INSERT INTO email([from],[to],subject,body) VALUES('susan.pereira@enron.com', 'kkw816@aol.com', 'soccer
practice', 'Kathy-

Is it safe to assume that practice is cancelled for tonight??

Susan Pereira');
INSERT INTO email([from],[to],subject,body) VALUES('mark.whitt@enron.com', 'barry.tycholiz@enron.com', 'Huber Internal Memo', 'Please look at this. I didn''t know how deep to go with the desk. Do you think this works.

');
INSERT INTO email([from],[to],subject,body) VALUES('m..forney@enron.com', 'george.phillips@enron.com', '', 'George,
Give me a call and we will further discuss opportunities on the 13st floor.

Thanks,
JMForney
3-7160');
INSERT INTO email([from],[to],subject,body) VALUES('brad.mckay@enron.com', 'angusmcka@aol.com', 'Re: (no subject)', 'not yet');
INSERT INTO email([from],[to],subject,body) VALUES('adam.bayer@enron.com', 'jonathan.mckay@enron.com', 'FW: Curve Fetch File', 'Here is the curve fetch file sent to me. It has plenty of points in it. If you give me a list of which ones you need we may be able to construct a secondary worksheet to vlookup the values.

adam
35227

-----Original Message-----
From: Royed, Jeff
Sent: Tuesday, September 25, 2001 11:37 AM
To: Bayer, Adam
Subject: Curve Fetch File

Let me know if it works.   It may be required to have a certain version of Oracle for it to work properly.

Jeff Royed
Enron
Energy Operations
Phone: 713-853-5295');
INSERT INTO email([from],[to],subject,body) VALUES('matt.smith@enron.com', 'yan.wang@enron.com', 'Report Formats', 'Yan,

The merged reports look great. I believe the only orientation changes are to
"unmerge" the following six reports:

31 Keystone Receipts
15 Questar Pipeline
40 Rockies Production
22 West_2

23 West_3
25 CIG_WIC

The orientation of the individual reports should be correct. Thanks.

Mat

PS. Just a reminder to add the "*" by the title of calculated points.');
INSERT INTO email([from],[to],subject,body) VALUES('michelle.lokay@enron.com', 'jimboman@bigfoot.com',
'Egyptian Festival', '--------------------- Forwarded by Michelle Lokay/ET&S/Enron on 09/07/2000
10:08 AM --------------------------

"Karkour, Randa" <Randa.Karkour@COMPAQ.com> on 09/07/2000 09:01:04 AM
To: ""Agheb (E-mail)" <Agheb@aol.com>, "Leila Mankarious (E-mail)"
<Leila_Mankarious@mhhs.org>, ""Marymankarious (E-mail)"
<marymankarious@aol.com>, "Michelle lokay (E-mail)" <mlokay@enron.com>, "Ramy
Mankarious (E-mail)" <Mankarious@aol.com>
cc:

Subject: Egyptian Festival

<<Egyptian Festival.url>>

http://www.egyptianfestival.com/

- Egyptian Festival.url
');
INSERT INTO email([from],[to],subject,body) VALUES('errol.mclaughlin@enron.com',
'sherry.dawson@enron.com', 'Urgent!!! --- New EAST books', 'This has to be done.................................

Thanks
---------------------- Forwarded by Errol McLaughlin/Corp/Enron on 12/20/2000
08:39 AM --------------------------

 From: William Kelly @ ECT   12/20/2000 08:31 AM

To: Kam Keiser/HOU/ECT@ECT, Darron C Giron/HOU/ECT@ECT, David
Baumbach/HOU/ECT@ECT, Errol McLaughlin/Corp/Enron@ENRON
cc: Kimat Singla/HOU/ECT@ECT, Kulvinder Fowler/NA/Enron@ENRON, Kyle R
Lilly/HOU/ECT@ECT, Jeff Royed/Corp/Enron@ENRON, Alejandra
Chavez/NA/Enron@ENRON, Crystal Hyde/HOU/ECT@ECT

Subject: New EAST books

We have new book names in TAGG for our intramonth portfolios and it is
extremely important that any deal booked to the East is communicated quickly
to someone on my team. I know it will take some time for the new names to
sink in and I do not want us to miss any positions or P&L.

Thanks for your help on this.

New:
Scott Neal :   East Northeast
Dick Jenkins: East Marketeast

WK
');
INSERT INTO email([from],[to],subject,body) VALUES('david.forster@enron.com', 'eol.wide@enron.com',
'Change to Stack Manager', 'Effective immediately, there is a change to the Stack Manager which will
affect any Inactive Child.

An inactive Child with links to Parent products will not have their
calculated prices updated until the Child product is Activated.

When the Child Product is activated, the price will be recalculated and
updated BEFORE it is displayed on the web.

This means that if you are inputting a basis price on a Child product, you
will not see the final, calculated price until you Activate the product, at
which time the customer will also see it.

If you have any questions, please contact the Help Desk on:

Americas: 713 853 4357
Europe: + 44 (0) 20 7783 7783
Asia/Australia: +61 2 9229 2300

Dave');
INSERT INTO email([from],[to],subject,body) VALUES('vince.kaminski@enron.com', 'jhh1@email.msn.com', 'Re:
Light reading - see pieces beginning on page 7', 'John,

I saw it. Very interesting.

Vince

"John H Herbert" <jhh1@email.msn.com> on 07/28/2000 08:38:08 AM
To: "Vince J Kaminski" <Vince_J_Kaminski@enron.com>

cc:
Subject: Light reading - see pieces beginning on page 7

Cheers and have a nice weekend,

JHHerbert

- gd000728.pdf

');
INSERT INTO email([from],[to],subject,body) VALUES('matthew.lenhart@enron.com',
'mmmarcantel@equiva.com', 'RE:', 'i will try to line up a pig for you ');
INSERT INTO email([from],[to],subject,body) VALUES('jae.black@enron.com', 'claudette.harvey@enron.com,
chaun.roberts@enron.com, judy.martinez@enron.com,', 'Disaster Recovery Equipment', 'As a reminder...there are
several pieces of equipment that are set up on the 30th Floor, as well as on our floor, for the Disaster Recovery
Team. PLEASE DO NOT TAKE, BORROW OR USE this equipment. Should you need to use another computer
system, other than yours, or make conference calls please work with your Assistant to help find or set up equipment
for you to use.

Thanks for your understanding in this matter.

T.Jae Black
East Power Trading
Assistant to Kevin Presto
off. 713-853-5800
fax 713-646-8272
cell 713-539-4760');
INSERT INTO email([from],[to],subject,body) VALUES('eric.bass@enron.com', 'dale.neuner@enron.com', '5 X
24', 'Dale,

Have you heard anything more on the 5 X 24s? We would like to get this
product out ASAP.

Thanks,

Eric');
INSERT INTO email([from],[to],subject,body) VALUES('messenger@smartreminders.com', 'm..tholt@enron.com',
'10% Coupon - PrintPal Printer Cartridges - 100% Guaranteed', '[IMAGE]
[IMAGE][IMAGE][IMAGE]
Dear SmartReminders Member,

We respect your privacy and are a Certified Participant of the BBBOnLine

Privacy Program. To be removed from future offers,click here.

SmartReminders.com is a permission based service. To unsubscribe click here . ');

INSERT INTO email([from],[to],subject,body) VALUES('benjamin.rogers@enron.com',

'mark.bernstein@enron.com', '', 'The guy you are talking about left CIN under a "cloud of suspicion" sort of

speak. He was the one who got into several bad deals and PPA''s in California

for CIN, thus he left on a bad note. Let me know if you need more detail

than that, I felt this was the type of info you were looking for. Thanks!

Ben');

INSERT INTO email([from],[to],subject,body) VALUES('enron_update@concureworkplace.com',

'michelle.cash@enron.com', 'Expense Report Receipts Not Received', 'Employee Name: Michelle Cash

Report Name: Houston Cellular 8-11-01

Report Date: 12/13/01

Report ID: 594D37C9ED2111D5B452

Submitted On: 12/13/01

You are only allowed 2 reports with receipts outstanding. Your expense reports will not be paid until you meet this requirement.');

INSERT INTO email([from],[to],subject,body) VALUES('susan.mara@enron.com', 'ray.alvarez@enron.com, mark.palmer@enron.com, karen.denne@enron.com,', 'CAISO Emergency Motion -- to discontinue market-based rates for', 'FYI. the latest broadside against the generators.

Sue Mara

Enron Corp.

Tel: (415) 782-7802

Fax:(415) 782-7854

----- Forwarded by Susan J Mara/NA/Enron on 06/08/2001 12:24 PM -----

"Milner, Marcie" <MMilner@coral-energy.com> 06/08/2001 11:13 AM   To: ""smara@enron.com"" <smara@enron.com> cc: Subject: CAISO Emergency Motion

Sue, did you see this emergency motion the CAISO filed today? Apparently they are requesting that FERC discontinue market-based rates immediately and grant refunds plus interest on the difference between cost-based rates and market revenues received back to May 2000. They are requesting the commission act within 14 days. Have you heard anything about what they are doing?

Marcie

http://www.caiso.com/docs/2001/06/08/200106081005526469.pdf
');
INSERT INTO email([from],[to],subject,body) VALUES('fletcher.sturm@enron.com', 'eloy.escobar@enron.com', 'Re: General Brinks Position Meeting', 'Eloy,

Who is General Brinks?

Fletch');
INSERT INTO email([from],[to],subject,body) VALUES('nailia.dindarova@enron.com', 'richard.shapiro@enron.com', 'Documents for Mark Frevert (on EU developments and lessons from', 'Rick,

Here are the documents that Peter has prepared for Mark Frevert.

Nailia
---------------------- Forwarded by Nailia Dindarova/LON/ECT on 25/06/2001 16:36 ---------------------------

Nailia Dindarova
25/06/2001 15:36
To: Michael Brown/Enron@EUEnronXGate
cc: Ross Sankey/Enron@EUEnronXGate, Eric Shaw/ENRON@EUEnronXGate, Peter Styles/LON/ECT@ECT

Subject: Documents for Mark Frevert (on EU developments and lessons from California)

Michael,

These are the documents that Peter promised to give to you for Mark Frevert. He has now handed them to him in person but asked me to transmit them

electronically to you, as well as Eric and Ross.

Nailia

');
INSERT INTO email([from],[to],subject,body) VALUES('peggy.a.kostial@accenture.com', 'dave.samuels@enron.com', 'EOL-Accenture Deal Sheet', 'Dave -

Attached are our comments and suggested changes. Please call to review.

On the time line for completion, we have four critical steps to complete:
    Finalize market analysis to refine business case, specifically
    projected revenue stream
    Complete counterparty surveying, including targeting 3 CPs for letters
    of intent
    Review Enron asset base for potential reuse/ licensing
    Contract negotiations

Joe will come back to us with an updated time line, but it is my
expectation that we are still on the same schedule (we just begun week
three) with possibly a week or so slippage.....contract negotiations will
probably be the critical path.

We will send our cut at the actual time line here shortly. Thanks,

Peggy

(See attached file: accenture-dealpoints v2.doc)
- accenture-dealpoints v2.doc ');
INSERT INTO email([from],[to],subject,body) VALUES('thomas.martin@enron.com', 'thomas.martin@enron.com',
'Re: Guadalupe Power Partners LP', '---------------------- Forwarded by Thomas A Martin/HOU/ECT on 03/20/2001
03:49 PM --------------------------

Thomas A Martin
10/11/2000 03:55 PM
To: Patrick Wade/HOU/ECT@ECT
cc:
Subject: Re: Guadalupe Power Partners LP

The deal is physically served at Oasis Waha or Oasis Katy and is priced at
either HSC, Waha or Katytailgate GD at buyers option three days prior to
NYMEX close.

');
INSERT INTO email([from],[to],subject,body) VALUES('judy.townsend@enron.com', 'dan.junek@enron.com,
chris.germany@enron.com', 'Columbia Distribution''s Capacity Available for Release - Sum', '---------------------
Forwarded by Judy Townsend/HOU/ECT on 03/09/2001 11:04
AM --------------------------

agoddard@nisource.com on 03/08/2001 09:16:57 AM
To: "   -   *Koch, Kent" <kkoch@nisource.com>, "   -
*Millar, Debra" <dmillar@nisource.com>, "   -   *Burke, Lynn"
<lburke@nisource.com>
cc: "   -   *Heckathorn, Tom" <theckathorn@nisource.com>
Subject: Columbia Distribution''s Capacity Available for Release - Sum

Attached is Columbia Distribution''s notice of capacity available for release
for
the summer of 2001 (Apr. 2001 through Oct. 2001).

Please note that the deadline for bids is 3:00pm EST on March 20, 2001.

If you have any questions, feel free to contact any of the representatives
listed
at the bottom of the attachment.

Aaron Goddard

- 2001Summer.doc
');
INSERT INTO email([from],[to],subject,body) VALUES('rhonda.denton@enron.com', 'tim.belden@enron.com,
dana.davis@enron.com, genia.fitzgerald@enron.com,', 'Split Rock Energy LLC', 'We have received the executed
EEI contract from this CP dated 12/12/2000.
Copies will be distributed to Legal and Credit.');
INSERT INTO email([from],[to],subject,body) VALUES('kerrymcelroy@dwt.com', 'jack.speer@alcoa.com,
crow@millernash.com, michaelearly@earthlink.net,', 'Oral Argument Request', ' - Oral Argument Request.doc');
INSERT INTO email([from],[to],subject,body) VALUES('mike.carson@enron.com', 'rlmichaelis@hormel.com', '',
'Did you come in town this wk end..... My new number at our house is :
713-668-3712...... my cell # is 281-381-7332

the kid');
INSERT INTO email([from],[to],subject,body) VALUES('cooper.richey@enron.com', 'trycooper@hotmail.com',
'FW: Contact Info', '

-----Original Message-----
From: Punja, Karim

Sent: Thursday, December 13, 2001 2:35 PM
To: Richey, Cooper
Subject: Contact Info

Cooper,

Its been a real pleasure working with you (even though it was for only a small amount of time)
I hope we can stay in touch.

Home# 234-0249
email: kpunja@hotmail.com

Take Care,

Karim.
 ');
INSERT INTO email([from],[to],subject,body) VALUES('bjm30@earthlink.net', 'mcguinn.k@enron.com,
mcguinn.ian@enron.com, mcguinn.stephen@enron.com,', 'email address change', 'Hello all.

I haven"t talked to many of you via email recently but I do want to give you
my new address for your email file:

   bjm30@earthlink.net

I hope all is well.

Brian McGuinn');
INSERT INTO email([from],[to],subject,body) VALUES('shelley.corman@enron.com', 'steve.hotte@enron.com',
'Flat Panels', 'Can you please advise what is going on with the flat panels that we had planned to distribute to our gas
logistics team. It was in the budget and we had the okay, but now I"m hearing there is some hold-up & the units are
stored on 44.

Shelley');
INSERT INTO email([from],[to],subject,body) VALUES('sara.davidson@enron.com',
'john.schwartzenburg@enron.com, scott.dieball@enron.com, recipients@enron.com,', '2001 Enron Law Conference
(Distribution List 2)', '   Enron Law Conference

San Antonio, Texas   May 2-4, 2001   Westin Riverwalk

           See attached memo for more details!!

? Registration for the law conference this year will be handled through an
Online RSVP Form on the Enron Law Conference Website at
http://lawconference.corp.enron.com. The website is still under construction
and will not be available until Thursday, March 15, 2001.

? We will send you another e-mail to confirm when the Law Conference Website
is operational.

? Please complete the Online RSVP Form as soon as it is available and submit
it no later than Friday, March 30th.

');
INSERT INTO email([from],[to],subject,body) VALUES('tori.kuykendall@enron.com',
'heath.b.taylor@accenture.com', 'Re:', 'hey - thats funny about john - he definitely remembers him - i"ll call pat
and let him know - we are coming on saturday - i just havent had a chance to
call you guys back -- looking forward to it -- i probably need the
directions again though');
INSERT INTO email([from],[to],subject,body) VALUES('darron.giron@enron.com', 'bryce.baxter@enron.com',
'Re: Feedback for Audrey Cook', 'Bryce,

I"ll get it done today.

DG   3-9573

    From: Bryce Baxter   06/12/2000 07:15 PM

To: Darron C Giron/HOU/ECT@ECT
cc:
Subject: Feedback for Audrey Cook

You were identified as a reviewer for Audrey Cook. If possible, could you
complete her feedback by end of business Wednesday? It will really help me
in the PRC process to have your input. Thanks.

');
INSERT INTO email([from],[to],subject,body) VALUES('casey.evans@enron.com', 'stephanie.sever@enron.com',
'Gas EOL ID', 'Stephanie,

In conjunction with the recent movement of several power traders, they are changing the names of their gas books as
well. The names of the new gas books and traders are as follows:

PWR-NG-LT-SPP: Mike Carson
PWR-NG-LT-SERC: Jeff King

If you need to know their power desk to map their ID to their gas books, those desks are as follows:

EPMI-LT-SPP: Mike Carson
EPMI-LT-SERC: Jeff King

I will be in training this afternoon, but will be back when class is over. Let me know if you have any questions.

Thanks for your help!
Casey');
INSERT INTO email([from],[to],subject,body) VALUES('darrell.schoolcraft@enron.com',
'david.roensch@enron.com, kimberly.watson@enron.com, michelle.lokay@enron.com,', 'Postings', 'Please see the
attached.

ds

');
INSERT INTO email([from],[to],subject,body) VALUES('mcominsky@aol.com', 'cpatman@bracepatt.com,
james_derrick@enron.com', 'Jurisprudence Luncheon', 'Carrin & Jim --

It was an honor and a pleasure to meet both of you yesterday. I know we will
have fun working together on this very special event.

Jeff left the jurisprudence luncheon lists for me before he left on vacation.
I wasn"t sure whether he transmitted them to you as well. Would you please
advise me if you would like them sent to you? I can email the MS Excel files
or I can fax the hard copies to you.   Please advise what is most convenient.

I plan to be in town through the holidays and can be reached by phone, email,
or cell phone at any time. My cell phone number is 713/705-4829.

Thanks again for your interest in the ADL"s work. Martin.

Martin B. Cominsky
Director, Southwest Region
Anti-Defamation League
713/627-3490, ext. 122
713/627-2011 (fax)
MCominsky@aol.com');
INSERT INTO email([from],[to],subject,body) VALUES('phillip.love@enron.com', 'todagost@utmb.edu,
gbsonnta@utmb.edu', 'New President', 'I had a little bird put a word in my ear. Is there any possibility for Ben
Raimer to be Bush"s secretary of HHS? Just curious about that infamous UTMB
rumor mill. Hope things are well, happy holidays.
PL');
INSERT INTO email([from],[to],subject,body) VALUES('marie.heard@enron.com', 'ehamilton@fna.com', 'ISDA
Master Agreement', 'Erin:

Pursuant to your request, attached are the Schedule to the ISDA Master Agreement, together with Paragraph 13 to the ISDA Credit Support Annex. Please let me know if you need anything else. We look forward to hearing your comments.

Marie

Marie Heard
Senior Legal Specialist
Enron North America Corp.
Phone: (713) 853-3907
Fax: (713) 646-3490
marie.heard@enron.com

    ');
INSERT INTO email([from],[to],subject,body) VALUES('andrea.ring@enron.com', 'beverly.beaty@enron.com', 'Re: Tennessee Buy - Louis Dreyfus', 'Beverly - once again thanks so much for your help on this.

                                      ');
INSERT INTO email([from],[to],subject,body) VALUES('karolyn.criado@enron.com', 'j..bonin@enron.com, felicia.case@enron.com, b..clapp@enron.com,', 'Price List week of Oct. 8-9, 2001', '
Please contact me if you have any questions regarding last weeks prices.

Thank you,
Karolyn Criado
3-9441

');
INSERT INTO email([from],[to],subject,body) VALUES('kevin.presto@enron.com', 'edward.baughman@enron.com, billy.braddock@enron.com', 'Associated', 'Please begin working on filling our Associated short position in 02.   I would like to take this risk off the books.

In addition, please find out what a buy-out of VEPCO would cost us.   With Rogers transitioning to run our retail risk management, I would like to clean up our customer positions.

We also need to continue to explore a JEA buy-out.

Thanks.');
INSERT INTO email([from],[to],subject,body) VALUES('stacy.dickson@enron.com', 'gregg.penman@enron.com', 'RE: Constellation TC 5-7-01', 'Gregg,

I am at home with a sick baby. (Lots of fun!) I will call you about this
tomorrow.

Stacy');
INSERT INTO email([from],[to],subject,body) VALUES('joe.quenet@enron.com', 'dfincher@utilicorp.com', '', 'hey big guy.....check this out.....

w ww.gorelieberman-2000.com/');
INSERT INTO email([from],[to],subject,body) VALUES('k..allen@enron.com', 'jacqestc@aol.com', '', 'Jacques,

I sent you a fax of Kevin Kolb''s comments on the release. The payoff on the note would be $36,248 ($36090(principal) + $158 (accrued interest)).
This is assuming we wrap this up on Tuesday.

Please email to confirm that their changes are ok so I can set up a meeting on Tuesday to reach closure.

Phillip');
INSERT INTO email([from],[to],subject,body) VALUES('kourtney.nelson@enron.com', 'mike.swerzbin@enron.com', 'Adjusted L/R Balance', 'Mike,

I placed the adjusted L/R Balance on the Enronwest site. It is under the "Staff/Kourtney Nelson". There are two links:

1) "Adj L_R" is the same data/format from the weekly strategy meeting.
2) "New Gen 2001_2002" link has all of the supply side info that is used to calculate the L/R balance
 -Please note the Data Flag column, a value of "3" indicates the project was cancelled, on hold, etc and is not included in the calc.

Both of these sheets are interactive Excel spreadsheets and thus you can play around with the data as you please. Also, James Bruce is working to get his gen report on the web. That will help with your access to information on new gen.

Please let me know if you have any questions or feedback,

Kourtney

Kourtney Nelson
Fundamental Analysis
Enron North America
(503) 464-8280
kourtney.nelson@enron.com');
INSERT INTO email([from],[to],subject,body) VALUES('d..thomas@enron.com', 'naveed.ahmed@enron.com', 'FW: Current Enron TCC Portfolio', '

-----Original Message-----
From: Grace, Rebecca M.
Sent: Monday, December 17, 2001 9:44 AM
To: Thomas, Paul D.

Cc: Cashion, Jim; Allen, Thresa A.; May, Tom
Subject: RE: Current Enron TCC Portfolio

Paul,

I reviewed NY"s list. I agree with all of their contracts numbers and mw amounts.

Call if you have any more questions.

Rebecca

-----Original Message-----
From: Thomas, Paul D.
Sent: Monday, December 17, 2001 9:08 AM
To: Grace, Rebecca M.
Subject: FW: Current Enron TCC Portfolio

<< File: enrontccs.xls >>
Rebecca,
Let me know if you see any differences.

Paul
X 3-0403
-----Original Message-----
From: Thomas, Paul D.
Sent: Monday, December 17, 2001 9:04 AM
To: Ahmed, Naveed
Subject: FW: Current Enron TCC Portfolio

-----Original Message-----
From: Thomas, Paul D.
Sent: Thursday, December 13, 2001 10:01 AM
To: Baughman, Edward D.
Subject: Current Enron TCC Portfolio

');
INSERT INTO email([from],[to],subject,body) VALUES('stephanie.panus@enron.com',
'william.bradford@enron.com, debbie.brackett@enron.com,', 'Coastal Merchant Energy/El Paso Merchant Energy',
'Coastal Merchant Energy, L.P. merged with and into El Paso Merchant Energy,
L.P., effective February 1, 2001, with the surviving entity being El Paso
Merchant Energy, L.P. We currently have ISDA Master Agreements with both

counterparties. Please see the attached memo regarding the existing Masters
and let us know which agreement should be terminated.

Thanks,
Stephanie
');
INSERT INTO email([from],[to],subject,body) VALUES('kam.keiser@enron.com', 'c..kenne@enron.com', 'RE:
What about this too???', '

-----Original Message-----
From: Kenne, Dawn C.
Sent: Wednesday, February 06, 2002 11:50 AM
To: Keiser, Kam
Subject: What about this too???

<< File: Netco Trader Matrix.xls >>
');
INSERT INTO email([from],[to],subject,body) VALUES('chris.meyer@enron.com', 'joe.parks@enron.com',
'Centana', 'Talked to Chip. We do need Cash Committe approval given the netting feature of your deal, which
means Batch Funding Request. Please update per my previous e-mail and forward.

Thanks

chris
x31666');
INSERT INTO email([from],[to],subject,body) VALUES('debra.perlingiere@enron.com',
'jworman@academyofhealth.com', '', 'Have a great weekend!   Happy Fathers Day!

Debra Perlingiere
Enron North America Corp.
1400 Smith Street, EB 3885
Houston, Texas 77002
dperlin@enron.com
Phone 713-853-7658
Fax 713-646-3490');
INSERT INTO email([from],[to],subject,body) VALUES('outlook.team@enron.com', '', 'Demo by Martha Janousek
of Dashboard & Pipeline Profile / Julia &', 'CALENDAR ENTRY: APPOINTMENT

Description:
 Demo by Martha Janousek of Dashboard & Pipeline Profile / Julia & Dir Rpts. - 4102

Date: 1/5/2001
Time: 9:00 AM - 10:00 AM (Central Standard Time)

Chairperson: Outlook Migration Team

Detailed Description:');
INSERT INTO email([from],[to],subject,body) VALUES('diana.seifert@enron.com', 'mark.taylor@enron.com', 'Guest access Chile', 'Hello Mark,

Justin Boyd told me that your can help me with questions regarding Chile.
We got a request for guest access through MG.
The company is called Escondida and is a subsidiary of BHP Australia.

Please advise if I can set up a guest account or not.
F.Y.I.: MG is planning to put a "in w/h Chile" contract for Copper on-line as
soon as Enron has done the due diligence for this country.
Thanks !

Best regards

Diana Seifert
EOL PCG');
INSERT INTO email([from],[to],subject,body) VALUES('enron_update@concureworkplace.com', 'mark.whitt@enron.com', '<<Concur Expense Document>> - 121001', 'The Approval status has changed on the following report:

Status last changed by: Barry L. Tycholiz
Expense Report Name: 121001
Report Total: $198.98
Amount Due Employee: $198.98
Amount Approved: $198.98
Amount Paid: $0.00
Approval Status: Approved
Payment Status: Pending

To review this expense report, click on the following link for Concur Expense.
http://expensexms.enron.com');
INSERT INTO email([from],[to],subject,body) VALUES('kevin.hyatt@enron.com', '', 'Technical Support', 'Outside the U.S., please refer to the list below:

Australia:
1800 678-515
support@palm-au.com

Canada:
1905 305-6530
support@palm.com

New Zealand:
0800 446-398
support@palm-nz.com

U.K.:

0171 867 0108

eurosupport@palm.3com.com

Please refer to the Worldwide Customer Support card for a complete technical support contact list.');
INSERT INTO email([from],[to],subject,body) VALUES('geoff.storey@enron.com', 'dutch.quigley@enron.com',
'RE:', 'duke contact?

-----Original Message-----
From: Quigley, Dutch
Sent: Wednesday, October 31, 2001 10:14 AM
To: Storey, Geoff
Subject: RE:

bp corp Albert LaMore 281-366-4962

running the reports now

-----Original Message-----
From: Storey, Geoff
Sent: Wednesday, October 31, 2001 10:10 AM
To: Quigley, Dutch
Subject: RE:

give me a contact over there too
BP

-----Original Message-----
From: Quigley, Dutch
Sent: Wednesday, October 31, 2001 9:42 AM
To: Storey, Geoff
Subject:

Coral Jeff Whitnah 713-767-5374
Relaint Steve McGinn 713-207-4000');
INSERT INTO email([from],[to],subject,body) VALUES('pete.davis@enron.com', 'pete.davis@enron.com', 'Start
Date: 4/22/01; HourAhead hour: 3; <CODESITE>', 'Start Date: 4/22/01; HourAhead hour: 3; No ancillary
schedules awarded.
Variances detected.
Variances detected in Load schedule.

  LOG MESSAGES:

PARSING FILE -->> O:\Portland\WestDesk\California Scheduling\ISO Final
Schedules\2001042203.txt

---- Load Schedule ----
$$$ Variance found in table tblLoads.
   Details: (Hour: 3 / Preferred: 1.92 / Final: 1.89)
 TRANS_TYPE: FINAL
 LOAD_ID: PGE4
 MKT_TYPE: 2
 TRANS_DATE: 4/22/01
 SC_ID: EPMI

');
INSERT INTO email([from],[to],subject,body) VALUES('john.postlethwaite@enron.com',
'john.zufferli@enron.com', 'Reference', 'John, hope things are going well up there for you. The big day is almost
here for you and Jessica. I was wondering if I could use your name as a job reference if need be. I am just trying to
get everything in order just in case something happens.

John');
INSERT INTO email([from],[to],subject,body) VALUES('jeffrey.shankman@enron.com',
'lschiffm@jonesday.com', 'Re:', 'I saw you called on the cell this a.m. Sorry I missed you. (I was in the
shower). I have had a shitty week--I suspect my silence (not only to you,
but others) after our phone call is a result of the week. I''m seeing Glen at
11:15....talk to you');
INSERT INTO email([from],[to],subject,body) VALUES('litebytz@enron.com', '', 'Lite Bytz RSVP', '
This week''s Lite Bytz presentation will feature the following TOOLZ speaker:

Richard McDougall
Solaris 8
Thursday, June 7, 2001

If you have not already signed up, please RSVP via email to litebytz@enron.com by the end of the day Tuesday,
June 5, 2001.

*Remember: this is now a Brown Bag Event--so bring your lunch and we will provide cookies and drinks.

Click below for more details.

http://home.enron.com:84/messaging/litebytztoolzprint.jpg');
  COMMIT;
 }
} {}

###
Everything above just builds an interesting test database. The actual
tests come after this comment.
###

do_test fts2c-1.2 {
 execsql {

```
    SELECT rowid FROM email WHERE email MATCH 'mark'
  }
} {6 17 25 38 40 42 73 74}
do_test fts2c-1.3 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH 'susan'
 }
} {24 40}
do_test fts2c-1.4 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH 'mark susan'
 }
} {40}
do_test fts2c-1.5 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH 'susan mark'
 }
} {40}
do_test fts2c-1.6 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH '"mark susan"'
 }
} {}
do_test fts2c-1.7 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH 'mark -susan'
 }
} {6 17 25 38 42 73 74}
do_test fts2c-1.8 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH '-mark susan'
 }
} {24}
do_test fts2c-1.9 {
 execsql {
   SELECT rowid FROM email WHERE email MATCH 'mark OR susan'
 }
} {6 17 24 25 38 40 42 73 74}


# Some simple tests of the automatic "offsets(email)" column.  In the sample
# data set above, only one message, number 20, contains the words
# "gas" and "reminder" in both body and subject.
#
do_test fts2c-2.1 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE email MATCH 'gas reminder'
 }
```

```
} {20 {2 0 42 3 2 1 54 8 3 0 42 3 3 1 54 8 3 0 129 3 3 0 143 3 3 0 240 3}}
do_test fts2c-2.2 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE email MATCH 'subject:gas reminder'
 }
} {20 {2 0 42 3 2 1 54 8 3 1 54 8}}
do_test fts2c-2.3 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE email MATCH 'body:gas reminder'
 }
} {20 {2 1 54 8 3 0 42 3 3 1 54 8 3 0 129 3 3 0 143 3 3 0 240 3}}
do_test fts2c-2.4 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE subject MATCH 'gas reminder'
 }
} {20 {2 0 42 3 2 1 54 8}}
do_test fts2c-2.5 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE body MATCH 'gas reminder'
 }
} {20 {3 0 42 3 3 1 54 8 3 0 129 3 3 0 143 3 3 0 240 3}}


# Document 32 contains 5 instances of the world "child".  But only
# 3 of them are paired with "product".  Make sure only those instances
# that match the phrase appear in the offsets(email) list.
#
do_test fts2c-3.1 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE body MATCH 'child product' AND +rowid=32
 }
} {32 {3 0 94 5 3 0 114 5 3 0 207 5 3 1 213 7 3 0 245 5 3 1 251 7 3 0 409 5 3 1 415 7 3 1 493 7}}
do_test fts2c-3.2 {
 execsql {
   SELECT rowid, offsets(email) FROM email
    WHERE body MATCH '"child product"'
 }
} {32 {3 0 207 5 3 1 213 7 3 0 245 5 3 1 251 7 3 0 409 5 3 1 415 7}}


# Snippet generator tests
#
do_test fts2c-4.1 {
 execsql {
   SELECT snippet(email) FROM email
```

```
    WHERE email MATCH 'subject:gas reminder'
 }
} {{Alert Posted 10:00 AM November 20,2000: E-<b>GAS</b> Request <b>Reminder</b>}}
do_test fts2c-4.2 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'christmas candlelight'
 }
} {{<b>...</b> place.? What do you think about going here <b>Christmas</b>
eve?? They have an 11:00 a.m. service and a <b>candlelight</b> service at 5:00 p.m.,
among others. <b>...</b>}}

do_test fts2c-4.3 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'deal sheet potential reuse'
 }
} {{EOL-Accenture <b>Deal</b> <b>Sheet</b> <b>...</b> intent
   Review Enron asset base for <b>potential</b> <b>reuse</b>/ licensing
   Contract negotiations <b>...</b>}}
do_test fts2c-4.4 {
 execsql {
   SELECT snippet(email,'<<<','>>>',' ') FROM email
    WHERE email MATCH 'deal sheet potential reuse'
 }
} {{EOL-Accenture <<<Deal>>> <<<Sheet>>>  intent
   Review Enron asset base for <<<potential>>> <<<reuse>>>/ licensing
   Contract negotiations  }}
do_test fts2c-4.5 {
 execsql {
   SELECT snippet(email,'<<<','>>>',' ') FROM email
    WHERE email MATCH 'first things'
 }
} {{Re: <<<First>>> Polish Deal!  Congrats!  <<<Things>>> seem to be building rapidly now on the  }}
do_test fts2c-4.6 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'chris is here'
 }
} {{<b>chris</b>.germany@enron.com <b>...</b> Sounds good to me.  I bet this <b>is</b> next to the Warick??
Hotel. <b>...</b> place.? What do you think about going <b>here</b> Christmas
eve?? They have an 11:00 a.m. <b>...</b>}}
do_test fts2c-4.7 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH '"pursuant to"'
 }
} {{Erin:
```

\Pursuant\ \to\ your request, attached are the Schedule to \...\}}

```
do_test fts2c-4.8 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'ancillary load davis'
 }
} {{pete.<b>davis</b>@enron.com <b>...</b> Start Date: 4/22/01; HourAhead hour: 3;  No <b>ancillary</b>
schedules awarded.
Variances detected.
Variances detected in <b>Load</b> schedule.

  LOG MESSAGES:

PARSING <b>...</b>}}

# Combinations of AND and OR operators:
#
do_test fts2c-5.1 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'questar enron OR com'
 }
} {{matt.smith@<b>enron</b>.<b>com</b> <b>...</b> six reports:

31 Keystone Receipts
15 <b>Questar</b> Pipeline
40 Rockies Production
22 West_2 <b>...</b>}}
do_test fts2c-5.2 {
 execsql {
   SELECT snippet(email) FROM email
    WHERE email MATCH 'enron OR com questar'
 }
} {{matt.smith@<b>enron</b>.<b>com</b> <b>...</b> six reports:

31 Keystone Receipts
15 <b>Questar</b> Pipeline
40 Rockies Production
22 West_2 <b>...</b>}}

finish_test
```

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/test/fts2c.test
No license file was found, but licenses were detected in source scan.

2001 September 15

```
#
# The author disclaims copyright to this source code.  In place of
# a legal notice, here is a blessing:
#
#    May you do good and not evil.
#    May you find forgiveness for yourself and forgive others.
#    May you share freely, never taking more than you give.
#
#***************************************************************************
# This file implements regression tests for SQLite library.  The
# focus of this file is testing built-in functions.
#
# $Id: func.test,v 1.60 2007/04/10 13:51:19 drh Exp $

set testdir [file dirname $argv0]
source $testdir/tester.tcl

# Create a table to work with.
#
do_test func-0.0 {
 execsql {CREATE TABLE tbl1(t1 text)}
 foreach word {this program is free software} {
   execsql "INSERT INTO tbl1 VALUES('$word')"
 }
 execsql {SELECT t1 FROM tbl1 ORDER BY t1}
} {free is program software this}
do_test func-0.1 {
 execsql {
   CREATE TABLE t2(a);
   INSERT INTO t2 VALUES(1);
   INSERT INTO t2 VALUES(NULL);
   INSERT INTO t2 VALUES(345);
   INSERT INTO t2 VALUES(NULL);
   INSERT INTO t2 VALUES(67890);
   SELECT * FROM t2;
 }
} {1 {} 345 {} 67890}

# Check out the length() function
#
do_test func-1.0 {
 execsql {SELECT length(t1) FROM tbl1 ORDER BY t1}
} {4 2 7 8 4}
do_test func-1.1 {
 set r [catch {execsql {SELECT length(*) FROM tbl1 ORDER BY t1}} msg]
 lappend r $msg
} {1 {wrong number of arguments to function length()}}
do_test func-1.2 {
```

```
    set r [catch {execsql {SELECT length(t1,5) FROM tbl1 ORDER BY t1}} msg]
    lappend r $msg
} {1 {wrong number of arguments to function length()}}
do_test func-1.3 {
    execsql {SELECT length(t1), count(*) FROM tbl1 GROUP BY length(t1)
        ORDER BY length(t1)}
} {2 1 4 2 7 1 8 1}
do_test func-1.4 {
    execsql {SELECT coalesce(length(a),-1) FROM t2}
} {1 -1 3 -1 5}


# Check out the substr() function
#
do_test func-2.0 {
    execsql {SELECT substr(t1,1,2) FROM tbl1 ORDER BY t1}
} {fr is pr so th}
do_test func-2.1 {
    execsql {SELECT substr(t1,2,1) FROM tbl1 ORDER BY t1}
} {r s r o h}
do_test func-2.2 {
    execsql {SELECT substr(t1,3,3) FROM tbl1 ORDER BY t1}
} {ee {} ogr ftw is}
do_test func-2.3 {
    execsql {SELECT substr(t1,-1,1) FROM tbl1 ORDER BY t1}
} {e s m e s}
do_test func-2.4 {
    execsql {SELECT substr(t1,-1,2) FROM tbl1 ORDER BY t1}
} {e s m e s}
do_test func-2.5 {
    execsql {SELECT substr(t1,-2,1) FROM tbl1 ORDER BY t1}
} {e i a r i}
do_test func-2.6 {
    execsql {SELECT substr(t1,-2,2) FROM tbl1 ORDER BY t1}
} {ee is am re is}
do_test func-2.7 {
    execsql {SELECT substr(t1,-4,2) FROM tbl1 ORDER BY t1}
} {fr {} gr wa th}
do_test func-2.8 {
    execsql {SELECT t1 FROM tbl1 ORDER BY substr(t1,2,20)}
} {this software free program is}
do_test func-2.9 {
    execsql {SELECT substr(a,1,1) FROM t2}
} {1 {} 3 {} 6}
do_test func-2.10 {
    execsql {SELECT substr(a,2,2) FROM t2}
} {{} {} 45 {} 78}

# Only do the following tests if TCL has UTF-8 capabilities
```

```
#
if {"\u1234"!="u1234"} {

# Put some UTF-8 characters in the database
#
do_test func-3.0 {
 execsql {DELETE FROM tbl1}
 foreach word "contains UTF-8 characters hi\u1234ho" {
   execsql "INSERT INTO tbl1 VALUES('$word')"
 }
 execsql {SELECT t1 FROM tbl1 ORDER BY t1}
} "UTF-8 characters contains hi\u1234ho"
do_test func-3.1 {
 execsql {SELECT length(t1) FROM tbl1 ORDER BY t1}
} {5 10 8 5}
do_test func-3.2 {
 execsql {SELECT substr(t1,1,2) FROM tbl1 ORDER BY t1}
} {UT ch co hi}
do_test func-3.3 {
 execsql {SELECT substr(t1,1,3) FROM tbl1 ORDER BY t1}
} "UTF cha con hi\u1234"
do_test func-3.4 {
 execsql {SELECT substr(t1,2,2) FROM tbl1 ORDER BY t1}
} "TF ha on i\u1234"
do_test func-3.5 {
 execsql {SELECT substr(t1,2,3) FROM tbl1 ORDER BY t1}
} "TF- har ont i\u1234h"
do_test func-3.6 {
 execsql {SELECT substr(t1,3,2) FROM tbl1 ORDER BY t1}
} "F- ar nt \u1234h"
do_test func-3.7 {
 execsql {SELECT substr(t1,4,2) FROM tbl1 ORDER BY t1}
} "-8 ra ta ho"
do_test func-3.8 {
 execsql {SELECT substr(t1,-1,1) FROM tbl1 ORDER BY t1}
} "8 s s o"
do_test func-3.9 {
 execsql {SELECT substr(t1,-3,2) FROM tbl1 ORDER BY t1}
} "F- er in \u1234h"
do_test func-3.10 {
 execsql {SELECT substr(t1,-4,3) FROM tbl1 ORDER BY t1}
} "TF- ter ain i\u1234h"
do_test func-3.99 {
 execsql {DELETE FROM tbl1}
 foreach word {this program is free software} {
   execsql "INSERT INTO tbl1 VALUES('$word')"
 }
 execsql {SELECT t1 FROM tbl1}
```

} {this program is free software}

} ;# End \u1234!=u1234

Test the abs() and round() functions.
#
do_test func-4.1 {
 execsql {
   CREATE TABLE t1(a,b,c);
   INSERT INTO t1 VALUES(1,2,3);
   INSERT INTO t1 VALUES(2,1.2345678901234,-12345.67890);
   INSERT INTO t1 VALUES(3,-2,-5);
 }
 catchsql {SELECT abs(a,b) FROM t1}
} {1 {wrong number of arguments to function abs()}}
do_test func-4.2 {
 catchsql {SELECT abs() FROM t1}
} {1 {wrong number of arguments to function abs()}}
do_test func-4.3 {
 catchsql {SELECT abs(b) FROM t1 ORDER BY a}
} {0 {2 1.2345678901234 2}}
do_test func-4.4 {
 catchsql {SELECT abs(c) FROM t1 ORDER BY a}
} {0 {3 12345.6789 5}}
do_test func-4.4.1 {
 execsql {SELECT abs(a) FROM t2}
} {1 {} 345 {} 67890}
do_test func-4.4.2 {
 execsql {SELECT abs(t1) FROM tbl1}
} {0.0 0.0 0.0 0.0 0.0}

do_test func-4.5 {
 catchsql {SELECT round(a,b,c) FROM t1}
} {1 {wrong number of arguments to function round()}}
do_test func-4.6 {
 catchsql {SELECT round(b,2) FROM t1 ORDER BY b}
} {0 {-2.0 1.23 2.0}}
do_test func-4.7 {
 catchsql {SELECT round(b,0) FROM t1 ORDER BY a}
} {0 {2.0 1.0 -2.0}}
do_test func-4.8 {
 catchsql {SELECT round(c) FROM t1 ORDER BY a}
} {0 {3.0 -12346.0 -5.0}}
do_test func-4.9 {
 catchsql {SELECT round(c,a) FROM t1 ORDER BY a}
} {0 {3.0 -12345.68 -5.0}}
do_test func-4.10 {
 catchsql {SELECT 'x' || round(c,a) || 'y' FROM t1 ORDER BY a}

```
} {0 {x3.0y x-12345.68y x-5.0y}}
do_test func-4.11 {
 catchsql {SELECT round() FROM t1 ORDER BY a}
} {1 {wrong number of arguments to function round()}}
do_test func-4.12 {
 execsql {SELECT coalesce(round(a,2),'nil') FROM t2}
} {1.0 nil 345.0 nil 67890.0}
do_test func-4.13 {
 execsql {SELECT round(t1,2) FROM tbl1}
} {0.0 0.0 0.0 0.0 0.0}
do_test func-4.14 {
 execsql {SELECT typeof(round(5.1,1));}
} {real}
do_test func-4.15 {
 execsql {SELECT typeof(round(5.1));}
} {real}


# Test the upper() and lower() functions
#
do_test func-5.1 {
 execsql {SELECT upper(t1) FROM tbl1}
} {THIS PROGRAM IS FREE SOFTWARE}
do_test func-5.2 {
 execsql {SELECT lower(upper(t1)) FROM tbl1}
} {this program is free software}
do_test func-5.3 {
 execsql {SELECT upper(a), lower(a) FROM t2}
} {1 1 {} {} 345 345 {} {} 67890 67890}
do_test func-5.4 {
 catchsql {SELECT upper(a,5) FROM t2}
} {1 {wrong number of arguments to function upper()}}
do_test func-5.5 {
 catchsql {SELECT upper(*) FROM t2}
} {1 {wrong number of arguments to function upper()}}

# Test the coalesce() and nullif() functions
#
do_test func-6.1 {
 execsql {SELECT coalesce(a,'xyz') FROM t2}
} {1 xyz 345 xyz 67890}
do_test func-6.2 {
 execsql {SELECT coalesce(upper(a),'nil') FROM t2}
} {1 nil 345 nil 67890}
do_test func-6.3 {
 execsql {SELECT coalesce(nullif(1,1),'nil')}
} {nil}
do_test func-6.4 {
```

```
   execsql {SELECT coalesce(nullif(1,2),'nil')}
} {1}
do_test func-6.5 {
 execsql {SELECT coalesce(nullif(1,NULL),'nil')}
} {1}


# Test the last_insert_rowid() function
#
do_test func-7.1 {
 execsql {SELECT last_insert_rowid()}
} [db last_insert_rowid]

# Tests for aggregate functions and how they handle NULLs.
#
do_test func-8.1 {
 ifcapable explain {
   execsql {EXPLAIN SELECT sum(a) FROM t2;}
 }
 execsql {
   SELECT sum(a), count(a), round(avg(a),2), min(a), max(a), count(*) FROM t2;
 }
} {68236 3 22745.33 1 67890 5}
do_test func-8.2 {
 execsql {
   SELECT max('z+'||a||'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP') FROM t2;
 }
} {z+67890abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP}

ifcapable tempdb {
 do_test func-8.3 {
   execsql {
     CREATE TEMP TABLE t3 AS SELECT a FROM t2 ORDER BY a DESC;
     SELECT min('z+'||a||'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP') FROM t3;
   }
 } {z+1abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP}
} else {
 do_test func-8.3 {
   execsql {
     CREATE TABLE t3 AS SELECT a FROM t2 ORDER BY a DESC;
     SELECT min('z+'||a||'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP') FROM t3;
   }
 } {z+1abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP}
}
do_test func-8.4 {
 execsql {
   SELECT max('z+'||a||'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP') FROM t3;
 }
```

```
    } {z+67890abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOP}

# How do you test the random() function in a meaningful, deterministic way?
#
do_test func-9.1 {
 execsql {
   SELECT random() is not null;
 }
} {1}
do_test func-9.2 {
 execsql {
   SELECT typeof(random());
 }
} {integer}
do_test func-9.3 {
 execsql {
   SELECT randomblob(32) is not null;
 }
} {1}
do_test func-9.4 {
 execsql {
   SELECT typeof(randomblob(32));
 }
} {blob}
do_test func-9.5 {
 execsql {
   SELECT length(randomblob(32)), length(randomblob(-5)),
       length(randomblob(2000))
 }
} {32 1 2000}

# The "hex()" function was added in order to be able to render blobs
# generated by randomblob().  So this seems like a good place to test
# hex().
#
do_test func-9.10 {
 execsql {SELECT hex(x'00112233445566778899aAbBcCdDeEfF')}
} {00112233445566778899AABBCCDDEEFF}
do_test func-9.11 {
 execsql {SELECT hex(replace('abcdefg','ef','12'))}
} {61626364313267}

# Use the "sqlite_register_test_function" TCL command which is part of
# the text fixture in order to verify correct operation of some of
# the user-defined SQL function APIs that are not used by the built-in
# functions.
#
set ::DB [sqlite3_connection_pointer db]
```

```
sqlite_register_test_function $::DB testfunc
do_test func-10.1 {
 catchsql {
   SELECT testfunc(NULL,NULL);
 }
} {1 {first argument should be one of: int int64 string double null value}}
do_test func-10.2 {
 execsql {
   SELECT testfunc(
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'int', 1234
   );
 }
} {1234}
do_test func-10.3 {
 execsql {
   SELECT testfunc(
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'string', NULL
   );
 }
} {{}}
do_test func-10.4 {
 execsql {
   SELECT testfunc(
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'double', 1.234
   );
 }
} {1.234}
do_test func-10.5 {
 execsql {
   SELECT testfunc(
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'int', 1234,
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'string', NULL,
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'double', 1.234,
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'int', 1234,
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'string', NULL,
   'string', 'abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ',
   'double', 1.234
   );
 }
} {1.234}
```

```
# Test the built-in sqlite_version(*) SQL function.
#
do_test func-11.1 {
 execsql {
   SELECT sqlite_version(*);
 }
} [sqlite3 -version]

# Test that destructors passed to sqlite3 by calls to sqlite3_result_text()
# etc. are called. These tests use two special user-defined functions
# (implemented in func.c) only available in test builds.
#
# Function test_destructor() takes one argument and returns a copy of the
# text form of that argument. A destructor is associated with the return
# value. Function test_destructor_count() returns the number of outstanding
# destructor calls for values returned by test_destructor().
#
do_test func-12.1 {
 execsql {
   SELECT test_destructor('hello world'), test_destructor_count();
 }
} {{hello world} 1}
do_test func-12.2 {
 execsql {
   SELECT test_destructor_count();
 }
} {0}
do_test func-12.3 {
 execsql {
   SELECT test_destructor('hello')||' world', test_destructor_count();
 }
} {{hello world} 0}
do_test func-12.4 {
 execsql {
   SELECT test_destructor_count();
 }
} {0}
do_test func-12.5 {
 execsql {
   CREATE TABLE t4(x);
   INSERT INTO t4 VALUES(test_destructor('hello'));
   INSERT INTO t4 VALUES(test_destructor('world'));
   SELECT min(test_destructor(x)), max(test_destructor(x)) FROM t4;
 }
} {hello world}
do_test func-12.6 {
 execsql {
```

```
    SELECT test_destructor_count();
  }
} {0}
do_test func-12.7 {
 execsql {
   DROP TABLE t4;
 }
} {}


# Test that the auxdata API for scalar functions works. This test uses
# a special user-defined function only available in test builds,
# test_auxdata(). Function test_auxdata() takes any number of arguments.
do_test func-13.1 {
 execsql {
   SELECT test_auxdata('hello world');
 }
} {0}


do_test func-13.2 {
 execsql {
   CREATE TABLE t4(a, b);
   INSERT INTO t4 VALUES('abc', 'def');
   INSERT INTO t4 VALUES('ghi', 'jkl');
 }
} {}
do_test func-13.3 {
 execsql {
   SELECT test_auxdata('hello world') FROM t4;
 }
} {0 1}
do_test func-13.4 {
 execsql {
   SELECT test_auxdata('hello world', 123) FROM t4;
 }
} {{0 0} {1 1}}
do_test func-13.5 {
 execsql {
   SELECT test_auxdata('hello world', a) FROM t4;
 }
} {{0 0} {1 0}}
do_test func-13.6 {
 execsql {
   SELECT test_auxdata('hello'||'world', a) FROM t4;
 }
} {{0 0} {1 0}}


# Test that auxilary data is preserved between calls for SQL variables.
do_test func-13.7 {
```

```
  set DB [sqlite3_connection_pointer db]
  set sql "SELECT test_auxdata( ? , a ) FROM t4;"
  set STMT [sqlite3_prepare $DB $sql -1 TAIL]
  sqlite3_bind_text $STMT 1 hello -1
  set res [list]
  while { "SQLITE_ROW"==[sqlite3_step $STMT] } {
   lappend res [sqlite3_column_text $STMT 0]
  }
  lappend res [sqlite3_finalize $STMT]
} {{0 0} {1 0} SQLITE_OK}

# Make sure that a function with a very long name is rejected
do_test func-14.1 {
 catch {
   db function [string repeat X 254] {return "hello"}
 }
} {0}
do_test func-14.2 {
 catch {
   db function [string repeat X 256] {return "hello"}
 }
} {1}

do_test func-15.1 {
 catchsql {
   select test_error(NULL);
 }
} {1 {}}

# Test the quote function for BLOB and NULL values.
do_test func-16.1 {
 execsql {
   CREATE TABLE tbl2(a, b);
 }
 set STMT [sqlite3_prepare $::DB "INSERT INTO tbl2 VALUES(?, ?)" -1 TAIL]
 sqlite3_bind_blob $::STMT 1 abc 3
 sqlite3_step $::STMT
 sqlite3_finalize $::STMT
 execsql {
   SELECT quote(a), quote(b) FROM tbl2;
 }
} {X'616263' NULL}

# Correctly handle function error messages that include %.  Ticket #1354
#
do_test func-17.1 {
 proc testfunc1 args {error "Error %d with %s percents %p"}
 db function testfunc1 ::testfunc1
```

```
 catchsql {
   SELECT testfunc1(1,2,3);
 }
} {1 {Error %d with %s percents %p}}

# The SUM function should return integer results when all inputs are integer.
#
do_test func-18.1 {
 execsql {
   CREATE TABLE t5(x);
   INSERT INTO t5 VALUES(1);
   INSERT INTO t5 VALUES(-99);
   INSERT INTO t5 VALUES(10000);
   SELECT sum(x) FROM t5;
 }
} {9902}
do_test func-18.2 {
 execsql {
   INSERT INTO t5 VALUES(0.0);
   SELECT sum(x) FROM t5;
 }
} {9902.0}

# The sum of nothing is NULL.  But the sum of all NULLs is NULL.
#
# The TOTAL of nothing is 0.0.
#
do_test func-18.3 {
 execsql {
   DELETE FROM t5;
   SELECT sum(x), total(x) FROM t5;
 }
} {{} 0.0}
do_test func-18.4 {
 execsql {
   INSERT INTO t5 VALUES(NULL);
   SELECT sum(x), total(x) FROM t5
 }
} {{} 0.0}
do_test func-18.5 {
 execsql {
   INSERT INTO t5 VALUES(NULL);
   SELECT sum(x), total(x) FROM t5
 }
} {{} 0.0}
do_test func-18.6 {
 execsql {
   INSERT INTO t5 VALUES(123);
```

```
   SELECT sum(x), total(x) FROM t5
 }
} {123 123.0}

# Ticket #1664, #1669, #1670, #1674: An integer overflow on SUM causes
# an error. The non-standard TOTAL() function continues to give a helpful
# result.
#
do_test func-18.10 {
 execsql {
  CREATE TABLE t6(x INTEGER);
  INSERT INTO t6 VALUES(1);
  INSERT INTO t6 VALUES(1<<62);
  SELECT sum(x) - ((1<<62)+1) from t6;
 }
} 0
do_test func-18.11 {
 execsql {
  SELECT typeof(sum(x)) FROM t6
 }
} integer
do_test func-18.12 {
 catchsql {
  INSERT INTO t6 VALUES(1<<62);
  SELECT sum(x) - ((1<<62)*2.0+1) from t6;
 }
} {1 {integer overflow}}
do_test func-18.13 {
 execsql {
  SELECT total(x) - ((1<<62)*2.0+1) FROM t6
 }
} 0.0
do_test func-18.14 {
 execsql {
  SELECT sum(-9223372036854775805);
 }
} -9223372036854775805

ifcapable compound&&subquery {

do_test func-18.15 {
 catchsql {
  SELECT sum(x) FROM
    (SELECT 9223372036854775807 AS x UNION ALL
     SELECT 10 AS x);
 }
} {1 {integer overflow}}
do_test func-18.16 {
```

```
 catchsql {
   SELECT sum(x) FROM
     (SELECT 9223372036854775807 AS x UNION ALL
      SELECT -10 AS x);
 }
} {0 9223372036854775797}
do_test func-18.17 {
 catchsql {
   SELECT sum(x) FROM
     (SELECT -9223372036854775807 AS x UNION ALL
      SELECT 10 AS x);
 }
} {0 -9223372036854775797}
do_test func-18.18 {
 catchsql {
   SELECT sum(x) FROM
     (SELECT -9223372036854775807 AS x UNION ALL
      SELECT -10 AS x);
 }
} {1 {integer overflow}}
do_test func-18.19 {
 catchsql {
   SELECT sum(x) FROM (SELECT 9 AS x UNION ALL SELECT -10 AS x);
 }
} {0 -1}
do_test func-18.20 {
 catchsql {
   SELECT sum(x) FROM (SELECT -9 AS x UNION ALL SELECT 10 AS x);
 }
} {0 1}
do_test func-18.21 {
 catchsql {
   SELECT sum(x) FROM (SELECT -10 AS x UNION ALL SELECT 9 AS x);
 }
} {0 -1}
do_test func-18.22 {
 catchsql {
   SELECT sum(x) FROM (SELECT 10 AS x UNION ALL SELECT -9 AS x);
 }
} {0 1}

} ;# ifcapable compound&&subquery

# Integer overflow on abs()
#
do_test func-18.31 {
 catchsql {
   SELECT abs(-9223372036854775807);
```

```
  }
} {0 9223372036854775807}
do_test func-18.32 {
 catchsql {
   SELECT abs(-9223372036854775807-1);
 }
} {1 {integer overflow}}

# The MATCH function exists but is only a stub and always throws an error.
#
do_test func-19.1 {
 execsql {
   SELECT match(a,b) FROM t1 WHERE 0;
 }
} {}
do_test func-19.2 {
 catchsql {
   SELECT 'abc' MATCH 'xyz';
 }
} {1 {unable to use function MATCH in the requested context}}
do_test func-19.3 {
 catchsql {
   SELECT 'abc' NOT MATCH 'xyz';
 }
} {1 {unable to use function MATCH in the requested context}}
do_test func-19.4 {
 catchsql {
   SELECT match(1,2,3);
 }
} {1 {wrong number of arguments to function match()}}

# Soundex tests.
#
if {![catch {db eval {SELECT soundex('hello')}}]} {
 set i 0
 foreach {name sdx} {
   euler        E460
   EULER        E460
   Euler        E460
   ellery       E460
   gauss        G200
   ghosh        G200
   hilbert      H416
   Heilbronn    H416
   knuth        K530
   kant         K530
   Lloyd        L300
   LADD         L300
```

```
   Lukasiewicz  L222
   Lissajous    L222
   A        A000
   12345      ?000
 } {
   incr i
   do_test func-20.$i {
     execsql {SELECT soundex($name)}
   } $sdx
 }
}


# Tests of the REPLACE function.
#
do_test func-21.1 {
 catchsql {
   SELECT replace(1,2);
 }
} {1 {wrong number of arguments to function replace()}}
do_test func-21.2 {
 catchsql {
   SELECT replace(1,2,3,4);
 }
} {1 {wrong number of arguments to function replace()}}
do_test func-21.3 {
 execsql {
   SELECT typeof(replace("This is the main test string", NULL, "ALT"));
 }
} {null}
do_test func-21.4 {
 execsql {
   SELECT typeof(replace(NULL, "main", "ALT"));
 }
} {null}
do_test func-21.5 {
 execsql {
   SELECT typeof(replace("This is the main test string", "main", NULL));
 }
} {null}
do_test func-21.6 {
 execsql {
   SELECT replace("This is the main test string", "main", "ALT");
 }
} {{This is the ALT test string}}
do_test func-21.7 {
 execsql {
   SELECT replace("This is the main test string", "main", "larger-main");
 }
```

```
} {{This is the larger-main test string}}
do_test func-21.8 {
 execsql {
   SELECT replace("aaaaaaa", "a", "0123456789");
 }
} {01234567890123456789012345678901234567890123456789012345678901234567890123456789}

# Tests for the TRIM, LTRIM and RTRIM functions.
#
do_test func-22.1 {
 catchsql {SELECT trim(1,2,3)}
} {1 {wrong number of arguments to function trim()}}
do_test func-22.2 {
 catchsql {SELECT ltrim(1,2,3)}
} {1 {wrong number of arguments to function ltrim()}}
do_test func-22.3 {
 catchsql {SELECT rtrim(1,2,3)}
} {1 {wrong number of arguments to function rtrim()}}
do_test func-22.4 {
 execsql {SELECT trim(' hi ');}
} {hi}
do_test func-22.5 {
 execsql {SELECT ltrim(' hi ');}
} {{hi }}
do_test func-22.6 {
 execsql {SELECT rtrim(' hi ');}
} {{ hi}}
do_test func-22.7 {
 execsql {SELECT trim(' hi ','xyz');}
} {{ hi }}
do_test func-22.8 {
 execsql {SELECT ltrim(' hi ','xyz');}
} {{ hi }}
do_test func-22.9 {
 execsql {SELECT rtrim(' hi ','xyz');}
} {{ hi }}
do_test func-22.10 {
 execsql {SELECT trim('xyxzy hi zzzy','xyz');}
} {{ hi }}
do_test func-22.11 {
 execsql {SELECT ltrim('xyxzy hi zzzy','xyz');}
} {{ hi zzzy}}
do_test func-22.12 {
 execsql {SELECT rtrim('xyxzy hi zzzy','xyz');}
} {{xyxzy hi }}
do_test func-22.13 {
 execsql {SELECT trim(' hi ','');}
} {{ hi }}
```

```
do_test func-22.20 {
 execsql {SELECT typeof(trim(NULL));}
} {null}
do_test func-22.21 {
 execsql {SELECT typeof(trim(NULL,'xyz'));}
} {null}
do_test func-22.22 {
 execsql {SELECT typeof(trim('hello',NULL));}
} {null}

finish_test
```

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/test/func.test
No license file was found, but licenses were detected in source scan.

```
/*
** The "printf" code that follows dates from the 1980's.  It is in
** the public domain.  The original comments are included here for
** completeness.  They are very out-of-date but might be useful as
** an historical reference.  Most of the "enhancements" have been backed
** out so that the functionality is now the same as standard printf().
**
*************************************************************************
**
** The following modules is an enhanced replacement for the "printf" subroutines
** found in the standard C library.  The following enhancements are
** supported:
**
**     + Additional functions.  The standard set of "printf" functions
**       includes printf, fprintf, sprintf, vprintf, vfprintf, and
**       vsprintf.  This module adds the following:
**
**        * snprintf -- Works like sprintf, but has an extra argument
**                which is the size of the buffer written to.
**
**        * mprintf --  Similar to sprintf.  Writes output to memory
**                obtained from malloc.
**
**        * xprintf --  Calls a function to dispose of output.
**
**        * nprintf -- No output, but returns the number of characters
**                that would have been output by printf.
**
**        * A v- version (ex: vsnprintf) of every function is also
**          supplied.
**
**     + A few extensions to the formatting notation are supported:
```

```
**
**        *  The "=" flag (similar to "-") causes the output to be
**           be centered in the appropriately sized field.
**
**        *  The %b field outputs an integer in binary notation.
**
**        *  The %c field now accepts a precision.  The character output
**           is repeated by the number of times the precision specifies.
**
**        *  The %' field works like %c, but takes as its character the
**           next character of the format string, instead of the next
**           argument.  For example,  printf("%.78'-")  prints 78 minus
**           signs, the same as  printf("%.78c",'-').
**
**      +  When compiled using GCC on a SPARC, this version of printf is
**         faster than the library printf for SUN OS 4.1.
**
**      +  All functions are fully reentrant.
**
*/
```

Found in path(s):
* /opt/cola/permits/1332727043_1653392698.341362/0/sqlite-3-3-17-tar-gz/sqlite-3.3.17/src/printf.c
No license file was found, but licenses were detected in source scan.

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1.26 ganymed-ssh2 262

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Version 3, 29 June 2007

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 "Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

 Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's
complete source code as you receive it, in any medium, provided that
you conspicuously and appropriately publish on each copy an
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all the notices that refer to this License and to the absence of any
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 You may charge a fee for the physical act of transferring a copy,
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 2. You may modify your copy or copies of the Library or any portion
of it, thus forming a work based on the Library, and copy and
distribute such modifications or work under the terms of Section 1
above, provided that you also meet all of these conditions:

  a) The modified work must itself be a software library.

  b) You must cause the files modified to carry prominent notices
  stating that you changed the files and the date of any change.

  c) You must cause the whole of the work to be licensed at no
  charge to all third parties under the terms of this License.

  d) If a facility in the modified Library refers to a function or a
  table of data to be supplied by an application program that uses
  the facility, other than as an argument passed when the facility
  is invoked, then you must make a good faith effort to ensure that,
  in the event an application does not supply such function or
  table, the facility still operates, and performs whatever part of
  its purpose remains meaningful.

  (For example, a function in a library to compute square roots has
  a purpose that is entirely well-defined independent of the
  application. Therefore, Subsection 2d requires that any
  application-supplied function or table used by this function must
  be optional: if the application does not supply it, the square
  root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the

entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

 3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

 Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

 You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

  a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood

that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

b) Accompany the work with a written offer, valid for at
least three years, to give the same user the materials
specified in Subsection 6a, above, for a charge no more
than the cost of performing this distribution.

c) If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
specified materials from the same place.

d) Verify that the user has already received a copy of these
materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the source code distributed need not include anything that is normally
distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

7. You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library
facilities not covered by this License, and distribute such a combined
library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work
based on the Library, uncombined with any other library
facilities. This must be distributed under the terms of the
Sections above.

b) Give prominent notice with the combined library of the fact
that part of it is a work based on the Library, and explaining
where to find the accompanying uncombined form of the same work.

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It is not the purpose of this section to induce you to infringe any
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END OF TERMS AND CONDITIONS

Appendix: How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

    <one line to give the library's name and a brief idea of what it does.>
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You should also get your employer (if you work as a programmer) or your

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necessary. Here is a sample; alter the names:

 Yoyodyne, Inc., hereby disclaims all copyright interest in the
 library `Frob' (a library for tweaking knobs) written by James Random Hacker.

 <signature of Ty Coon>, 1 April 1990
 Ty Coon, President of Vice

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 To protect your rights, we need to make restrictions that forbid
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rights. These restrictions translate to certain responsibilities for
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For example, if you distribute copies of the library, whether gratis
or for a fee, you must give the recipients all the rights that we gave
you. You must make sure that they, too, receive or can get the source
code. If you link other code with the library, you must provide
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with the library after making changes to the library and recompiling
it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the
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When a program is linked with a library, whether statically or using
a shared library, the combination of the two is legally speaking a
combined work, a derivative of the original library. The ordinary
General Public License therefore permits such linking only if the
entire combination fits its criteria of freedom. The Lesser General
Public License permits more lax criteria for linking other code with
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We call this license the "Lesser" General Public License because it
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Public License. It also provides other free software developers Less
of an advantage over competing non-free programs. These disadvantages
are the reason we use the ordinary General Public License for many
libraries. However, the Lesser license provides advantages in certain

special circumstances.

 For example, on rare occasions, there may be a special need to
encourage the widest possible use of a certain library, so that it becomes
a de-facto standard. To achieve this, non-free programs must be
allowed to use the library. A more frequent case is that a free
library does the same job as widely used non-free libraries. In this
case, there is little to gain by limiting the free library to free
software only, so we use the Lesser General Public License.

 In other cases, permission to use a particular library in non-free
programs enables a greater number of people to use a large body of
free software. For example, permission to use the GNU C Library in
non-free programs enables many more people to use the whole GNU
operating system, as well as its variant, the GNU/Linux operating
system.

 Although the Lesser General Public License is Less protective of the
users' freedom, it does ensure that the user of a program that is
linked with the Library has the freedom and the wherewithal to run
that program using a modified version of the Library.

 The precise terms and conditions for copying, distribution and
modification follow. Pay close attention to the difference between a
"work based on the library" and a "work that uses the library". The
former contains code derived from the library, whereas the latter must
be combined with the library in order to run.

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 A "library" means a collection of software functions and/or data
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portion of it, either verbatim or with modifications and/or translated
straightforwardly into another language. (Hereinafter, translation is
included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

  a) The modified work must itself be a software library.

  b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

  c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

  d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
with the Library (or with a work based on the Library) on a volume of
a storage or distribution medium does not bring the other work under
the scope of this License.

 3. You may opt to apply the terms of the ordinary GNU General Public
License instead of this License to a given copy of the Library. To do
this, you must alter all the notices that refer to this License, so
that they refer to the ordinary GNU General Public License, version 2,
instead of to this License. (If a newer version than version 2 of the
ordinary GNU General Public License has appeared, then you can specify
that version instead if you wish.) Do not make any other change in
these notices.

 Once this change is made in a given copy, it is irreversible for
that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which

must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the

Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

  a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

  b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

  c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

  d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

  e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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(This file is under construction.)   -*- text -*-

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the documentation, and info on specific files will go into an AUTHORS
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++++++++++++++++

Dean Elsner wrote the original gas for vax. [more details?]

Jay Fenlason maintained gas for a while, adding support for
gdb-specific debug information and the 68k series machines, most of
the preprocessing pass, and extensive changes in messages.c,
input-file.c, write.c.

K. Richard Pixley maintained gas for a while, adding various
enhancements and many bug fixes, including merging support for several
processors, breaking gas up to handle multiple object file format
backends (including heavy rewrite, testing, an integration of the coff
and b.out backends), adding configuration including heavy testing and
verification of cross assemblers and file splits and renaming,
converted gas to strictly ansi C including full prototypes, added
support for m680[34]0 & cpu32, considerable work on i960 including a
coff port (including considerable amounts of reverse engineering), a
sparc opcode file rewrite, decstation, rs6000, and hp300hpux host
ports, updated "know" assertions and made them work, much other
reorganization, cleanup, and lint.

Ken Raeburn wrote the high-level BFD interface code to replace most of
the code in format-specific I/O modules.

The original Vax-VMS support was contributed by David L. Kashtan.
Eric Youngdale and Pat Rankin have done much work with it since.

The Intel 80386 machine description was written by Eliot Dresselhaus.

Minh Tran-Le at IntelliCorp contributed some AIX 386 support.

The Motorola 88k machine description was contributed by Devon Bowen of Buffalo University and Torbjorn Granlund of the Swedish Institute of Computer Science.

Keith Knowles at the Open Software Foundation wrote the original MIPS back end (tc-mips.c, tc-mips.h), and contributed Rose format support that hasn't been merged in yet. Ralph Campbell worked with the MIPS code to support a.out format.

Support for the Zilog Z8k and Hitachi H8/300, H8/500 and SH processors (tc-z8k, tc-h8300, tc-h8500, tc-sh), and IEEE 695 object file format (obj-ieee), was written by Steve Chamberlain of Cygnus Solutions. Steve also modified the COFF back end (obj-coffbfd) to use BFD for some low-level operations, for use with the Hitachi, 29k and Zilog targets.

John Gilmore built the AMD 29000 support, added .include support, and simplified the configuration of which versions accept which pseudo-ops. He updated the 68k machine description so that Motorola's opcodes always produced fixed-size instructions (e.g. jsr), while synthetic instructions remained shrinkable (jbsr). John fixed many bugs, including true tested cross-compilation support, and one bug in relaxation that took a week and required the proverbial one-bit fix.

Ian Lance Taylor of Cygnus Solutions merged the Motorola and MIT syntaxes for the 68k, completed support for some COFF targets (68k, i386 SVR3, and SCO Unix), wrote the ECOFF support based on Michael Meissner's mips-tfile program, wrote the PowerPC and RS/6000 support, and made a few other minor patches. He handled the binutils releases for versions 2.7 through 2.9.

David Edelsohn contributed fixes for the PowerPC and AIX support.

Steve Chamberlain made gas able to generate listings.

Support for the HP9000/300 was contributed by Glenn Engel of HP.

Support for ELF format files has been worked on by Mark Eichin of Cygnus Solutions (original, incomplete implementation), Pete Hoogenboom at the University of Utah (HPPA mainly), Michael Meissner of the Open Software Foundation (i386 mainly), and Ken Raeburn of Cygnus Solutions (sparc, initial 64-bit support).

Several engineers at Cygnus Solutions have also provided many small bug fixes and configuration enhancements.

The initial Alpha support was contributed by Carnegie-Mellon

University. Additional work was done by Ken Raeburn of Cygnus
Solutions. Richard Henderson then rewrote much of the Alpha support.

Ian Dall updated the support code for the National Semiconductor 32000
series, and added support for Mach 3 and NetBSD running on the PC532.

Klaus Kaempf ported the assembler and the binutils to openVMS/Alpha.

Steve Haworth contributed the support for the Texas Instruction c30
(tms320c30).

H.J. Lu has contributed many patches and much testing.

Alan Modra reworked much of the i386 backend, improving the error
checking, updating the code, and improving the 16 bit support, using
patches from the work of Martynas Kunigelis and H.J. Lu.

Many others have contributed large or small bugfixes and enhancements. If
you've contributed significant work and are not mentioned on this list, and
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intentionally leaving anyone out.

1.30 pyyaml 3.12

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RFC1831: RPC: Remote Procedure Call Protocol Specification
Version 2 RFC1832: XDR: External Data REpresentation
Standard RFC1833: Binding Protocols for ONC RPC Version 2
RFC2078: Generic Security Service Application Program
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You may convey a covered work in object code form under the terms of
sections 4 and 5, provided that you also convey the machine-readable
Corresponding Source under the terms of this License, in one of these
ways:

@enumerate a
@item
Convey the object code in, or embodied in, a physical product
(including a physical distribution medium), accompanied by the
Corresponding Source fixed on a durable physical medium customarily
used for software interchange.

@item
Convey the object code in, or embodied in, a physical product
(including a physical distribution medium), accompanied by a written
offer, valid for at least three years and valid for as long as you
offer spare parts or customer support for that product model, to give
anyone who possesses the object code either (1) a copy of the
Corresponding Source for all the software in the product that is
covered by this License, on a durable physical medium customarily used
for software interchange, for a price no more than your reasonable
cost of physically performing this conveying of source, or (2) access
to copy the Corresponding Source from a network server at no charge.

@item
Convey individual copies of the object code with a copy of the written

offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.

@item
Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

@item
Convey the object code using peer-to-peer transmission, provided you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

@end enumerate

A separable portion of the object code, whose source code is excluded from the Corresponding Source as a System Library, need not be included in conveying the object code work.

A ``User Product'' is either (1) a ``consumer product'', which means any tangible personal property which is normally used for personal, family, or household purposes, or (2) anything designed or sold for incorporation into a dwelling. In determining whether a product is a consumer product, doubtful cases shall be resolved in favor of coverage. For a particular product received by a particular user, ``normally used'' refers to a typical or common use of that class of product, regardless of the status of the particular user or of the way in which the particular user actually uses, or expects or is expected to use, the product. A product is a consumer product regardless of whether the product has substantial commercial, industrial or non-consumer uses, unless such uses represent the only significant mode of use of the product.

``Installation Information'' for a User Product means any methods, procedures, authorization keys, or other information required to install and execute modified versions of a covered work in that User

Product from a modified version of its Corresponding Source. The information must suffice to ensure that the continued functioning of the modified object code is in no case prevented or interfered with solely because modification has been made.

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@end enumerate

@heading END OF TERMS AND CONDITIONS

@heading How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest
possible use to the public, the best way to achieve this is to make it
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To do so, attach the following notices to the program. It is safest
to attach them to the start of each source file to most effectively
state the exclusion of warranty; and each file should have at least
the ``copyright'' line and a pointer to where the full notice is found.

@smallexample

@var{one line to give the program's name and a brief idea of what it does.}
Copyright (C) @var{year} @var{name of author}

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it under the terms of the GNU General Public License as published by
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@end smallexample

Also add information on how to contact you by electronic and paper mail.

If the program does terminal interaction, make it output a short
notice like this when it starts in an interactive mode:

@smallexample
@var{program} Copyright (C) @var{year} @var{name of author}
This program comes with ABSOLUTELY NO WARRANTY; for details type @samp{show w}.
This is free software, and you are welcome to redistribute it
under certain conditions; type @samp{show c} for details.
@end smallexample

The hypothetical commands @samp{show w} and @samp{show c} should show
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@c man end
   GNU LIBRARY GENERAL PUBLIC LICENSE
        Version 2, June 1991

[This is the first released version of the library GPL. It is
numbered 2 because it goes with version 2 of the ordinary GPL.]

    Preamble

  The licenses for most software are designed to take away your
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  To protect your rights, we need to make restrictions that forbid
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code. If you link a program with the library, you must provide
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with the library, after making changes to the library and recompiling
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 Most GNU software, including some libraries, is covered by the ordinary
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the same as in the ordinary license.

 The reason we have a separate public license for some libraries is that
they blur the distinction we usually make between modifying or adding to a
program and simply using it. Linking a program with a library, without
changing the library, is in some sense simply using the library, and is
analogous to running a utility program or application program. However, in
a textual and legal sense, the linked executable is a combined work, a
derivative of the original library, and the ordinary General Public License
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 Because of this blurred distinction, using the ordinary General
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sharing, because most developers did not use the libraries. We
concluded that weaker conditions might promote sharing better.

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changes in the actual functions of the Library.) The hope is that this
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  stating that you changed the files and the date of any change.

  c) You must cause the whole of the work to be licensed at no
  charge to all third parties under the terms of this License.

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  table of data to be supplied by an application program that uses
  the facility, other than as an argument passed when the facility
  is invoked, then you must make a good faith effort to ensure that,
  in the event an application does not supply such function or
  table, the facility still operates, and performs whatever part of
  its purpose remains meaningful.

  (For example, a function in a library to compute square roots has
  a purpose that is entirely well-defined independent of the
  application. Therefore, Subsection 2d requires that any
  application-supplied function or table used by this function must
  be optional: if the application does not supply it, the square
  root function must still compute square roots.)

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  Once this change is made in a given copy, it is irreversible for
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  This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

  4. You may copy and distribute the Library (or a portion or
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under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

  If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

  5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

  However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

  When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be

linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

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"Source code" for a work means the preferred form of the work for
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table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

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medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
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work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
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Section 6 states terms for distribution of such executables.

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 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
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work. (Executables containing this object code plus portions of the

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Otherwise, if the work is a derivative of the Library, you may
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Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or
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[This is the first released version of the library GPL. It is
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 The reason we have a separate public license for some libraries is that
they blur the distinction we usually make between modifying or adding to a
program and simply using it. Linking a program with a library, without
changing the library, is in some sense simply using the library, and is
analogous to running a utility program or application program. However, in
a textual and legal sense, the linked executable is a combined work, a
derivative of the original library, and the ordinary General Public License
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 Because of this blurred distinction, using the ordinary General
Public License for libraries did not effectively promote software
sharing, because most developers did not use the libraries. We
concluded that weaker conditions might promote sharing better.

 However, unrestricted linking of non-free programs would deprive the
users of those programs of all benefit from the free status of the
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permit developers of non-free programs to use free libraries, while
preserving your freedom as a user of such programs to change the free
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1.37 tcl 8.3.2

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1.41 commons-lang3 2.4

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1.43 dmalloc 5.5.2

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```
#
/*
*
* Copyright (c) 1994, Textil Computer Design GmbH, Dresden
*
* Author: J"org Wunsch
*
* Dumb atexit() implementation. It is far from being elegant. It is
* only here to provide a workaround for systems where the existing
* atexit() implementation is known to cause problems due to doing
* own mallocs. The problem arose originally on a Data General
* machine running DG/UX 5.4R*, along with gcc compiling C++ code.
* In order to have global and static variables called their const-
* ructors, a chunk of code has been placed by the compiler that
* ran before invoking main(). This code registered the desctructors
* with atexit() at this very early stage, but the existing atexit()
* bypassed the normal memory allocation scheme, and hence caused
* grievous troubles in combination with the dmalloc library.
*
* Known problem for DG/UX: the crt0.o (at least in a COFF environ-
* ment) passes the return value from main() to _real_exit() instead
* of exit(). Hence programs which return from main instead of calling
* exit() do not work as expected. I do not see any good workaround
* for this so far (since crt0.o always happens to reference the
* _real_exit() from the library, even if we would provide our very
* own symbol for it).
*
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1.44 d-bus 1.2.16

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1.47 util-linux 2.17.2

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it. And you must show them these terms so they know their rights.

 Our method of protecting your rights has two steps: (1) copyright
the library, and (2) offer you this license which gives you legal
permission to copy, distribute and/or modify the library.

 Also, for each distributor's protection, we want to make certain
that everyone understands that there is no warranty for this free
library. If the library is modified by someone else and passed on, we
want its recipients to know that what they have is not the original
version, so that any problems introduced by others will not reflect on
the original authors' reputations.

 Finally, any free program is threatened constantly by software
patents. We wish to avoid the danger that companies distributing free
software will individually obtain patent licenses, thus in effect
transforming the program into proprietary software. To prevent this,
we have made it clear that any patent must be licensed for everyone's
free use or not licensed at all.

 Most GNU software, including some libraries, is covered by the ordinary
GNU General Public License, which was designed for utility programs. This
license, the GNU Library General Public License, applies to certain
designated libraries. This license is quite different from the ordinary
one; be sure to read it in full, and don't assume that anything in it is
the same as in the ordinary license.

 The reason we have a separate public license for some libraries is that
they blur the distinction we usually make between modifying or adding to a

program and simply using it. Linking a program with a library, without
changing the library, is in some sense simply using the library, and is
analogous to running a utility program or application program. However, in
a textual and legal sense, the linked executable is a combined work, a
derivative of the original library, and the ordinary General Public License
treats it as such.

 Because of this blurred distinction, using the ordinary General
Public License for libraries did not effectively promote software
sharing, because most developers did not use the libraries. We
concluded that weaker conditions might promote sharing better.

 However, unrestricted linking of non-free programs would deprive the
users of those programs of all benefit from the free status of the
libraries themselves. This Library General Public License is intended to
permit developers of non-free programs to use free libraries, while
preserving your freedom as a user of such programs to change the free
libraries that are incorporated in them. (We have not seen how to achieve
this as regards changes in header files, but we have achieved it as regards
changes in the actual functions of the Library.) The hope is that this
will lead to faster development of free libraries.

 The precise terms and conditions for copying, distribution and
modification follow. Pay close attention to the difference between a
"work based on the library" and a "work that uses the library". The
former contains code derived from the library, while the latter only
works together with the library.

 Note that it is possible for a library to be covered by the ordinary
General Public License rather than by this special one.

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 A "library" means a collection of software functions and/or data
prepared so as to be conveniently linked with application programs
(which use some of those functions and data) to form executables.

 The "Library", below, refers to any such software library or work
which has been distributed under these terms. A "work based on the
Library" means either the Library or any derivative work under
copyright law: that is to say, a work containing the Library or a

portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

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2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

  a) The modified work must itself be a software library.

  b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

  c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

  d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or

table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
with the Library (or with a work based on the Library) on a volume of
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 3. You may opt to apply the terms of the ordinary GNU General Public
License instead of this License to a given copy of the Library. To do
this, you must alter all the notices that refer to this License, so
that they refer to the ordinary GNU General Public License, version 2,
instead of to this License. (If a newer version than version 2 of the
ordinary GNU General Public License has appeared, then you can specify
that version instead if you wish.) Do not make any other change in
these notices.

 Once this change is made in a given copy, it is irreversible for
that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or

derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

  If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

  5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

  However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

  When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

  If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

  Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

  6. As an exception to the Sections above, you may also compile or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse

engineering for debugging such modifications.

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during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

  a) Accompany the work with the complete corresponding
  machine-readable source code for the Library including whatever
  changes were used in the work (which must be distributed under
  Sections 1 and 2 above); and, if the work is an executable linked
  with the Library, with the complete machine-readable "work that
  uses the Library", as object code and/or source code, so that the
  user can modify the Library and then relink to produce a modified
  executable containing the modified Library. (It is understood
  that the user who changes the contents of definitions files in the
  Library will not necessarily be able to recompile the application
  to use the modified definitions.)

  b) Accompany the work with a written offer, valid for at
  least three years, to give the same user the materials
  specified in Subsection 6a, above, for a charge no more
  than the cost of performing this distribution.

  c) If distribution of the work is made by offering access to copy
  from a designated place, offer equivalent access to copy the above
  specified materials from the same place.

  d) Verify that the user has already received a copy of these
  materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the source code distributed need not include anything that is normally
distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

 It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

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That's all there is to it!

1.49 linux-kernel 3.10.19

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  b) You must cause any work that you distribute or publish, that in
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  part thereof, to be licensed as a whole at no charge to all third
  parties under the terms of this License.

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when run, you must cause it, when started running for such
interactive use in the most ordinary way, to print or display an
announcement including an appropriate copyright notice and a
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  b) Accompany it with a written offer, valid for at least three
  years, to give any third party, for a charge no more than your
  cost of physically performing source distribution, a complete
  machine-readable copy of the corresponding source code, to be
  distributed under the terms of Sections 1 and 2 above on a medium
  customarily used for software interchange; or,

  c) Accompany it with the information you received as to the offer

to distribute corresponding source code. (This alternative is
allowed only for noncommercial distribution and only if you
received the program in object code or executable form with such
an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for
making modifications to it. For an executable work, complete source
code means all the source code for all modules it contains, plus any
associated interface definition files, plus the scripts used to
control compilation and installation of the executable. However, as a
special exception, the source code distributed need not include
anything that is normally distributed (in either source or binary
form) with the major components (compiler, kernel, and so on) of the
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/* nicstar.c v0.22 Jawaid Bazyar (bazyar@hypermall.com)
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* http://www.hypermall.com/
* 10/1/97 - commented out CFG_PHYIE bit - we don't care when the PHY
* interrupts us (except possibly for removal/insertion of the cable?)
* 10/4/97 - began heavy inline documentation of the code. Corrected typos
* and spelling mistakes.
* 10/5/97 - added code to handle PHY interrupts, disable PHY on
* loss of link, and correctly re-enable PHY when link is
* re-established. (put back CFG_PHYIE)
*
*   Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.
*
* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997
*
* Linux driver for the IDT77201 NICStAR PCI ATM controller.
* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;
* see init_nicstar() for PHY initialization to change this. This driver
* expects the Linux ATM stack to support scatter-gather lists
* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.
*
* Implementing minimal-copy of received data:
*   IDT always receives data into a small buffer, then large buffers
*   as needed. This means that data must always be copied to create
*   the linear buffer needed by most non-ATM protocol stacks (e.g. IP)
*   Fix is simple: make large buffers large enough to hold entire
*   SDU, and leave <small_buffer_data> bytes empty at the start. Then
*   copy small buffer contents to head of large buffer.
*   Trick is to avoid fragmenting Linux, due to need for a lot of large

*   buffers. This is done by 2 things:
*   1) skb->destructor / skb->atm.recycle_buffer
*   combined, allow nicstar_free_rx_skb to be called to
*   recycle large data buffers
*   2) skb_clone of received buffers
*   See nicstar_free_rx_skb and linearize_buffer for implementation
*   details.
*
*
*
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* M. Welsh, 6 July 1996
*
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 for CyberLogin for Linux which allows logging onto EON
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 Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and

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  When a program is linked with a library, whether statically or using
a shared library, the combination of the two is legally speaking a
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are the reason we use the ordinary General Public License for many
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encourage the widest possible use of a certain library, so that it
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allowed to use the library. A more frequent case is that a free
library does the same job as widely used non-free libraries. In this
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  table of data to be supplied by an application program that uses
  the facility, other than as an argument passed when the facility
  is invoked, then you must make a good faith effort to ensure that,
  in the event an application does not supply such function or
  table, the facility still operates, and performs whatever part of
  its purpose remains meaningful.

  (For example, a function in a library to compute square roots has
  a purpose that is entirely well-defined independent of the
  application. Therefore, Subsection 2d requires that any
  application-supplied function or table used by this function must
  be optional: if the application does not supply it, the square
  root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
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Thus, it is not the intent of this section to claim rights or contest
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In addition, mere aggregation of another work not based on the Library
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subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.
^L
6. As an exception to the Sections above, you may also combine or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
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during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

a) Accompany the work with the complete corresponding
machine-readable source code for the Library including whatever
changes were used in the work (which must be distributed under
Sections 1 and 2 above); and, if the work is an executable linked
with the Library, with the complete machine-readable "work that
uses the Library", as object code and/or source code, so that the
user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the
Library. A suitable mechanism is one that (1) uses at run time a
copy of the library already present on the user's computer system,
rather than copying library functions into the executable, and (2)
will operate properly with a modified version of the library, if
the user installs one, as long as the modified version is
interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at

least three years, to give the same user the materials
specified in Subsection 6a, above, for a charge no more
than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
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e) Verify that the user has already received a copy of these
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 For an executable, the required form of the "work that uses the
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reproducing the executable from it. However, as a special exception,
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which the executable runs, unless that component itself accompanies
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1.52 popt 1.15

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  b) Accompany it with a written offer, valid for at least three
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received the program in object code or executable form with such
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The source code for a work means the preferred form of the work for
making modifications to it. For an executable work, complete source
code means all the source code for all modules it contains, plus any
associated interface definition files, plus the scripts used to
control compilation and installation of the executable. However, as a
special exception, the source code distributed need not include
anything that is normally distributed (in either source or binary
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1.54 netbsd-resolv 2.20

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End

1.55 grub 0.97

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1.56 ntp 4.2.8p6

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  owner = "The University of Delaware and Network Time Foundation";
  eaddr = "http://bugs.ntp.org, bugs@ntp.org";
  type  = ntp;
};

long-opts;
config-header  = config.h;
environrc;
no-misuse-usage;
version-proc = ntpOptionPrintVersion;

version        = `
eval VERSION=\`sed -e 's/.*,\\[//' -e 's/\\].*//' < ../sntp/m4/version.m4\`
[ -z "${VERSION}" ] && echo "Cannot determine VERSION" && kill -TERM $AG_pid
echo $VERSION`;

version-value = ''; /* Don't use -v as a shortcut for --version */

/*
* HMS: man pages already have this, and texi pages can use the
* values in sntp/include/version.texi .
*/
// doc-sub = {
//    sub-name = version;
//    sub-text = 's/#VERSION#/<<version>>/g';
// };
```

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<!-- Changed by: Harlan Stenn, 10-Mar-2014 -->
<link href="scripts/style.css" type="text/css" rel="stylesheet">
</head>
<body>
<h3>Copyright Notice</h3>
<img src="pic/sheepb.jpg" alt="jpg" align="left"> "Clone me," says Dolly sheepishly.
<p>Last update:
 <!-- #BeginDate format:En2m -->2-Jan-2017  11:58<!-- #EndDate -->
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<br clear="left">
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 Johannes Maximilian Kuehn <kuehn@ntp.org> Rewrote
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 Lars H. Mathiesen <thorinn@diku.dk> adaptation of
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 Danny Mayer <mayer@ntp.org>Network I/O, Windows Port,
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 <li><a href="mailto:%20mogul@pa.dec.com">Jeffrey Mogul &lt;mogul@pa.dec.com&gt;</a> ntptrace utility</li>
 <li><a href="mailto:%20tmoore@fievel.daytonoh.ncr.com">Tom Moore
&lt;tmoore@fievel.daytonoh.ncr.com&gt;</a> i386 svr4 port</li>
 <li><a href="mailto:%20kamal@whence.com">Kamal A Mostafa &lt;kamal@whence.com&gt;</a> SCO
OpenServer port</li>
 <li><a href="mailto:%20derek@toybox.demon.co.uk">Derek Mulcahy &lt;derek@toybox.demon.co.uk&gt;</a>
and <a href="mailto:%20d@hd.org">Damon Hart-Davis &lt;d@hd.org&gt;</a> ARCRON MSF clock driver</li>
 <li><a href="mailto:%20neal@ntp.org">Rob Neal &lt;neal@ntp.org&gt;</a> Bancomm refclock and config/parse
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 <li><a href="mailto:%20Rainer.Pruy@informatik.uni-erlangen.de">Rainer Pruy &lt;Rainer.Pruy@informatik.uni-
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 <li><a href="mailto:%20wsanchez@apple.com">Wilfredo S&aacute;nchez &lt;wsanchez@apple.com&gt;</a>
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 <li><a href="mailto:%20mrapple@quack.kfu.com">Nick Sayer &lt;mrapple@quack.kfu.com&gt;</a> SunOS
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 <li><a href="mailto:%20jack@innovativeinternet.com">Jack Sasportas &lt;jack@innovativeinternet.com&gt;</a>
Saved a Lot of space on the stuff in the html/pic/ subdirectory</li>
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clock driver</li>
 <li><a href="mailto:%20harlan@pfcs.com">Harlan Stenn &lt;harlan@pfcs.com&gt;</a> GNU
automake/autoconfigure makeover, various other bits (see the ChangeLog)</li>
 <li><a href="mailto:%20ken@sdd.hp.com">Kenneth Stone &lt;ken@sdd.hp.com&gt;</a> HP-UX port</li>
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support</li>
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Sandboxing (libseccomp) support</li>
 <li><a href="mailto:%20vixie@vix.com">Paul A Vixie &lt;vixie@vix.com&gt;</a> TrueTime GPS driver,
generic TrueTime clock driver</li>
 <li><a href="mailto:%20Ulrich.Windl@rz.uni-regensburg.de">Ulrich Windl &lt;Ulrich.Windl@rz.uni-
regensburg.de&gt;</a> corrected and validated HTML documents according to the HTML DTD</li>
</ol>
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</html>
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jpg "Clone me," says Dolly sheepishly.

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2. [2]Mark Andrews <mark_andrews@isc.org> Leitch atomic clock
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3. [3]Bernd Altmeier <altmeier@atlsoft.de> hopf Elektronik serial line
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4. [4]Viraj Bais <vbais@mailman1.intel.com> and [5]Clayton Kirkwood
   <kirkwood@striderfm.intel.com> port to WindowsNT 3.5
5. [6]Michael Barone <michael,barone@lmco.com> GPSVME fixes
6. [7]Karl Berry <karl@owl.HQ.ileaf.com> syslog to file option
7. [8]Greg Brackley <greg.brackley@bigfoot.com> Major rework of WINNT
   port. Clean up recvbuf and iosignal code into separate modules.
8. [9]Marc Brett <Marc.Brett@westgeo.com> Magnavox GPS clock driver
9. [10]Piete Brooks <Piete.Brooks@cl.cam.ac.uk> MSF clock driver,
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10. [11]Nelson B Bolyard <nelson@bolyard.me> update and complete
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11. [12]Jean-Francois Boudreault
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12. [13]Reg Clemens <reg@dwf.com> Oncore driver (Current maintainer)
13. [14]Steve Clift <clift@ml.csiro.au> OMEGA clock driver
14. [15]Casey Crellin <casey@csc.co.za> vxWorks (Tornado) port and help
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15. [16]Sven Dietrich <sven_dietrich@trimble.com> Palisade reference
    clock driver, NT adj. residuals, integrated Greg's Winnt port.
16. [17]John A. Dundas III <dundas@salt.jpl.nasa.gov> Apple A/UX port
17. [18]Torsten Duwe <duwe@immd4.informatik.uni-erlangen.de> Linux port
18. [19]Dennis Ferguson <dennis@mrbill.canet.ca> foundation code for
    NTP Version 2 as specified in RFC-1119
19. [20]John Hay <jhay@icomtek.csir.co.za> IPv6 support and testing
20. [21]Dave Hart <davehart@davehart.com> General maintenance, Windows
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30. [33]William L. Jones <jones@hermes.chpc.utexas.edu> RS/6000 AIX modifications, HPUX modifications

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32. [35]Craig Leres <leres@ee.lbl.gov> 4.4BSD port, ppsclock, Magnavox GPS clock driver

33. [36]George Lindholm <lindholm@ucs.ubc.ca> SunOS 5.1 port

34. [37]Louis A. Mamakos <louie@ni.umd.edu> MD5-based authentication

35. [38]Lars H. Mathiesen <thorinn@diku.dk> adaptation of foundation code for Version 3 as specified in RFC-1305

36. [39]Danny Mayer <mayer@ntp.org>Network I/O, Windows Port, Code Maintenance

37. [40]David L. Mills <mills@udel.edu> Version 4 foundation, precision kernel; clock drivers: 1, 3, 4, 6, 7, 11, 13, 18, 19, 22, 36

38. [41]Wolfgang Moeller <moeller@gwdgv1.dnet.gwdg.de> VMS port

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1.57 lvm2 2.02.64

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if you want it, that you can change the software or use pieces of it
in new free programs; and that you know you can do these things.

  To protect your rights, we need to make restrictions that forbid
anyone to deny you these rights or to ask you to surrender the rights.
These restrictions translate to certain responsibilities for you if
you distribute copies of the library, or if you modify it.

  For example, if you distribute copies of the library, whether gratis
or for a fee, you must give the recipients all the rights that we gave
you. You must make sure that they, too, receive or can get the source
code. If you link a program with the library, you must provide
complete object files to the recipients so that they can relink them
with the library, after making changes to the library and recompiling
it. And you must show them these terms so they know their rights.

  Our method of protecting your rights has two steps: (1) copyright
the library, and (2) offer you this license which gives you legal
permission to copy, distribute and/or modify the library.

  Also, for each distributor's protection, we want to make certain
that everyone understands that there is no warranty for this free
library. If the library is modified by someone else and passed on, we
want its recipients to know that what they have is not the original
version, so that any problems introduced by others will not reflect on
the original authors' reputations.

  Finally, any free program is threatened constantly by software
patents. We wish to avoid the danger that companies distributing free
software will individually obtain patent licenses, thus in effect
transforming the program into proprietary software. To prevent this,
we have made it clear that any patent must be licensed for everyone's

free use or not licensed at all.

 Most GNU software, including some libraries, is covered by the ordinary
GNU General Public License, which was designed for utility programs. This
license, the GNU Library General Public License, applies to certain
designated libraries. This license is quite different from the ordinary
one; be sure to read it in full, and don't assume that anything in it is
the same as in the ordinary license.

 The reason we have a separate public license for some libraries is that
they blur the distinction we usually make between modifying or adding to a
program and simply using it. Linking a program with a library, without
changing the library, is in some sense simply using the library, and is
analogous to running a utility program or application program. However, in
a textual and legal sense, the linked executable is a combined work, a
derivative of the original library, and the ordinary General Public License
treats it as such.

 Because of this blurred distinction, using the ordinary General
Public License for libraries did not effectively promote software
sharing, because most developers did not use the libraries. We
concluded that weaker conditions might promote sharing better.

 However, unrestricted linking of non-free programs would deprive the
users of those programs of all benefit from the free status of the
libraries themselves. This Library General Public License is intended to
permit developers of non-free programs to use free libraries, while
preserving your freedom as a user of such programs to change the free
libraries that are incorporated in them. (We have not seen how to achieve
this as regards changes in header files, but we have achieved it as regards
changes in the actual functions of the Library.) The hope is that this
will lead to faster development of free libraries.

 The precise terms and conditions for copying, distribution and
modification follow. Pay close attention to the difference between a
"work based on the library" and a "work that uses the library". The
former contains code derived from the library, while the latter only
works together with the library.

 Note that it is possible for a library to be covered by the ordinary
General Public License rather than by this special one.

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General Public License (also called "this License"). Each licensee is addressed as "you".

 A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

 The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

 "Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

 Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

 1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

 You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

 2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

  a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices
stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no
charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a
table of data to be supplied by an application program that uses
the facility, other than as an argument passed when the facility
is invoked, then you must make a good faith effort to ensure that,
in the event an application does not supply such function or
table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
with the Library (or with a work based on the Library) on a volume of
a storage or distribution medium does not bring the other work under
the scope of this License.

 3. You may opt to apply the terms of the ordinary GNU General Public
License instead of this License to a given copy of the Library. To do
this, you must alter all the notices that refer to this License, so
that they refer to the ordinary GNU General Public License, version 2,
instead of to this License. (If a newer version than version 2 of the
ordinary GNU General Public License has appeared, then you can specify

that version instead if you wish.) Do not make any other change in
these notices.

 Once this change is made in a given copy, it is irreversible for
that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also compile or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

 You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
this License. You must supply a copy of this License. If the work
during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

  a) Accompany the work with the complete corresponding
  machine-readable source code for the Library including whatever
  changes were used in the work (which must be distributed under
  Sections 1 and 2 above); and, if the work is an executable linked
  with the Library, with the complete machine-readable "work that
  uses the Library", as object code and/or source code, so that the
  user can modify the Library and then relink to produce a modified
  executable containing the modified Library. (It is understood
  that the user who changes the contents of definitions files in the
  Library will not necessarily be able to recompile the application
  to use the modified definitions.)

  b) Accompany the work with a written offer, valid for at
  least three years, to give the same user the materials
  specified in Subsection 6a, above, for a charge no more
  than the cost of performing this distribution.

  c) If distribution of the work is made by offering access to copy
  from a designated place, offer equivalent access to copy the above
  specified materials from the same place.

  d) Verify that the user has already received a copy of these
  materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,

the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

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    END OF TERMS AND CONDITIONS

   Appendix: How to Apply These Terms to Your New Libraries

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everyone can redistribute and change. You can do so by permitting

redistribution under these terms (or, alternatively, under the terms of the
ordinary General Public License).

 To apply these terms, attach the following notices to the library. It is
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convey the exclusion of warranty; and each file should have at least the
"copyright" line and a pointer to where the full notice is found.

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necessary. Here is a sample; alter the names:

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 library `Frob' (a library for tweaking knobs) written by James Random Hacker.

 <signature of Ty Coon>, 1 April 1990
 Ty Coon, President of Vice

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  stating that you changed the files and the date of any change.

  b) You must cause any work that you distribute or publish, that in
  whole or in part contains or is derived from the Program or any
  part thereof, to be licensed as a whole at no charge to all third
  parties under the terms of this License.

  c) If the modified program normally reads commands interactively
  when run, you must cause it, when started running for such
  interactive use in the most ordinary way, to print or display an

announcement including an appropriate copyright notice and a
notice that there is no warranty (or else, saying that you provide
a warranty) and that users may redistribute the program under
these conditions, and telling the user how to view a copy of this
License. (Exception: if the Program itself is interactive but
does not normally print such an announcement, your work based on
the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If
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In addition, mere aggregation of another work not based on the Program
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 3. You may copy and distribute the Program (or a work based on it,
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  source code, which must be distributed under the terms of Sections
  1 and 2 above on a medium customarily used for software interchange; or,

  b) Accompany it with a written offer, valid for at least three
  years, to give any third party, for a charge no more than your
  cost of physically performing source distribution, a complete
  machine-readable copy of the corresponding source code, to be
  distributed under the terms of Sections 1 and 2 above on a medium
  customarily used for software interchange; or,

  c) Accompany it with the information you received as to the offer
  to distribute corresponding source code. (This alternative is
  allowed only for noncommercial distribution and only if you
  received the program in object code or executable form with such
  an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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Julian Seward, jseward@bzip.org
bzip2/libbzip2 version 1.0.6 of 6 September 2010

---
abstract: 'Build and install Perl modules'
author:
 - 'Ken Williams <kwilliams@cpan.org>'
 - "Development questions, bug reports, and patches should be sent to the\nModule-Build mailing list at <module-build@perl.org>."
build_requires:
 File::Temp: 0.15
 Test::Harness: 3.16
 Test::More: 0.49
generated_by: 'Module::Build version 0.3608'
license: gpl
meta-spec:
 url: http://module-build.sourceforge.net/META-spec-v1.4.html
 version: 1.4
name: Module-Build
resources:
 MailingList: mailto:module-build@perl.org
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 repository: http://github.com/dagolden/module-build/
version: 3

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    <one line to give the program's name and a brief idea of what it does.>
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 <signature of Ty Coon>, 1 April 1989
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The End
#!perl

=head1 NAME

copyright.t

=head1 DESCRIPTION

Tests that the latest copyright years in the top-level README file and the
C<perl -v> output match each other.

If the test fails, update at least one of README and perl.c so that they match
reality.

Optionally you can pass the C<--now> option to check they are at the current

year. This isn't checked by default, so that it doesn't fail for people
working on older releases. It should be run before making a new release.

=cut

```
use strict;
use Config;
BEGIN { require './test.pl' }

if ( $Config{usecrosscompile} ) {
 skip_all( "Not all files are available during cross-compilation" );
}

my ($opt) = @ARGV;

my $readme_year = readme_year();
my $v_year = v_year();

# Check that both copyright dates are up-to-date, but only if requested, so
# that tests still pass for people intentionally working on older versions:
if ($opt eq '--now')
{
 my $current_year = (gmtime)[5] + 1900;
 is $v_year, $current_year, 'perl -v copyright includes current year';
 is $readme_year, $current_year, 'README copyright includes current year';
}

# Otherwise simply check that the two copyright dates match each other:
else
{
 is $readme_year, $v_year, 'README and perl -v copyright dates match';
}

done_testing;


sub readme_year
# returns the latest copyright year from the top-level README file
{

 open my $readme, '<', '../README' or die "Opening README failed: $!";

 # The copyright message is the first paragraph:
 local $/ = '';
 my $copyright_msg = <$readme>;

 my ($year) = $copyright_msg =~ /.*\b(\d{4,})/s
     or die "Year not found in README copyright message '$copyright_msg'";
```

```
 $year;
}


sub v_year
# returns the latest copyright year shown in perl -v
{

 my $output = runperl switches => ['-v'];
 my ($year) = $output =~ /copyright 1987.*\b(\d{4,})/i
    or die "Copyright statement not found in perl -v output '$output'";

 $year;
}
```

1.61 grpc-go 1.4.0

1.61.1 Available under license :

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1.62 strace 4.5

1.62.1 Available under license :

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$Id: copyright,v 1.1 2002/03/31 18:45:45 wichert Exp $

1.63 socat 1.7.2.2

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1.64 zlib 1.2.3

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1.66 ethtool 3.14

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The source code for a work means the preferred form of the work for
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code means all the source code for all modules it contains, plus any
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anything that is normally distributed (in either source or binary
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1.69 glib 2.26.0

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1.70 berkeley-db 4.7.25

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1.72 autogen 1.2

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from distutils.core import setup

with open('README.md') as readme:
  with open('HISTORY.md') as history:
    long_description = readme.read() + '\n\n' + history.read()

```
try:
    import pypandoc

    long_description = pypandoc.convert(long_description, 'rst', 'markdown')
except(IOError, ImportError):
    long_description = long_description

VERSION = '1.2'

setup(
    name='argparse-autogen',
    py_modules=['argparse_autogen'],
    version=VERSION,
    url='https://github.com/sashgorokhov/argparse-autogen',
    download_url='https://github.com/sashgorokhov/argparse-autogen/archive/v%s.zip' % VERSION,
    keywords=['python', 'argparse', 'generate'],
    classifiers=[],
    long_description=long_description,
    license='MIT License',
    author='sashgorokhov',
    author_email='sashgorokhov@gmail.com',
    description="Parser with automatic creation of parsers and subparsers for paths.",
)
```

Found in path(s):
* /opt/cola/permits/1328610500_1652761164.793856/0/argparse-autogen-1-2-tar-gz/argparse-autogen-1.2/setup.py
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Metadata-Version: 1.1
Name: argparse-autogen
Version: 1.2
Summary: Parser with automatic creation of parsers and subparsers for paths.
Home-page: https://github.com/sashgorokhov/argparse-autogen
Author: sashgorokhov
Author-email: sashgorokhov@gmail.com
License: MIT License
Download-URL: https://github.com/sashgorokhov/argparse-autogen/archive/v1.2.zip
Description: argparse-autogen
        ================

        |PyPI version| |GitHub release| |Build Status| |codecov| |GitHub
        license|

        Parser with automatic creation of parsers and subparsers for paths.

        Installation

Supported versions of python: **``3.3+``** (because of
inspect.Signature, which was introduced in python 3.3)

.. code:: shell

    pip install argparse-autogen

Usage

``argparse_autogen.EndpointParser`` is intended to replace basic
``argparse.ArgumentParser``. It extends subparsers creation logic, and
adds a new special method ``add_endpoint``.

Simple example:

.. code:: python

    import argparse_autogen

    class MyCli():
      def do_stuff(self, target, force=False):
        """
        This does cool stuff!

        :param str target: Target to execute a cool stuff
        :param bool force: Force doing cool stuff
        """
        print(target, force)

    cli = MyCli()

    parser = argparse_autogen.EndpointParser()
    parser.add_endpoint('do_stuff', cli.do_stuff)
    parser.parse_and_call(['do_stuff', 'my target']) # this will print "my target false"
    parser.parse_and_call(['do_stuff', '--force', 'my target']) # this will print "my target true"

``add_endpoint`` method is clever enough to parse methods docstring and
add corresponding helps in arguments. For example,
``parser.parse_args(['do_stuff', '--help'])`` in above example will show
something like

::

    usage: example.py do_stuff [-h] [--force]

    This does cool stuff!

optional arguments:
  -h, --help show this help message and exit
  --force   Force doing cool stuff

This magic is done by ``argparse_autogen.autospec`` function. It
introspects function signature, and adds corresponding argparse
arguments to parser. ``*args`` aguments in function are not supported -
this parameter will be skipped. ``**kwargs`` are supported and can be
passed as ``[key=value [key=value ...]]``. You can override argument
settings by passing ``argument_overrides`` option to ``add_endpoint``.
This must be a ``dict[str, dict]`` where keys are parameter name, and
values are parameters to override defaults passed to
``parser.add_argument``

More endpoint examples

Nested class and complex paths:

.. code:: python

    import argparse_autogen

    class MyCli():
      def __init__(self):
        self.users = self.Users()
        self.groups = self.Groups()

      class Users():
        def get(self, user_id): pass
        def list(self, **filter): pass
        def update(self, user_id, **fields): pass

      class Groups():
        def get(self, group_id): pass

    cli = MyCli()

    parser = argparse_autogen.EndpointParser()

    parser.add_endpoint('users.get', cli.users.get, argument_overrides={'user_id': {'help': 'Users id'}})
    parser.add_endpoint('users.list', cli.users.list)
    parser.add_endpoint(cli.users.update)
    # this will use __qualname__ of update func as path, lowercased and trailing and ending underscores
removed.
    # The first item of qualname is skipped, so it would be `users.update`, not `mycli.users.update`

    groups_get_parser = parser.add_endpoint('groups get', cli.groups.get, autospec=False)

```
        groups_get_parser.add_argument('group_id', help='Group id')


        users_parser = parser.get_endpoint_parser('users')
        users_parser.description = 'Users operations'


        parser.parse_and_call()
```

History

1.2 (2017-03-01)
~~~~~~~~~~~~~~~~

- Ability to automatically generate path from func's qualname

1.1 (2017-02-28)
~~~~~~~~~~~~~~~~

- Filter args from func signature in call method #1

1.0 (2017-02-26)
~~~~~~~~~~~~~~~~

- First release

0.1 (2017-02-25)
~~~~~~~~~~~~~~~~

- Initial commit

.. |PyPI version| image:: https://badge.fury.io/py/argparse-autogen.svg
   :target: https://badge.fury.io/py/argparse-autogen
.. |GitHub release| image:: https://img.shields.io/github/release/sashgorokhov/argparse-autogen.svg
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   :target: https://travis-ci.org/sashgorokhov/argparse-autogen
.. |codecov| image:: https://codecov.io/gh/sashgorokhov/argparse-autogen/branch/master/graph/badge.svg
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Keywords: python,argparse,generate
Platform: UNKNOWN

Found in path(s):
* /opt/cola/permits/1328610500_1652761164.793856/0/argparse-autogen-1-2-tar-gz/argparse-autogen-1.2/PKG-INFO

1.73 libxml2 2.7.6

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1.74 hd-parm 9.39

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Theodore Ts'o

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1.78 tftp-hpa 5.2

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 *
 * ---------------------------------------------------------------- */
```

Found in path(s):

* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftpd/recvfrom.c
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftpd/recvfrom.h

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* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftpd/tftpd.8.in
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Found in path(s):
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/MCONFIG.in
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Summary: The client for the Trivial File Transfer Protocol (TFTP).
Name: tftp
Version: 5.2
Release: 1
License: BSD
Group: Applications/Internet
Source0: http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz
BuildRequires: tcp_wrappers-devel
BuildRoot: %{_tmppath}/%{name}-root

%description
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations. The tftp package provides the user
interface for TFTP, which allows users to transfer files to and from a
remote machine. This program and TFTP provide very little security,
and should not be enabled unless it is expressly needed.

%package server
Group: System Environment/Daemons
Summary: The server for the Trivial File Transfer Protocol (TFTP).
Requires: xinetd

%description server
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations. The tftp-server package provides the
server for TFTP, which allows users to transfer files to and from a
remote machine. TFTP provides very little security, and should not be
enabled unless it is expressly needed. The TFTP server is run from

/etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

```
%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
  SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
 install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
  /sbin/service xinetd reload > /dev/null 2>&1 || :
fi

%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
```

- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
- 0.33
- Add /tftpboot directory (#88204)

* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
- add BuildPreReq on tcp_wrappers

* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
- rebuilt

* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
- Update to 0.32

* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
- Fix #55789
- Update to 0.30

* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
- Try applying HJ's patch from #65476

* Fri Jun 21 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>
- Update to 0.29

* Thu May 23 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Wed Jan 09 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Tue Dec 18 2001 Elliot Lee <sopwith@redhat.com> 0.17-15
- Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562
- Update to tftp-hpa-0.28 (bug #56131)
- Remove include/arpa/tftp.h to fix #57259
- Add resource limits in tftp-xinetd (#56722)

* Sun Jun 24 2001 Elliot Lee <sopwith@redhat.com>
- Bump release + rebuild.

* Tue Jun 12 2001 Helge Deller <hdeller@redhat.de> (0.17-13)
- updated tftp-hpa source to tftp-hpa-0.17
- tweaked specfile with different defines for tftp-netkit and tftp-hpa version
- use hpa's tftpd.8 man page instead of the netkits one

* Mon May 07 2001 Helge Deller <hdeller@redhat.de>
- rebuilt in 7.1.x

* Wed Apr 18 2001 Helge Deller <hdeller@redhat.de>
- fix tftp client's put problems (#29529)
- update to tftp-hpa-0.16

* Wed Apr 4 2001 Jakub Jelinek <jakub@redhat.com>
- don't let configure to guess compiler, it can pick up egcs

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
- fixed hpa-tftpd to handle files greater than 32MB (#23725)
- added "-l" flag to hpa-tftpd for file-logging (#26467)
- added description for "-l" to the man-page

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- updated tftp client to 0.17 stable (#19640),
- drop dependency on xinetd for tftp client (#25051),

* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
- xinetd shouldn't wait on tftp (which forks) (#23923).

* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
- fix to permit tftp put's (#18128).
- startup as root with chroot to /tftpboot with early reversion to nobody
 is preferable to starting as nobody w/o ability to chroot.
- %%post is needed by server, not client. Add %%postun for erasure as well.

* Wed Aug 23 2000 Nalin Dahyabhai <nalin@redhat.com>
- default to being disabled

* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
- correct group.

* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
- change user from root to nobody

* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>

- update to tftp-hpa-0.14 (#14003).
- add server_args (#14003).
- remove -D_BSD_SOURCE (#14003).

* Fri Jul 21 2000 Nalin Dahyabhai <nalin@redhat.com>
- cook up an xinetd config file for tftpd

* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
- automatic rebuild

* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
- FHS packaging.
- update to 0.17.

* Fri May 5 2000 Matt Wilson <msw@redhat.com>
- use _BSD_SOURCE for hpa's tftpd so we get BSD signal semantics.

* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
- fix description

* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
- compress man pages (again).

* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
- man pages are compressed
- fix description and summary

* Tue Jan 4 2000 Bill Nottingham <notting@redhat.com>
- split client and server

* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.16.

* Sat Aug 28 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.15.

* Wed Apr 7 1999 Jeff Johnson <jbj@redhat.com>
- tftpd should truncate file when overwriting (#412)

* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
- auto rebuild in the new build environment (release 22)

* Mon Mar 15 1999 Jeff Johnson <jbj@redhat.com>
- compile for 6.0.

* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>
- build root

* Mon Apr 27 1998 Prospector System <bugs@redhat.com>
- translations modified for de, fr, tr

* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>
- added check for getpwnam() failure

* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>
- initial build

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* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/common/tftpsubs.h
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Summary: The client for the Trivial File Transfer Protocol (TFTP).
Name: tftp
Version: @@VERSION@@

Release: 1
License: BSD
Group: Applications/Internet
Source0: http://www.kernel.org/pub/software/network/tftp/tftp-hpa-%{version}.tar.gz
BuildRequires: tcp_wrappers-devel
BuildRoot: %{_tmppath}/%{name}-root

%description
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations. The tftp package provides the user
interface for TFTP, which allows users to transfer files to and from a
remote machine. This program and TFTP provide very little security,
and should not be enabled unless it is expressly needed.

%package server
Group: System Environment/Daemons
Summary: The server for the Trivial File Transfer Protocol (TFTP).
Requires: xinetd

%description server
The Trivial File Transfer Protocol (TFTP) is normally used only for
booting diskless workstations. The tftp-server package provides the
server for TFTP, which allows users to transfer files to and from a
remote machine. TFTP provides very little security, and should not be
enabled unless it is expressly needed. The TFTP server is run from
/etc/xinetd.d/tftp, and is disabled by default on Red Hat Linux systems.

%prep
%setup -q -n tftp-hpa-%{version}

%build

%configure
make %{?_smp_mflags}

%install
rm -rf ${RPM_BUILD_ROOT}
mkdir -p ${RPM_BUILD_ROOT}%{_bindir}
mkdir -p ${RPM_BUILD_ROOT}%{_mandir}/man{1,8}
mkdir -p ${RPM_BUILD_ROOT}%{_sbindir}

make INSTALLROOT=${RPM_BUILD_ROOT} \
  SBINDIR=%{_sbindir} MANDIR=%{_mandir} \
 install
install -m755 -d ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/ ${RPM_BUILD_ROOT}/tftpboot
install -m644 tftp-xinetd ${RPM_BUILD_ROOT}%{_sysconfdir}/xinetd.d/tftp

%post server

```
/sbin/service xinetd reload > /dev/null 2>&1 || :

%postun server
if [ $1 = 0 ]; then
  /sbin/service xinetd reload > /dev/null 2>&1 || :
fi

%clean
rm -rf ${RPM_BUILD_ROOT}

%files
%defattr(-,root,root)
%{_bindir}/tftp
%{_mandir}/man1/*

%files server
%defattr(-,root,root)
%config(noreplace) %{_sysconfdir}/xinetd.d/tftp
%dir /tftpboot
%{_sbindir}/in.tftpd
%{_mandir}/man8/*

%changelog
* Tue Sep 14 2004 H. Peter Anvin <hpa@zytor.com>
- removed completely broken "Malta" patch.
- integrated into build machinery so rpm -ta works.

* Fri Feb 13 2004 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Wed Jun 04 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Fri Apr 11 2003 Elliot Lee <sopwith@redhat.com>
- 0.33
- Add /tftpboot directory (#88204)

* Mon Feb 24 2003 Elliot Lee <sopwith@redhat.com>
- rebuilt

* Sun Feb 23 2003 Tim Powers <timp@redhat.com>
- add BuildPreReq on tcp_wrappers

* Wed Jan 22 2003 Tim Powers <timp@redhat.com>
- rebuilt

* Mon Nov 11 2002 Elliot Lee <sopwith@redhat.com> 0.32-1
- Update to 0.32
```

* Wed Oct 23 2002 Elliot Lee <sopwith@redhat.com> 0.30-1
- Fix #55789
- Update to 0.30

* Thu Jun 27 2002 Elliot Lee <sopwith@redhat.com>
- Try applying HJ's patch from #65476

* Fri Jun 21 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Mon Jun 17 2002 Elliot Lee <sopwith@redhat.com>
- Update to 0.29

* Thu May 23 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Wed Jan 09 2002 Tim Powers <timp@redhat.com>
- automated rebuild

* Tue Dec 18 2001 Elliot Lee <sopwith@redhat.com> 0.17-15
- Add patch4: netkit-tftp-0.17-defaultport.patch for bug #57562
- Update to tftp-hpa-0.28 (bug #56131)
- Remove include/arpa/tftp.h to fix #57259
- Add resource limits in tftp-xinetd (#56722)

* Sun Jun 24 2001 Elliot Lee <sopwith@redhat.com>
- Bump release + rebuild.

* Tue Jun 12 2001 Helge Deller <hdeller@redhat.de> (0.17-13)
- updated tftp-hpa source to tftp-hpa-0.17
- tweaked specfile with different defines for tftp-netkit and tftp-hpa version
- use hpa's tftpd.8 man page instead of the netkits one

* Mon May 07 2001 Helge Deller <hdeller@redhat.de>
- rebuilt in 7.1.x

* Wed Apr 18 2001 Helge Deller <hdeller@redhat.de>
- fix tftp client's put problems (#29529)
- update to tftp-hpa-0.16

* Wed Apr 4 2001 Jakub Jelinek <jakub@redhat.com>
- don't let configure to guess compiler, it can pick up egcs

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- changed "wait" in xinetd file to "yes" (hpa-tftpd forks and exits) (#26467)
- fixed hpa-tftpd to handle files greater than 32MB (#23725)
- added "-l" flag to hpa-tftpd for file-logging (#26467)

- added description for "-l" to the man-page

* Thu Feb 08 2001 Helge Deller <hdeller@redhat.de>
- updated tftp client to 0.17 stable (#19640),
- drop dependency on xinetd for tftp client (#25051),

* Wed Jan 17 2001 Jeff Johnson <jbj@redhat.com>
- xinetd shouldn't wait on tftp (which forks) (#23923).

* Sat Jan 6 2001 Jeff Johnson <jbj@redhat.com>
- fix to permit tftp put's (#18128).
- startup as root with chroot to /tftpboot with early reversion to nobody
 is preferable to starting as nobody w/o ability to chroot.
- %%post is needed by server, not client. Add %%postun for erasure as well.

* Wed Aug 23 2000 Nalin Dahyabhai <nalin@redhat.com>
- default to being disabled

* Thu Aug 17 2000 Jeff Johnson <jbj@redhat.com>
- correct group.

* Tue Jul 25 2000 Nalin Dahyabhai <nalin@redhat.com>
- change user from root to nobody

* Sat Jul 22 2000 Jeff Johnson <jbj@redhat.com>
- update to tftp-hpa-0.14 (#14003).
- add server_args (#14003).
- remove -D_BSD_SOURCE (#14003).

* Fri Jul 21 2000 Nalin Dahyabhai <nalin@redhat.com>
- cook up an xinetd config file for tftpd

* Wed Jul 12 2000 Prospector <bugzilla@redhat.com>
- automatic rebuild

* Sun Jun 18 2000 Jeff Johnson <jbj@redhat.com>
- FHS packaging.
- update to 0.17.

* Fri May 5 2000 Matt Wilson <msw@redhat.com>
- use _BSD_SOURCE for hpa's tftpd so we get BSD signal semantics.

* Fri Feb 11 2000 Bill Nottingham <notting@redhat.com>
- fix description

* Wed Feb 9 2000 Jeff Johnson <jbj@redhat.com>
- compress man pages (again).

* Wed Feb 02 2000 Cristian Gafton <gafton@redhat.com>
- man pages are compressed
- fix description and summary

* Tue Jan 4 2000 Bill Nottingham <notting@redhat.com>
- split client and server

* Tue Dec 21 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.16.

* Sat Aug 28 1999 Jeff Johnson <jbj@redhat.com>
- update to 0.15.

* Wed Apr 7 1999 Jeff Johnson <jbj@redhat.com>
- tftpd should truncate file when overwriting (#412)

* Sun Mar 21 1999 Cristian Gafton <gafton@redhat.com>
- auto rebuild in the new build environment (release 22)

* Mon Mar 15 1999 Jeff Johnson <jbj@redhat.com>
- compile for 6.0.

* Fri Aug 7 1998 Jeff Johnson <jbj@redhat.com>
- build root

* Mon Apr 27 1998 Prospector System <bugs@redhat.com>
- translations modified for de, fr, tr

* Mon Sep 22 1997 Erik Troan <ewt@redhat.com>
- added check for getpwnam() failure

* Tue Jul 15 1997 Erik Troan <ewt@redhat.com>
- initial build

Found in path(s):
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftp.spec.in
No license file was found, but licenses were detected in source scan.

```
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 *
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 *
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 *
 * --------------------------------------------------------------------- */
```

Found in path(s):
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftpd/tftpd.h
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```

Found in path(s):
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftp/main.c
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftp/tftp.c
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/common/tftpsubs.c
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```
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```

Found in path(s):
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftpd/remap.c
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftpd/misc.c
* /opt/cola/permits/1127995194_1611893805.73/0/tftp-hpa-5-2-tar-bz2/tftp-hpa-5.2/tftpd/remap.h

1.79 xinetd 2.3.14

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1.80 libpcap 0.9.8

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1.81 bridgeutils 1.2

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1.82 yajl 2.0.1

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1.83 zlib 1.2.5

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1.84 erlang-otp 7.3
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table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
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1.86 sed 4.1.5

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The End

1.88 upstart 0.6.3

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1.89 berkeley-db 4.8.26

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
Foundation (PSF, see http://www.python.org/psf/) was formed, a
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All Python releases are Open Source (see http://www.opensource.org for
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Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
2.2.3	2.2.2	2003	PSF	yes
2.3	2.2.2	2002-2003	PSF	yes
2.3.1	2.3	2002-2003	PSF	yes
2.3.2	2.3.1	2002-2003	PSF	yes
2.3.3	2.3.2	2002-2003	PSF	yes
2.3.4	2.3.3	2004	PSF	yes
2.3.5	2.3.4	2005	PSF	yes
2.4	2.3	2004	PSF	yes
2.4.1	2.4	2005	PSF	yes
2.4.2	2.4.1	2005	PSF	yes
2.4.3	2.4.2	2006	PSF	yes
2.4.4	2.4.3	2006	PSF	yes
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2.5.1	2.5	2007	PSF	yes
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2.5.3	2.5.2	2008	PSF	yes
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1.96 valgrind 3.10.1

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```
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#
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#
```

```
#    "Copyright (C) 20xy-2012"
#
# where x can be 0 or 1 and y can be anything.
# To use:
# - change the years in the 'perl' command below appropriately.
# - Run it from the base directory of a Valgrind workspace.
# - And check the results look ok by diff'ing against the repository.
#
# Note that it will spit out some warnings when it runs;  ignore these.
#

# The find command deliberately skips .svn/ subdirs -- we don't want to
# change them.
for i in `find . -name '*.[chS]' -o -name '*.in' -type f -not -path '*.svn\/*'` ; do
  echo $i
  if [ -L $i ]; then continue; fi  # skip symbolic links
  perl -p -e 's/Copyright \(C\) 20([0-1])([0-9])-2013/Copyright (C) 20$1$2-2014/' < $i > tmp.$$
  mv tmp.$$ $i

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done
```

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1.98 go 1.8.1

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1.99 nss 3.12.4

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serializer.jar - Xalan-Java 2 - Serializer
Source: http://xalan.apache.org/
Used by: Xalan-Java 2 and Xerces-Java 2

The license above also applies to the jar file
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Source: http://xerces.apache.org/
Used by: Xalan-Java 2

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xml-apis.jar - Xerces-Java 2 XML Parser.
Source: http://xerces.apache.org/
Used by: Xalan-Java 2 and release copy of Xerces-Java 2

The following license applies to the included files:
 tools/ant.jar
 tools/antRun
 tools/antRun.bat
Source: http://ant.apache.org/
Used By: Xalan's build process: java/build.xml and test/build.xml

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Source: http://jakarta.apache.org/bcel
Used By: XSLTC component of xml-xalan/java

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also applies to the included regexp.jar,
jakarta-regexp-1.2.jar from Apache Jakarta.
Source: http://jakarta.apache.org/regexp
Used By: BCEL.jar which is used by XSLTC component of xml-xalan/java

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Source: http://www.cs.princeton.edu/~appel/modern/java/CUP
Used By: XSLTC component of xml-xalan/java

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Used By: XSLTC component of xml-xalan/java

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Integrated with Xalan-Java 2 and Xerces 2.
Source: http://svn.apache.org/viewvc/xml/stylebook/
Used by: Xalan-Java 2, Xalan-C++

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portion of it, either verbatim or with modifications and/or translated
straightforwardly into another language. (Hereinafter, translation is
included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for
making modifications to it. For a library, complete source code means
all the source code for all modules it contains, plus any associated
interface definition files, plus the scripts used to control compilation
and installation of the library.

Activities other than copying, distribution and modification are not
covered by this License; they are outside its scope. The act of
running a program using the Library is not restricted, and output from
such a program is covered only if its contents constitute a work based
on the Library (independent of the use of the Library in a tool for
writing it). Whether that is true depends on what the Library does
and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's
complete source code as you receive it, in any medium, provided that
you conspicuously and appropriately publish on each copy an
appropriate copyright notice and disclaimer of warranty; keep intact
all the notices that refer to this License and to the absence of any
warranty; and distribute a copy of this License along with the
Library.

You may charge a fee for the physical act of transferring a copy,
and you may at your option offer warranty protection in exchange for a
fee.

2. You may modify your copy or copies of the Library or any portion
of it, thus forming a work based on the Library, and copy and
distribute such modifications or work under the terms of Section 1

above, provided that you also meet all of these conditions:

  a) The modified work must itself be a software library.

  b) You must cause the files modified to carry prominent notices
  stating that you changed the files and the date of any change.

  c) You must cause the whole of the work to be licensed at no
  charge to all third parties under the terms of this License.

  d) If a facility in the modified Library refers to a function or a
  table of data to be supplied by an application program that uses
  the facility, other than as an argument passed when the facility
  is invoked, then you must make a good faith effort to ensure that,
  in the event an application does not supply such function or
  table, the facility still operates, and performs whatever part of
  its purpose remains meaningful.

  (For example, a function in a library to compute square roots has
  a purpose that is entirely well-defined independent of the
  application. Therefore, Subsection 2d requires that any
  application-supplied function or table used by this function must
  be optional: if the application does not supply it, the square
  root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
with the Library (or with a work based on the Library) on a volume of
a storage or distribution medium does not bring the other work under
the scope of this License.

 3. You may opt to apply the terms of the ordinary GNU General Public
License instead of this License to a given copy of the Library. To do

this, you must alter all the notices that refer to this License, so
that they refer to the ordinary GNU General Public License, version 2,
instead of to this License. (If a newer version than version 2 of the
ordinary GNU General Public License has appeared, then you can specify
that version instead if you wish.) Do not make any other change in
these notices.

 Once this change is made in a given copy, it is irreversible for
that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline

functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also combine or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

 You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
this License. You must supply a copy of this License. If the work
during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

  a) Accompany the work with the complete corresponding
  machine-readable source code for the Library including whatever
  changes were used in the work (which must be distributed under
  Sections 1 and 2 above); and, if the work is an executable linked
  with the Library, with the complete machine-readable "work that
  uses the Library", as object code and/or source code, so that the
  user can modify the Library and then relink to produce a modified
  executable containing the modified Library. (It is understood
  that the user who changes the contents of definitions files in the
  Library will not necessarily be able to recompile the application
  to use the modified definitions.)

  b) Use a suitable shared library mechanism for linking with the
  Library. A suitable mechanism is one that (1) uses at run time a
  copy of the library already present on the user's computer system,
  rather than copying library functions into the executable, and (2)
  will operate properly with a modified version of the library, if
  the user installs one, as long as the modified version is
  interface-compatible with the version that the work was made with.

  c) Accompany the work with a written offer, valid for at
  least three years, to give the same user the materials
  specified in Subsection 6a, above, for a charge no more

than the cost of performing this distribution.

    d) If distribution of the work is made by offering access to copy
    from a designated place, offer equivalent access to copy the above
    specified materials from the same place.

    e) Verify that the user has already received a copy of these
    materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the materials to be distributed need not include anything that is
normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

 It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

 7. You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library
facilities not covered by this License, and distribute such a combined
library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
permitted, and provided that you do these two things:

    a) Accompany the combined library with a copy of the same work
    based on the Library, uncombined with any other library
    facilities. This must be distributed under the terms of the
    Sections above.

    b) Give prominent notice with the combined library of the fact
    that part of it is a work based on the Library, and explaining
    where to find the accompanying uncombined form of the same work.

 8. You may not copy, modify, sublicense, link with, or distribute
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distribute the Library is void, and will automatically terminate your
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the only way you could satisfy both it and this License would be to
refrain entirely from distribution of the Library.

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and the section as a whole is intended to apply in other circumstances.

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DAMAGES.

END OF TERMS AND CONDITIONS

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possible use to the public, we recommend making it free software that
everyone can redistribute and change. You can do so by permitting
redistribution under these terms (or, alternatively, under the terms of the
ordinary General Public License).

To apply these terms, attach the following notices to the library. It is
safest to attach them to the start of each source file to most effectively
convey the exclusion of warranty; and each file should have at least the
"copyright" line and a pointer to where the full notice is found.

    <one line to give the library's name and a brief idea of what it does.>
    Copyright (C) <year> <name of author>

    This library is free software; you can redistribute it and/or
    modify it under the terms of the GNU Lesser General Public
    License as published by the Free Software Foundation; either
    version 2.1 of the License, or (at your option) any later version.

    This library is distributed in the hope that it will be useful,
    but WITHOUT ANY WARRANTY; without even the implied warranty of
    MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU
    Lesser General Public License for more details.

    You should have received a copy of the GNU Lesser General Public
    License along with this library; if not, write to the Free Software
    Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your
school, if any, to sign a "copyright disclaimer" for the library, if
necessary. Here is a sample; alter the names:

 Yoyodyne, Inc., hereby disclaims all copyright interest in the
 library `Frob' (a library for tweaking knobs) written by James Random Hacker.

 <signature of Ty Coon>, 1 April 1990
 Ty Coon, President of Vice

That's all there is to it!

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@center Version 2.1, February 1999

@c This file is intended to be included within another document,

@c hence no sectioning command or @node.

@display

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of this license document, but changing it is not allowed.

[This is the first released version of the Lesser GPL. It also counts

as the successor of the GNU Library Public License, version 2, hence the

version number 2.1.]

@end display

@subheading Preamble

 The licenses for most software are designed to take away your

freedom to share and change it. By contrast, the GNU General Public

Licenses are intended to guarantee your freedom to share and change

free software---to make sure the software is free for all its users.

 This license, the Lesser General Public License, applies to some

specially designated software---typically libraries---of the Free

Software Foundation and other authors who decide to use it. You can use

it too, but we suggest you first think carefully about whether this

license or the ordinary General Public License is the better strategy to

use in any particular case, based on the explanations below.

 When we speak of free software, we are referring to freedom of use,

not price. Our General Public Licenses are designed to make sure that

you have the freedom to distribute copies of free software (and charge

for this service if you wish); that you receive source code or can get

it if you want it; that you can change the software and use pieces of it

in new free programs; and that you are informed that you can do these

things.

 To protect your rights, we need to make restrictions that forbid

distributors to deny you these rights or to ask you to surrender these

rights. These restrictions translate to certain responsibilities for

you if you distribute copies of the library or if you modify it.

 For example, if you distribute copies of the library, whether gratis

or for a fee, you must give the recipients all the rights that we gave
you. You must make sure that they, too, receive or can get the source
code. If you link other code with the library, you must provide
complete object files to the recipients, so that they can relink them
with the library after making changes to the library and recompiling
it. And you must show them these terms so they know their rights.

 We protect your rights with a two-step method: (1) we copyright the
library, and (2) we offer you this license, which gives you legal
permission to copy, distribute and/or modify the library.

 To protect each distributor, we want to make it very clear that
there is no warranty for the free library. Also, if the library is
modified by someone else and passed on, the recipients should know
that what they have is not the original version, so that the original
author's reputation will not be affected by problems that might be
introduced by others.

 Finally, software patents pose a constant threat to the existence of
any free program. We wish to make sure that a company cannot
effectively restrict the users of a free program by obtaining a
restrictive license from a patent holder. Therefore, we insist that
any patent license obtained for a version of the library must be
consistent with the full freedom of use specified in this license.

 Most GNU software, including some libraries, is covered by the
ordinary GNU General Public License. This license, the GNU Lesser
General Public License, applies to certain designated libraries, and
is quite different from the ordinary General Public License. We use
this license for certain libraries in order to permit linking those
libraries into non-free programs.

 When a program is linked with a library, whether statically or using
a shared library, the combination of the two is legally speaking a
combined work, a derivative of the original library. The ordinary
General Public License therefore permits such linking only if the
entire combination fits its criteria of freedom. The Lesser General
Public License permits more lax criteria for linking other code with
the library.

 We call this license the @dfn{Lesser} General Public License because it
does @emph{Less} to protect the user's freedom than the ordinary General
Public License. It also provides other free software developers Less
of an advantage over competing non-free programs. These disadvantages
are the reason we use the ordinary General Public License for many
libraries. However, the Lesser license provides advantages in certain
special circumstances.

For example, on rare occasions, there may be a special need to
encourage the widest possible use of a certain library, so that it becomes
a de-facto standard. To achieve this, non-free programs must be
allowed to use the library. A more frequent case is that a free
library does the same job as widely used non-free libraries. In this
case, there is little to gain by limiting the free library to free
software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free
programs enables a greater number of people to use a large body of
free software. For example, permission to use the GNU C Library in
non-free programs enables many more people to use the whole GNU
operating system, as well as its variant, the GNU/Linux operating
system.

Although the Lesser General Public License is Less protective of the
users' freedom, it does ensure that the user of a program that is
linked with the Library has the freedom and the wherewithal to run
that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and
modification follow. Pay close attention to the difference between a
``work based on the library'' and a ``work that uses the library''. The
former contains code derived from the library, whereas the latter must
be combined with the library in order to run.

@subheading TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

@enumerate 0
@item
This License Agreement applies to any software library or other program
which contains a notice placed by the copyright holder or other
authorized party saying it may be distributed under the terms of this
Lesser General Public License (also called ``this License''). Each
licensee is addressed as ``you''.

A ``library'' means a collection of software functions and/or data
prepared so as to be conveniently linked with application programs
(which use some of those functions and data) to form executables.

The ``Library'', below, refers to any such software library or work
which has been distributed under these terms. A ``work based on the
Library'' means either the Library or any derivative work under
copyright law: that is to say, a work containing the Library or a
portion of it, either verbatim or with modifications and/or translated
straightforwardly into another language. (Hereinafter, translation is
included without limitation in the term ``modification''.)

``Source code'' for a work means the preferred form of the work for
making modifications to it. For a library, complete source code means
all the source code for all modules it contains, plus any associated
interface definition files, plus the scripts used to control compilation
and installation of the library.

 Activities other than copying, distribution and modification are not
covered by this License; they are outside its scope. The act of
running a program using the Library is not restricted, and output from
such a program is covered only if its contents constitute a work based
on the Library (independent of the use of the Library in a tool for
writing it). Whether that is true depends on what the Library does
and what the program that uses the Library does.

@item
You may copy and distribute verbatim copies of the Library's
complete source code as you receive it, in any medium, provided that
you conspicuously and appropriately publish on each copy an
appropriate copyright notice and disclaimer of warranty; keep intact
all the notices that refer to this License and to the absence of any
warranty; and distribute a copy of this License along with the
Library.

 You may charge a fee for the physical act of transferring a copy,
and you may at your option offer warranty protection in exchange for a
fee.

@item
You may modify your copy or copies of the Library or any portion
of it, thus forming a work based on the Library, and copy and
distribute such modifications or work under the terms of Section 1
above, provided that you also meet all of these conditions:

@enumerate a
@item
The modified work must itself be a software library.

@item
You must cause the files modified to carry prominent notices
stating that you changed the files and the date of any change.

@item
You must cause the whole of the work to be licensed at no
charge to all third parties under the terms of this License.

@item
If a facility in the modified Library refers to a function or a
table of data to be supplied by an application program that uses

the facility, other than as an argument passed when the facility
is invoked, then you must make a good faith effort to ensure that,
in the event an application does not supply such function or
table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)
@end enumerate

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
sections when you distribute them as separate works. But when you
distribute the same sections as part of a whole which is a work based
on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
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You may opt to apply the terms of the ordinary GNU General Public
License instead of this License to a given copy of the Library. To do
this, you must alter all the notices that refer to this License, so
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 Once this change is made in a given copy, it is irreversible for
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This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

@item
You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

If distribution of object code is made by offering access to copy
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However, linking a ``work that uses the Library'' with the Library
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Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
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If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
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Any executables containing that work also fall under Section 6,

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@item
As an exception to the Sections above, you may also combine or
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under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

 You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
this License. You must supply a copy of this License. If the work
during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

@enumerate a
@item
Accompany the work with the complete corresponding
machine-readable source code for the Library including whatever
changes were used in the work (which must be distributed under
Sections 1 and 2 above); and, if the work is an executable linked
with the Library, with the complete machine-readable ``work that
uses the Library'', as object code and/or source code, so that the
user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

@item
Use a suitable shared library mechanism for linking with the Library. A
suitable mechanism is one that (1) uses at run time a copy of the
library already present on the user's computer system, rather than
copying library functions into the executable, and (2) will operate
properly with a modified version of the library, if the user installs
one, as long as the modified version is interface-compatible with the
version that the work was made with.

@item
Accompany the work with a written offer, valid for at
least three years, to give the same user the materials
specified in Subsection 6a, above, for a charge no more
than the cost of performing this distribution.

@item

If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
specified materials from the same place.

@item
Verify that the user has already received a copy of these
materials or that you have already sent this user a copy.
@end enumerate

  For an executable, the required form of the ``work that uses the
Library'' must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the materials to be distributed need not include anything that is
normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies the
executable.

  It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

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facilities not covered by this License, and distribute such a combined
library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
permitted, and provided that you do these two things:

@enumerate a
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1.105 ncurses 5.7

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1.107 libevent 2.0.10

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1.108 qemu 1.5.3

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of using an interface provided by the Library.

A "Combined Work" is a work produced by combining or linking an
Application with the Library. The particular version of the Library
with which the Combined Work was made is also called the "Linked
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The "Minimal Corresponding Source" for a Combined Work means the
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You may convey a covered work under sections 3 and 4 of this License

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1.112 netkit-tftp 5

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* /opt/cola/permits/1312824191_1652762165.6295753/0/netkit-tftp-develop-zip/netkit-tftp-develop/tftp/main.c
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*   @(#)tftp.h   8.1 (Berkeley) 6/2/93
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    <signature of Ty Coon>, 1 April 1989
    Ty Coon, President of Vice

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1.114 vim 7.3

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uganda.txt   For Vim version 7.3. Last change: 2010 Aug 07

VIM REFERENCE MANUAL   by Bram Moolenaar

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SUMMARY
iccf *ICCF*
Vim is Charityware. You can use and copy it as much as you like, but you are
encouraged to make a donation for needy children in Uganda. Please see |kcc|
below or visit the ICCF web site, available at these URLs:

 http://iccf-holland.org/
 http://www.vim.org/iccf/
 http://www.iccf.nl/

You can also sponsor the development of Vim. Vim sponsors can vote for
features. See |sponsor|. The money goes to Uganda anyway.

The Open Publication License applies to the Vim documentation, see
|manual-copyright|.

=== begin of license ===

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    examples and Vim scripts.

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    including executables and/or source code, when the following four
    conditions are met:
    1) This license text must be included unmodified.
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       a) If you make changes to Vim yourself, you must clearly describe in
       the distribution how to contact you. When the maintainer asks you

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then this license, or a later version, also applies to your changes.
The current maintainer is Bram Moolenaar <Bram@vim.org>. If this
changes it will be announced in appropriate places (most likely
vim.sf.net, www.vim.org and/or comp.editors). When it is completely
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text under a) applies to those changes.
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  contact information must remain valid for at least three years
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  as possible.
  e) When the GNU General Public License (GPL) applies to the changes,
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any later version.
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Note:

- If you are happy with Vim, please express that by reading the rest of this
 file and consider helping needy children in Uganda.

- If you want to support further Vim development consider becoming a
 |sponsor|. The money goes to Uganda anyway.

- According to Richard Stallman the Vim license is GNU GPL compatible.
 A few minor changes have been made since he checked it, but that should not
 make a difference.

- If you link Vim with a library that goes under the GNU GPL, this limits
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 MODIFIED_BY define.

==

Kibaale Children's Centre *kcc* *Kibaale* *charity*

Kibaale Children's Centre (KCC) is located in Kibaale, a small town in the
south of Uganda, near Tanzania, in East Africa. The area is known as Rakai
District. The population is mostly farmers. Although people are poor, there
is enough food. But this district is suffering from AIDS more than any other
part of the world. Some say that it started there. Estimations are that 10

to 30% of the Ugandans are infected with HIV. Because parents die, there are many orphans. In this district about 60,000 children have lost one or both parents, out of a population of 350,000. And this is still continuing.

The children need a lot of help. The KCC is working hard to provide the needy with food, medical care and education. Food and medical care to keep them healthy now, and education so that they can take care of themselves in the future. KCC works on a Christian base, but help is given to children of any religion.

The key to solving the problems in this area is education. This has been neglected in the past years with president Idi Amin and the following civil wars. Now that the government is stable again, the children and parents have to learn how to take care of themselves and how to avoid infections. There is also help for people who are ill and hungry, but the primary goal is to prevent people from getting ill and to teach them how to grow healthy food.

Most of the orphans are living in an extended family. An uncle or older sister is taking care of them. Because these families are big and the income (if any) is low, a child is lucky if it gets healthy food. Clothes, medical care and schooling is beyond its reach. To help these needy children, a sponsorship program was put into place. A child can be financially adopted. For a few dollars a month KCC sees to it that the child gets indispensable items, is healthy, goes to school and KCC takes care of anything else that needs to be done for the child and the family that supports it.

Besides helping the child directly, the environment where the child grows up needs to be improved. KCC helps schools to improve their teaching methods. There is a demonstration school at the centre and teacher trainings are given. Health workers are being trained, hygiene education is carried out and households are stimulated to build a proper latrine. I helped setting up a production site for cement slabs. These are used to build a good latrine. They are sold below cost price.

There is a small clinic at the project, which provides children and their family with medical help. When needed, transport to a hospital is offered. Immunization programs are carried out and help is provided when an epidemic is breaking out (measles and cholera have been a problem).

donate

Summer 1994 to summer 1995 I spent a whole year at the centre, working as a volunteer. I have helped to expand the centre and worked in the area of water and sanitation. I learned that the help that the KCC provides really helps. When I came back to Holland, I wanted to continue supporting KCC. To do this I'm raising funds and organizing the sponsorship program. Please consider one of these possibilities:

1. Sponsor a child in primary school: 17 euro a month (or more).
2. Sponsor a child in secondary school: 25 euro a month (or more).

3. Sponsor the clinic: Any amount a month or quarter
4. A one-time donation

Compared with other organizations that do child sponsorship the amounts are
very low. This is because the money goes directly to the centre. Less than
5% is used for administration. This is possible because this is a small
organization that works with volunteers. If you would like to sponsor a
child, you should have the intention to do this for at least one year.

How do you know that the money will be spent right? First of all you have my
personal guarantee as the author of Vim. I trust the people that are working
at the centre, I know them personally. Further more, the centre has been
co-sponsored and inspected by World Vision, Save the Children Fund and is now
under the supervision of Pacific Academy Outreach Society. The centre is
visited about once a year to check the progress (at our own cost). I have
visited the centre myself many times, starting in 1993. The visit reports are
on the ICCF web site.

If you have any further questions, send me e-mail: <Bram@vim.org>.

The address of the centre is:
  Kibaale Children's Centre
  p.o. box 1658
  Masaka, Uganda, East Africa

Sending money: *iccf-donations*

Check the ICCF web site for the latest information! See |iccf| for the URL.

USA: The methods mentioned below can be used.
  Sending a check to the Nehemiah Group Outreach Society (NGOS)
  is no longer possible, unfortunately. We are looking for
  another way to get you an IRS tax receipt.
  For sponsoring a child contact KCF in Canada (see below). US
  checks can be sent to them to lower banking costs.

Canada: Contact Kibaale Children's Fund (KCF) in Surrey, Canada. They
  take care of the Canadian sponsors for the children in
  Kibaale. KCF forwards 100% of the money to the project in
  Uganda. You can send them a one time donation directly.
  Please send me a note so that I know what has been donated
  because of Vim. Ask KCF for information about sponsorship.
  Kibaale Children's Fund c/o Pacific Academy
  10238-168 Street
  Surrey, B.C. V4N 1Z4
  Canada
  Phone: 604-581-5353

If you make a donation to Kibaale Children's Fund (KCF) you
will receive a tax receipt which can be submitted with your
tax return.

Holland: Transfer to the account of "Stichting ICCF Holland" in Lisse.
  This will allow for tax deduction if you live in Holland.
   Postbank, nr. 4548774

Germany: It is possible to make donations that allow for a tax return.
  Check the ICCF web site for the latest information:
   http://iccf-holland.org/germany.html

World: Use a postal money order. That should be possible from any
  country, mostly from the post office. Use this name (which is
  in my passport): "Abraham Moolenaar". Use Euro for the
  currency if possible.

Europe: Use a bank transfer if possible. Your bank should have a form
  that you can use for this. See "Others" below for the swift
  code and IBAN number.
  Any other method should work. Ask for information about
  sponsorship.

Credit Card: You can use PayPal to send money with a Credit card. This is
  the most widely used Internet based payment system. It's
  really simple to use. Use this link to find more info:
    https://www.paypal.com/en_US/mrb/pal=XAC62PML3GF8Q
  The e-mail address for sending the money to is:
    Bram@iccf-holland.org
  For amounts above 400 Euro ($500) sending a check is
  preferred.

Others: Transfer to one of these accounts if possible:
    Postbank, account 4548774
   Swift code: INGB NL 2A
   IBAN: NL47 PSTB 0004 5487 74
  under the name "stichting ICCF Holland", Lisse
    If that doesn't work:
    Rabobank Lisse, account 3765.05.117
   Swift code: RABO NL 2U
  under the name "Bram Moolenaar", Lisse
  Otherwise, send a check in euro or US dollars to the address
  below. Minimal amount: $70 (my bank does not accept smaller
  amounts for foreign check, sorry)

Address to send checks to:
  stichting ICCF Holland
  Bram Moolenaar

Finsterruetihof 1

8134 Adliswil

Switzerland

This address is expected to be valid for a long time.

vim:tw=78:ts=8:ft=help:norl:

1.115 pcre 7.8

1.115.1 Available under license :

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and semantics are as close as possible to those of the Perl 5 language.

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The basic library functions are written in C and are freestanding. Also
included in the distribution is a set of C++ wrapper functions.

THE BASIC LIBRARY FUNCTIONS

Written by: Philip Hazel

Email local part: ph10

Email domain: cam.ac.uk

University of Cambridge Computing Service,

Cambridge, England.

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1.116 libcap 2.16

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1.117 expat 2.0.0

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Component, and (b) serves only to enable use of the work with that
Major Component, or to implement a Standard Interface for which an
implementation is available to the public in source code form. A
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1.119 curl 7.30.0

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===

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krb4

While nothing in particular says that a Kerberos4 library must use any particular license, the one I've tried and used successfully so far (kth-krb4) is partly Original BSD-licensed with the announcement clause. Some of the code in libcurl that is written to deal with Kerberos4 is Modified BSD-licensed.

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fbopenssl

(Used for SPNEGO support) Unclear license. Based on its name, I assume that it uses the OpenSSL license and thus shares the same issues as described for OpenSSL above.

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OpenLDAP http://www.openldap.org/software/release/license.html

(Used for LDAP support) Uses a Modified BSD-style license. Since libcurl uses OpenLDAP as a shared library only, I have not heard of anyone that ships OpenLDAP linked with libcurl in an app.

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^L
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case, there is little to gain by limiting the free library to free
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linked with the Library has the freedom and the wherewithal to run
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(which use some of those functions and data) to form executables.

 The "Library", below, refers to any such software library or work
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 "Source code" for a work means the preferred form of the work for
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interface definition files, plus the scripts used to control
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 Activities other than copying, distribution and modification are not
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  charge to all third parties under the terms of this License.

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  table of data to be supplied by an application program that uses
  the facility, other than as an argument passed when the facility
  is invoked, then you must make a good faith effort to ensure that,
  in the event an application does not supply such function or
  table, the facility still operates, and performs whatever part of
  its purpose remains meaningful.

  (For example, a function in a library to compute square roots has
  a purpose that is entirely well-defined independent of the

application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

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entire whole, and thus to each and every part regardless of who wrote
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 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
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under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.
^L
 6. As an exception to the Sections above, you may also combine or
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modification of the work for the customer's own use and reverse
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   c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

   d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

   e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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The source code for a work means the preferred form of the work for

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1.124 gawk 3.1.5

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changing the library, is in some sense simply using the library, and is
analogous to running a utility program or application program. However, in
a textual and legal sense, the linked executable is a combined work, a
derivative of the original library, and the ordinary General Public License
treats it as such.

 Because of this blurred distinction, using the ordinary General
Public License for libraries did not effectively promote software
sharing, because most developers did not use the libraries. We
concluded that weaker conditions might promote sharing better.

 However, unrestricted linking of non-free programs would deprive the
users of those programs of all benefit from the free status of the
libraries themselves. This Library General Public License is intended to
permit developers of non-free programs to use free libraries, while
preserving your freedom as a user of such programs to change the free
libraries that are incorporated in them. (We have not seen how to achieve
this as regards changes in header files, but we have achieved it as regards
changes in the actual functions of the Library.) The hope is that this
will lead to faster development of free libraries.

 The precise terms and conditions for copying, distribution and
modification follow. Pay close attention to the difference between a
"work based on the library" and a "work that uses the library". The
former contains code derived from the library, while the latter only
works together with the library.

 Note that it is possible for a library to be covered by the ordinary

General Public License rather than by this special one.

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 A "library" means a collection of software functions and/or data
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(which use some of those functions and data) to form executables.

 The "Library", below, refers to any such software library or work
which has been distributed under these terms. A "work based on the
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 "Source code" for a work means the preferred form of the work for
making modifications to it. For a library, complete source code means
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interface definition files, plus the scripts used to control compilation
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and what the program that uses the Library does.

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of it, thus forming a work based on the Library, and copy and
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  b) You must cause the files modified to carry prominent notices
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  c) You must cause the whole of the work to be licensed at no
  charge to all third parties under the terms of this License.

  d) If a facility in the modified Library refers to a function or a
  table of data to be supplied by an application program that uses
  the facility, other than as an argument passed when the facility
  is invoked, then you must make a good faith effort to ensure that,
  in the event an application does not supply such function or
  table, the facility still operates, and performs whatever part of
  its purpose remains meaningful.

  (For example, a function in a library to compute square roots has
  a purpose that is entirely well-defined independent of the
  application. Therefore, Subsection 2d requires that any
  application-supplied function or table used by this function must
  be optional: if the application does not supply it, the square
  root function must still compute square roots.)

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Thus, it is not the intent of this section to claim rights or contest
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In addition, mere aggregation of another work not based on the Library
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these notices.

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that copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
derivative of it, under Section 2) in object code or executable form
under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The

threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also compile or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

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this License. You must supply a copy of this License. If the work
during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

  a) Accompany the work with the complete corresponding
  machine-readable source code for the Library including whatever
  changes were used in the work (which must be distributed under
  Sections 1 and 2 above); and, if the work is an executable linked
  with the Library, with the complete machine-readable "work that
  uses the Library", as object code and/or source code, so that the
  user can modify the Library and then relink to produce a modified
  executable containing the modified Library. (It is understood
  that the user who changes the contents of definitions files in the
  Library will not necessarily be able to recompile the application
  to use the modified definitions.)

  b) Accompany the work with a written offer, valid for at
  least three years, to give the same user the materials
  specified in Subsection 6a, above, for a charge no more
  than the cost of performing this distribution.

  c) If distribution of the work is made by offering access to copy
  from a designated place, offer equivalent access to copy the above

specified materials from the same place.

    d) Verify that the user has already received a copy of these
    materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the
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reproducing the executable from it. However, as a special exception,
the source code distributed need not include anything that is normally
distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

 It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

 7. You may place library facilities that are a work based on the
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library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
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school, if any, to sign a "copyright disclaimer" for the library, if
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 library `Frob' (a library for tweaking knobs) written by James Random Hacker.

 <signature of Ty Coon>, 1 April 1990
 Ty Coon, President of Vice

That's all there is to it!

1.125 less 1

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@end smallexample

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@c Local Variables:
@c ispell-local-pdict: "ispell-dict"
@c End:

1.128 minicom 2.3

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  ====================

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1.129 zlib 1.2.8

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 version 1.2.11, January 15th, 2017

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table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
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 Otherwise, if the work is a derivative of the Library, you may
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1.138 net-tools 1.60

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1.140 beecrypt 7.0.0

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I would like to thank the following people (in alphabetical order):

- Seth Arnold, for contributing to the documentation.
- Daniel Black, (former) maintainer of the Gentoo GNU/Linux BeeCrypt package.
- Jan-Rudolph Bhrmann, for helping me get started on the 64-bit multi-
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Debian GNU/Linux.
- Jon Sturgeon, bug hunter extraordinaire.

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- FSF France, for providing me with access to the GCC Compile Farm.
- SourceForge, for their excellent open source development platform.

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reported bugs, provided feedback, or works on including BeeCrypt in any
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If I've missed anyone, it's due to oversight. Drop me a line and I'll
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1.143 python 3.5.1

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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
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Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

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Thanks to the many outside volunteers who have worked under Guido's
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1.146 libconfig 1.4.6

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  (For example, a function in a library to compute square roots has
  a purpose that is entirely well-defined independent of the
  application. Therefore, Subsection 2d requires that any
  application-supplied function or table used by this function must
  be optional: if the application does not supply it, the square
  root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
identifiable sections of that work are not derived from the Library,
and can be reasonably considered independent and separate works in
themselves, then this License, and its terms, do not apply to those
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on the Library, the distribution of the whole must be on the terms of
this License, whose permissions for other licensees extend to the
entire whole, and thus to each and every part regardless of who wrote
it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
collective works based on the Library.

In addition, mere aggregation of another work not based on the Library
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 3. You may opt to apply the terms of the ordinary GNU General Public
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 This option is useful when you wish to copy part of the code of
the Library into a program that is not a library.

 4. You may copy and distribute the Library (or a portion or
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under the terms of Sections 1 and 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be

linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also combine or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
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Library is used in it and that the Library and its use are covered by
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  a) Accompany the work with the complete corresponding
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  changes were used in the work (which must be distributed under
  Sections 1 and 2 above); and, if the work is an executable linked
  with the Library, with the complete machine-readable "work that
  uses the Library", as object code and/or source code, so that the
  user can modify the Library and then relink to produce a modified
  executable containing the modified Library. (It is understood
  that the user who changes the contents of definitions files in the
  Library will not necessarily be able to recompile the application
  to use the modified definitions.)

  b) Use a suitable shared library mechanism for linking with the
  Library. A suitable mechanism is one that (1) uses at run time a
  copy of the library already present on the user's computer system,
  rather than copying library functions into the executable, and (2)
  will operate properly with a modified version of the library, if
  the user installs one, as long as the modified version is

interface-compatible with the version that the work was made with.

  c) Accompany the work with a written offer, valid for at
  least three years, to give the same user the materials
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  than the cost of performing this distribution.

  d) If distribution of the work is made by offering access to copy
  from a designated place, offer equivalent access to copy the above
  specified materials from the same place.

  e) Verify that the user has already received a copy of these
  materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
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the materials to be distributed need not include anything that is
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which the executable runs, unless that component itself accompanies
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 We call this license the "Lesser" General Public License because it
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 For example, on rare occasions, there may be a special need to
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software only, so we use the Lesser General Public License.

 In other cases, permission to use a particular library in non-free
programs enables a greater number of people to use a large body of
free software. For example, permission to use the GNU C Library in
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  its purpose remains meaningful.

  (For example, a function in a library to compute square roots has
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  application. Therefore, Subsection 2d requires that any
  application-supplied function or table used by this function must
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  root function must still compute square roots.)

These requirements apply to the modified work as a whole. If
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 However, linking a "work that uses the Library" with the Library
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Whether this is true is especially significant if the work can be
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 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline

functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
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uses the Library", as object code and/or source code, so that the
user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the
Library. A suitable mechanism is one that (1) uses at run time a
copy of the library already present on the user's computer system,
rather than copying library functions into the executable, and (2)
will operate properly with a modified version of the library, if
the user installs one, as long as the modified version is
interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least
three years, to give the same user the materials specified in
Subsection 6a, above, for a charge no more than the cost of

performing this distribution.

d) If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
specified materials from the same place.

e) Verify that the user has already received a copy of these
materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the materials to be distributed need not include anything that is
normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

7. You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library
facilities not covered by this License, and distribute such a combined
library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work
based on the Library, uncombined with any other library
facilities. This must be distributed under the terms of the
Sections above.

b) Give prominent notice with the combined library of the fact
that part of it is a work based on the Library, and explaining
where to find the accompanying uncombined form of the same work.

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 library `Frob' (a library for tweaking knobs) written by James

Random Hacker.

<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

That's all there is to it!
@c \input texinfo.tex   @c -*-texinfo-*-
@c
@c %**start of header

@c All text is ignored before the setfilename.
@setfilename LGPL.info

@center GNU LESSER GENERAL PUBLIC LICENSE
@center Version 2.1, February 1999

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@center Preamble
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Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

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library.

We call this license the ``Lesser'' General Public License because it does
Less to protect the user's freedom than the ordinary General Public
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In other cases, permission to use a particular library in non-free
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Although the Lesser General Public License is Less protective of the
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``work based on the library'' and a ``work that uses the library''. The
former contains code derived from the library, whereas the latter must
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@page

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it). Whether that is true depends on what the Library does and what the
program that uses the Library does.

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@enumerate a

@item
The modified work must itself be a software library.

@sp 1
@item
You must cause the files modified to carry prominent notices stating
that you changed the files and the date of any change.

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You must cause the whole of the work to be licensed at no charge to all
third parties under the terms of this License.

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If a facility in the modified Library refers to a function or a table of
data to be supplied by an application program that uses the facility,
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must make a good faith effort to ensure that, in the event an
application does not supply such function or table, the facility still
operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a
purpose that is entirely well-defined independent of the application.
Therefore, Subsection 2d requires that any application-supplied function
or table used by this function must be optional: if the application does
not supply it, the square root function must still compute square
roots.)

@end enumerate

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identifiable sections of that work are not derived from the Library, and
can be reasonably considered independent and separate works in
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distribute the same sections as part of a whole which is a work based on
the Library, the distribution of the whole must be on the terms of this
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whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest
your rights to work written entirely by you; rather, the intent is to
exercise the right to control the distribution of derivative or
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Once this change is made in a given copy, it is irreversible for that
copy, so the ordinary GNU General Public License applies to all
subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the
Library into a program that is not a library.

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You may copy and distribute the Library (or a portion or derivative of
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of Sections 1 and 2 above provided that you accompany it with the
complete corresponding machine-readable source code, which must be
distributed under the terms of Sections 1 and 2 above on a medium
customarily used for software interchange.

If distribution of object code is made by offering access to copy from a
designated place, then offering equivalent access to copy the source
code from the same place satisfies the requirement to distribute the
source code, even though third parties are not compelled to copy the
source along with the object code.

@sp 1
@item
A program that contains no derivative of any portion of the Library, but
is designed to work with the Library by being compiled or linked with
it, is called a ``work that uses the Library''. Such a work, in
isolation, is not a derivative work of the Library, and therefore falls
outside the scope of this License.

However, linking a ``work that uses the Library'' with the Library creates
an executable that is a derivative of the Library (because it contains
portions of the Library), rather than a ``work that uses the library''.

The executable is therefore covered by this License. Section 6 states
terms for distribution of such executables.

When a ``work that uses the Library'' uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be linked
without the Library, or if the work is itself a library. The threshold
for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure
layouts and accessors, and small macros and small inline functions (ten
lines or less in length), then the use of the object file is
unrestricted, regardless of whether it is legally a derivative work.
(Executables containing this object code plus portions of the Library
will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6, whether
or not they are linked directly with the Library itself.

@sp 1
@item
As an exception to the Sections above, you may also combine or link a
``work that uses the Library'' with the Library to produce a work
containing portions of the Library, and distribute that work under terms
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for the customer's own use and reverse engineering for debugging such
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You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
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during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

@enumerate a

@sp 1
@item
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source code for the Library including whatever changes were used in the
work (which must be distributed under Sections 1 and 2 above); and, if
the work is an executable linked with the Library, with the complete
machine-readable ``work that uses the Library'', as object code and/or

source code, so that the user can modify the Library and then relink to
produce a modified executable containing the modified Library. (It is
understood that the user who changes the contents of definitions files
in the Library will not necessarily be able to recompile the application
to use the modified definitions.)

@sp 1
@item
Use a suitable shared library mechanism for linking with the Library. A
suitable mechanism is one that (1) uses at run time a copy of the
library already present on the user's computer system, rather than
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properly with a modified version of the library, if the user installs
one, as long as the modified version is interface-compatible with the
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Accompany the work with a written offer, valid for at least three years,
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@sp 1
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Verify that the user has already received a copy of these materials or
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For an executable, the required form of the ``work that uses the Library''
must include any data and utility programs needed for reproducing the
executable from it. However, as a special exception, the materials to
be distributed need not include anything that is normally distributed
(in either source or binary form) with the major components (compiler,
kernel, and so on) of the operating system on which the executable runs,
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It may happen that this requirement contradicts the license restrictions
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@enumerate a

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Accompany the combined library with a copy of the same work based on the
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@sp 1
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Give prominent notice with the combined library of the fact that part of
it is a work based on the Library, and explaining where to find the
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@sp 1
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@sp 1
@page
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