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1.3 glibc 2.3.1-51a_8

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1.6 libjpeg 6b

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README for release 6b of 27-Mar-1998

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Serious users of this software (particularly those incorporating it into larger programs) should contact IJG at jpeg-info@uunet.uu.net to be added to our electronic mailing list. Mailing list members are notified of updates and have a chance to participate in technical discussions, etc.

This software is the work of Tom Lane, Philip Gladstone, Jim Boucher, Lee Crocker, Julian Minguillon, Luis Ortiz, George Phillips, Davide Rossi, Guido Vollbeding, Ge' Weijers, and other members of the Independent JPEG Group.

IJG is not affiliated with the official ISO JPEG standards committee.

DOCUMENTATION ROADMAP

This file contains the following sections:

OVERVIEW General description of JPEG and the IJG software.

LEGAL ISSUES Copyright, lack of warranty, terms of distribution.

REFERENCES Where to learn more about JPEG.

ARCHIVE LOCATIONS Where to find newer versions of this software.

RELATED SOFTWARE Other stuff you should get.

FILE FORMAT WARS Software *not* to get.

TO DO Plans for future IJG releases.

Other documentation files in the distribution are:

User documentation:

install.doc How to configure and install the IJG software.

usage.doc Usage instructions for cjpeg, djpeg, jpegtran,

rdjpgcom, and wrjpgcom.

*.1 Unix-style man pages for programs (same info as usage.doc).

wizard.doc Advanced usage instructions for JPEG wizards only.

change.log Version-to-version change highlights.

Programmer and internal documentation:

libjpeg.doc How to use the JPEG library in your own programs.

example.c Sample code for calling the JPEG library.

structure.doc Overview of the JPEG library's internal structure.

filelist.doc Road map of IJG files.

coderules.doc Coding style rules --- please read if you contribute code.

Please read at least the files install.doc and usage.doc. Useful information can also be found in the JPEG FAQ (Frequently Asked Questions) article. See

ARCHIVE LOCATIONS below to find out where to obtain the FAQ article.

If you want to understand how the JPEG code works, we suggest reading one or more of the REFERENCES, then looking at the documentation files (in roughly the order listed) before diving into the code.

OVERVIEW

This package contains C software to implement JPEG image compression and decompression. JPEG (pronounced "jay-peg") is a standardized compression method for full-color and gray-scale images. JPEG is intended for compressing "real-world" scenes; line drawings, cartoons and other non-realistic images are not its strong suit. JPEG is lossy, meaning that the output image is not exactly identical to the input image. Hence you must not use JPEG if you have to have identical output bits. However, on typical photographic images, very good compression levels can be obtained with no visible change, and remarkably high compression levels are possible if you can tolerate a low-quality image. For more details, see the references, or just experiment with various compression settings.

This software implements JPEG baseline, extended-sequential, and progressive compression processes. Provision is made for supporting all variants of these processes, although some uncommon parameter settings aren't implemented yet. For legal reasons, we are not distributing code for the arithmetic-coding variants of JPEG; see LEGAL ISSUES. We have made no provision for supporting the hierarchical or lossless processes defined in the standard.

We provide a set of library routines for reading and writing JPEG image files, plus two sample applications "cjpeg" and "djpeg", which use the library to perform conversion between JPEG and some other popular image file formats. The library is intended to be reused in other applications.

In order to support file conversion and viewing software, we have included considerable functionality beyond the bare JPEG coding/decoding capability; for example, the color quantization modules are not strictly part of JPEG decoding, but they are essential for output to colormapped file formats or colormapped displays. These extra functions can be compiled out of the library if not required for a particular application. We have also included "jpegtran", a utility for lossless transcoding between different JPEG processes, and "rdjpgcom" and "wrjpgcom", two simple applications for inserting and extracting textual comments in JFIF files.

The emphasis in designing this software has been on achieving portability and flexibility, while also making it fast enough to be useful. In particular, the software is not intended to be read as a tutorial on JPEG. (See the REFERENCES section for introductory material.) Rather, it is intended to

be reliable, portable, industrial-strength code. We do not claim to have achieved that goal in every aspect of the software, but we strive for it.

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The Unix configuration script "configure" was produced with GNU Autoconf. It is copyright by the Free Software Foundation but is freely distributable. The same holds for its supporting scripts (config.guess, config.sub, ltconfig, ltmain.sh). Another support script, install-sh, is copyright by M.I.T. but is also freely distributable.

It appears that the arithmetic coding option of the JPEG spec is covered by patents owned by IBM, AT&T, and Mitsubishi. Hence arithmetic coding cannot legally be used without obtaining one or more licenses. For this reason, support for arithmetic coding has been removed from the free JPEG software. (Since arithmetic coding provides only a marginal gain over the unpatented Huffman mode, it is unlikely that very many implementations will support it.) So far as we are aware, there are no patent restrictions on the remaining code.

The IJG distribution formerly included code to read and write GIF files. To avoid entanglement with the Unisys LZW patent, GIF reading support has been removed altogether, and the GIF writer has been simplified to produce "uncompressed GIFs". This technique does not use the LZW algorithm; the resulting GIF files are larger than usual, but are readable by all standard GIF decoders.

We are required to state that

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REFERENCES

We highly recommend reading one or more of these references before trying to understand the innards of the JPEG software.

The best short technical introduction to the JPEG compression algorithm is Wallace, Gregory K. "The JPEG Still Picture Compression Standard", Communications of the ACM, April 1991 (vol. 34 no. 4), pp. 30-44. (Adjacent articles in that issue discuss MPEG motion picture compression, applications of JPEG, and related topics.) If you don't have the CACM issue handy, a PostScript file containing a revised version of Wallace's article is available at ftp://ftp.uu.net/graphics/jpeg/wallace.ps.gz. The file (actually a preprint for an article that appeared in IEEE Trans. Consumer Electronics) omits the sample images that appeared in CACM, but it includes corrections and some added material. Note: the Wallace article is copyright ACM and IEEE, and it may not be used for commercial purposes.

A somewhat less technical, more leisurely introduction to JPEG can be found in "The Data Compression Book" by Mark Nelson and Jean-loup Gailly, published by M&T Books (New York), 2nd ed. 1996, ISBN 1-55851-434-1. This book provides good explanations and example C code for a multitude of compression methods including JPEG. It is an excellent source if you are comfortable reading C code but don't know much about data compression in general. The book's JPEG sample code is far from industrial-strength, but when you are ready to look at a full implementation, you've got one here...

The best full description of JPEG is the textbook "JPEG Still Image Data Compression Standard" by William B. Pennebaker and Joan L. Mitchell, published by Van Nostrand Reinhold, 1993, ISBN 0-442-01272-1. Price US\$59.95, 638 pp. The book includes the complete text of the ISO JPEG standards (DIS 10918-1 and draft DIS 10918-2). This is by far the most complete exposition of JPEG in existence, and we highly recommend it.

The JPEG standard itself is not available electronically; you must order a paper copy through ISO or ITU. (Unless you feel a need to own a certified official copy, we recommend buying the Pennebaker and Mitchell book instead; it's much cheaper and includes a great deal of useful explanatory material.) In the USA, copies of the standard may be ordered from ANSI Sales at (212) 642-4900, or from Global Engineering Documents at (800) 854-7179. (ANSI doesn't take credit card orders, but Global does.) It's not cheap: as of 1992, ANSI was charging \$95 for Part 1 and \$47 for Part 2, plus 7% shipping/handling. The standard is divided into two parts, Part 1 being the actual specification, while Part 2 covers compliance testing methods. Part 1 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 1: Requirements and guidelines" and has document numbers ISO/IEC IS 10918-1, ITU-T T.81. Part 2 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 2: Compliance testing" and has document numbers ISO/IEC IS 10918-2, ITU-T T.83.

Some extensions to the original JPEG standard are defined in JPEG Part 3, a newer ISO standard numbered ISO/IEC IS 10918-3 and ITU-T T.84. IJG currently does not support any Part 3 extensions.

The JPEG standard does not specify all details of an interchangeable file format. For the omitted details we follow the "JFIF" conventions, revision 1.02. A copy of the JFIF spec is available from:

Literature Department

C-Cube Microsystems, Inc.

1778 McCarthy Blvd.

Milpitas, CA 95035

phone (408) 944-6300, fax (408) 944-6314

A PostScript version of this document is available by FTP at ftp://ftp.uu.net/graphics/jpeg/jfif.ps.gz. There is also a plain text version at ftp://ftp.uu.net/graphics/jpeg/jfif.txt.gz, but it is missing the figures.

The TIFF 6.0 file format specification can be obtained by FTP from ftp://ftp.sgi.com/graphics/tiff/TIFF6.ps.gz. The JPEG incorporation scheme found in the TIFF 6.0 spec of 3-June-92 has a number of serious problems. IJG does not recommend use of the TIFF 6.0 design (TIFF Compression tag 6). Instead, we recommend the JPEG design proposed by TIFF Technical Note #2 (Compression tag 7). Copies of this Note can be obtained from ftp.sgi.com or from ftp://ftp.uu.net/graphics/jpeg/. It is expected that the next revision of the TIFF spec will replace the 6.0 JPEG design with the Note's design. Although IJG's own code does not support TIFF/JPEG, the free libtiff library uses our library to implement TIFF/JPEG per the Note. libtiff is available from ftp://ftp.sgi.com/graphics/tiff/.

ARCHIVE LOCATIONS

The "official" archive site for this software is ftp.uu.net (Internet address 192.48.96.9). The most recent released version can always be found there in directory graphics/jpeg. This particular version will be archived as ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz. If you don't have direct Internet access, UUNET's archives are also available via UUCP; contact help@uunet.uu.net for information on retrieving files that way.

Numerous Internet sites maintain copies of the UUNET files. However, only ftp.uu.net is guaranteed to have the latest official version.

You can also obtain this software in DOS-compatible "zip" archive format from the SimTel archives (ftp://ftp.simtel.net/pub/simtelnet/msdos/graphics/), or on CompuServe in the Graphics Support forum (GO CIS:GRAPHSUP), library 12 "JPEG Tools". Again, these versions may sometimes lag behind the ftp.uu.net

release.

The JPEG FAQ (Frequently Asked Questions) article is a useful source of general information about JPEG. It is updated constantly and therefore is not included in this distribution. The FAQ is posted every two weeks to Usenet newsgroups comp.graphics.misc, news.answers, and other groups. It is available on the World Wide Web at http://www.faqs.org/faqs/jpeg-faq/ and other news.answers archive sites, including the official news.answers archive at rtfm.mit.edu: ftp://rtfm.mit.edu/pub/usenet/news.answers/jpeg-faq/. If you don't have Web or FTP access, send e-mail to mail-server@rtfm.mit.edu with body send usenet/news.answers/jpeg-faq/part1

send usenet/news.answers/jpeg-faq/part2

RELATED SOFTWARE

Numerous viewing and image manipulation programs now support JPEG. (Quite a few of them use this library to do so.) The JPEG FAQ described above lists some of the more popular free and shareware viewers, and tells where to obtain them on Internet.

If you are on a Unix machine, we highly recommend Jef Poskanzer's free PBMPLUS software, which provides many useful operations on PPM-format image files. In particular, it can convert PPM images to and from a wide range of other formats, thus making cjpeg/djpeg considerably more useful. The latest version is distributed by the NetPBM group, and is available from numerous sites, notably ftp://wuarchive.wustl.edu/graphics/graphics/packages/NetPBM/. Unfortunately PBMPLUS/NETPBM is not nearly as portable as the IJG software is; you are likely to have difficulty making it work on any non-Unix machine.

A different free JPEG implementation, written by the PVRG group at Stanford, is available from ftp://havefun.stanford.edu/pub/jpeg/. This program is designed for research and experimentation rather than production use; it is slower, harder to use, and less portable than the IJG code, but it is easier to read and modify. Also, the PVRG code supports lossless JPEG, which we do not. (On the other hand, it doesn't do progressive JPEG.)

FILE FORMAT WARS

Some JPEG programs produce files that are not compatible with our library. The root of the problem is that the ISO JPEG committee failed to specify a concrete file format. Some vendors "filled in the blanks" on their own, creating proprietary formats that no one else could read. (For example, none of the early commercial JPEG implementations for the Macintosh were able to exchange compressed files.)

The file format we have adopted is called JFIF (see REFERENCES). This format has been agreed to by a number of major commercial JPEG vendors, and it has become the de facto standard. JFIF is a minimal or "low end" representation. We recommend the use of TIFF/JPEG (TIFF revision 6.0 as modified by TIFF Technical Note #2) for "high end" applications that need to record a lot of additional data about an image. TIFF/JPEG is fairly new and not yet widely supported, unfortunately.

The upcoming JPEG Part 3 standard defines a file format called SPIFF. SPIFF is interoperable with JFIF, in the sense that most JFIF decoders should be able to read the most common variant of SPIFF. SPIFF has some technical advantages over JFIF, but its major claim to fame is simply that it is an official standard rather than an informal one. At this point it is unclear whether SPIFF will supersede JFIF or whether JFIF will remain the de-facto standard. IJG intends to support SPIFF once the standard is frozen, but we have not decided whether it should become our default output format or not. (In any case, our decoder will remain capable of reading JFIF indefinitely.)

Various proprietary file formats incorporating JPEG compression also exist. We have little or no sympathy for the existence of these formats. Indeed, one of the original reasons for developing this free software was to help force convergence on common, open format standards for JPEG files. Don't use a proprietary file format!

TO DO

=====

The major thrust for v7 will probably be improvement of visual quality. The current method for scaling the quantization tables is known not to be very good at low Q values. We also intend to investigate block boundary smoothing, "poor man's variable quantization", and other means of improving quality-vs-file-size performance without sacrificing compatibility.

In future versions, we are considering supporting some of the upcoming JPEG Part 3 extensions --- principally, variable quantization and the SPIFF file format.

As always, speeding things up is of great interest.

Please send bug reports, offers of help, etc. to jpeg-info@uunet.uu.net.

1.7 libmad 0.15.1b

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Version 2, June 1991

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1.9 libxml2 2.7.7

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XML toolkit from the GNOME project

Full documentation is available on-line at http://xmlsoft.org/

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To build on an Unixised setup:

./configure; make; make install

To build on Windows:

see instructions on win32/Readme.txt

To assert build quality:

on an Unixised setup:

run make tests

otherwise:

There is 3 standalone tools runtest.c runsuite.c testapi.c, which should compile as part of the build or as any application would. Launch them from this directory to get results, runtest checks the proper functionning of libxml2 main APIs while testapi does a full coverage check. Report failures to the list.

To report bugs, follow the instructions at:

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A mailing-list xml@gnome.org is available, to subscribe:

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1.10 LINUX Kernel 2.6.16.16-88w8xx8

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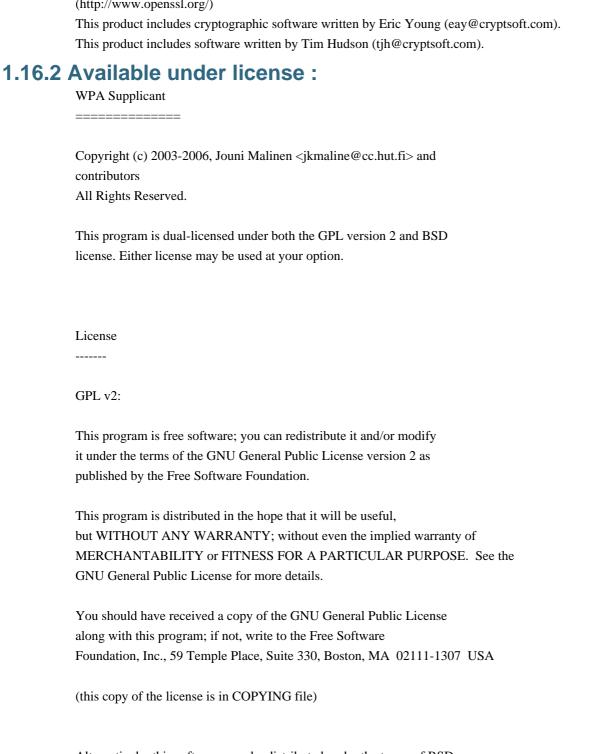
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1.16 mrvl_wpasupplicant 0.4.9

1.16.1 Notifications:

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Features

Supported WPA/IEEE 802.11i features:

- WPA-PSK ("WPA-Personal")
- WPA with EAP (e.g., with RADIUS authentication server) ("WPA-Enterprise") Following authentication methods are supported with an integrate IEEE 802.1X Supplicant:
- * EAP-TLS
- * EAP-PEAP/MSCHAPv2 (both PEAPv0 and PEAPv1)
- * EAP-PEAP/TLS (both PEAPv0 and PEAPv1)
- * EAP-PEAP/GTC (both PEAPv0 and PEAPv1)
- * EAP-PEAP/OTP (both PEAPv0 and PEAPv1)
- * EAP-PEAP/MD5-Challenge (both PEAPv0 and PEAPv1)
- * EAP-TTLS/EAP-MD5-Challenge
- * EAP-TTLS/EAP-GTC
- * EAP-TTLS/EAP-OTP
- * EAP-TTLS/EAP-MSCHAPv2
- * EAP-TTLS/EAP-TLS
- * EAP-TTLS/MSCHAPv2
- * EAP-TTLS/MSCHAP

- * EAP-TTLS/PAP
- * EAP-TTLS/CHAP
- * EAP-SIM
- * EAP-AKA
- * EAP-PSK
- * EAP-PAX
- * LEAP (note: requires special support from the driver for IEEE 802.11 authentication)

(following methods are supported, but since they do not generate keying material, they cannot be used with WPA or IEEE 802.1X WEP keying)

- * EAP-MD5-Challenge
- * EAP-MSCHAPv2
- * EAP-GTC
- * EAP-OTP
- key management for CCMP, TKIP, WEP104, WEP40
- RSN/WPA2 (IEEE 802.11i)
- * pre-authentication
- * PMKSA caching

Requirements

Current hardware/software requirements:

- Linux kernel 2.4.x or 2.6.x with Linux Wireless Extensions v15 or newer
- FreeBSD 6-CURRENT
- NetBSD-current
- Microsoft Windows with WinPcap (at least WinXP, may work with other versions)
- drivers

Host AP driver for Prism2/2.5/3 (development snapshot/v0.2.x)

(http://hostap.epitest.fi/)

Driver need to be set in Managed mode ('iwconfig wlan0 mode managed').

Please note that station firmware version needs to be 1.7.0 or newer to work in WPA mode.

Linuxant DriverLoader (http://www.linuxant.com/driverloader/) with Windows NDIS driver for your wlan card supporting WPA.

Agere Systems Inc. Linux Driver

(http://www.agere.com/support/drivers/)

Please note that the driver interface file (driver_hermes.c) and

hardware specific include files are not included in the

wpa_supplicant distribution. You will need to copy these from the source package of the Agere driver.

madwifi driver for cards based on Atheros chip set (ar521x) (http://sourceforge.net/projects/madwifi/)

Please note that you will need to modify the wpa_supplicant .config file to use the correct path for the madwifi driver root directory (CFLAGS += -I../madwifi/wpa line in example defconfig).

ATMEL AT76C5XXx driver for USB and PCMCIA cards (http://atmelwlandriver.sourceforge.net/).

Linux ndiswrapper (http://ndiswrapper.sourceforge.net/) with Windows NDIS driver.

Broadcom wl.o driver

This is a generic Linux driver for Broadcom IEEE 802.11a/g cards. However, it is proprietary driver that is not publicly available except for couple of exceptions, mainly Broadcom-based APs/wireless routers that use Linux. The driver binary can be downloaded, e.g., from Linksys support site (http://www.linksys.com/support/gpl.asp) for Linksys WRT54G. The GPL tarball includes cross-compiler and the needed header file, wlioctl.h, for compiling wpa_supplicant. This driver support in wpa_supplicant is expected to work also with other devices based on Broadcom driver (assuming the driver includes client mode support).

Intel ipw2100 driver (http://sourceforge.net/projects/ipw2100/)

Intel ipw2200 driver (http://sourceforge.net/projects/ipw2200/)

In theory, any driver that supports Linux wireless extensions can be used with IEEE 802.1X (i.e., not WPA) when using ap_scan=0 option in configuration file.

Wired Ethernet drivers (with ap_scan=0)

BSD net80211 layer (e.g., Atheros driver)
At the moment, this is for FreeBSD 6-CURRENT branch and NetBSD-current.

Windows NDIS

The current Windows port requires WinPcap (http://winpcap.polito.it/). See README-Windows.txt for more information.

wpa_supplicant was designed to be portable for different drivers and operating systems. Hopefully, support for more wlan cards and OSes will be added in the future. See developer's documentation (http://hostap.epitest.fi/wpa_supplicant/devel/) for more information about the design of wpa_supplicant and porting to other drivers. One main goal is to add full WPA/WPA2 support to Linux wireless extensions to allow new drivers to be supported without having to implement new

driver-specific interface code in wpa_supplicant.

Optional libraries for layer2 packet processing:

 libpcap (tested with 0.7.2, most relatively recent versions assumed to work, this is likely to be available with most distributions, http://tcpdump.org/)

 libdnet (tested with v1.4, most versions assumed to work, http://libdnet.sourceforge.net/)

These libraries are _not_ used in the default Linux build. Instead, internal Linux specific implementation is used. libpcap/libdnet are more portable and they can be used by adding CONFIG_DNET_PCAP=y into .config. They may also be selected automatically for other operating systems.

Optional libraries for EAP-TLS, EAP-PEAP, and EAP-TTLS:

- openssl (tested with 0.9.7c and 0.9.7d, assumed to work with most relatively recent versions; this is likely to be available with most distributions, http://www.openssl.org/)

This library is only needed when EAP-TLS, EAP-PEAP, or EAP-TTLS support is enabled. WPA-PSK mode does not require this or EAPOL/EAP implementation. A configuration file, .config, for compilation is needed to enable IEEE 802.1X/EAPOL and EAP methods. Note that EAP-MD5, EAP-GTC, EAP-OTP, and EAP-MSCHAPV2 cannot be used alone with WPA, so they should only be enabled if testing the EAPOL/EAP state machines. However, there can be used as inner authentication algorithms with EAP-PEAP and EAP-TTLS.

See Building and installing section below for more detailed information about the wpa_supplicant build time configuration.

WPA

The original security mechanism of IEEE 802.11 standard was not designed to be strong and has proven to be insufficient for most networks that require some kind of security. Task group I (Security) of IEEE 802.11 working group (http://www.ieee802.org/11/) has worked to address the flaws of the base standard and has in practice completed its work in May 2004. The IEEE 802.11i amendment to the IEEE 802.11 standard was approved in June 2004 and published in July 2004.

Wi-Fi Alliance (http://www.wi-fi.org/) used a draft version of the IEEE 802.11i work (draft 3.0) to define a subset of the security

enhancements that can be implemented with existing wlan hardware. This is called Wi-Fi Protected Access<TM> (WPA). This has now become a mandatory component of interoperability testing and certification done by Wi-Fi Alliance. Wi-Fi provides information about WPA at its web site (http://www.wi-fi.org/OpenSection/protected_access.asp).

IEEE 802.11 standard defined wired equivalent privacy (WEP) algorithm for protecting wireless networks. WEP uses RC4 with 40-bit keys, 24-bit initialization vector (IV), and CRC32 to protect against packet forgery. All these choices have proven to be insufficient: key space is too small against current attacks, RC4 key scheduling is insufficient (beginning of the pseudorandom stream should be skipped), IV space is too small and IV reuse makes attacks easier, there is no replay protection, and non-keyed authentication does not protect against bit flipping packet data.

WPA is an intermediate solution for the security issues. It uses Temporal Key Integrity Protocol (TKIP) to replace WEP. TKIP is a compromise on strong security and possibility to use existing hardware. It still uses RC4 for the encryption like WEP, but with per-packet RC4 keys. In addition, it implements replay protection, keyed packet authentication mechanism (Michael MIC).

Keys can be managed using two different mechanisms. WPA can either use an external authentication server (e.g., RADIUS) and EAP just like IEEE 802.1X is using or pre-shared keys without need for additional servers. Wi-Fi calls these "WPA-Enterprise" and "WPA-Personal", respectively. Both mechanisms will generate a master session key for the Authenticator (AP) and Supplicant (client station).

WPA implements a new key handshake (4-Way Handshake and Group Key Handshake) for generating and exchanging data encryption keys between the Authenticator and Supplicant. This handshake is also used to verify that both Authenticator and Supplicant know the master session key. These handshakes are identical regardless of the selected key management mechanism (only the method for generating master session key changes).

IEEE 802.11i / WPA2

The design for parts of IEEE 802.11i that were not included in WPA has finished (May 2004) and this amendment to IEEE 802.11 was approved in June 2004. Wi-Fi Alliance is using the final IEEE 802.11i as a new version of WPA called WPA2. This includes, e.g., support for more robust encryption algorithm (CCMP: AES in Counter mode with CBC-MAC)

to replace TKIP and optimizations for handoff (reduced number of messages in initial key handshake, pre-authentication, and PMKSA caching).

wpa_supplicant

wpa_supplicant is an implementation of the WPA Supplicant component, i.e., the part that runs in the client stations. It implements WPA key negotiation with a WPA Authenticator and EAP authentication with Authentication Server. In addition, it controls the roaming and IEEE 802.11 authentication/association of the wlan driver.

wpa_supplicant is designed to be a "daemon" program that runs in the background and acts as the backend component controlling the wireless connection. wpa_supplicant supports separate frontend programs and an example text-based frontend, wpa_cli, is included with wpa_supplicant.

Following steps are used when associating with an AP using WPA:

- wpa_supplicant requests the kernel driver to scan neighboring BSSes
- wpa_supplicant selects a BSS based on its configuration
- wpa_supplicant requests the kernel driver to associate with the chosen BSS
- If WPA-EAP: integrated IEEE 802.1X Supplicant completes EAP authentication with the authentication server (proxied by the Authenticator in the AP)
- If WPA-EAP: master key is received from the IEEE 802.1X Supplicant
- If WPA-PSK: wpa_supplicant uses PSK as the master session key
- wpa_supplicant completes WPA 4-Way Handshake and Group Key Handshake with the Authenticator (AP)
- wpa_supplicant configures encryption keys for unicast and broadcast
- normal data packets can be transmitted and received

Building and installing

In order to be able to build wpa_supplicant, you will first need to select which parts of it will be included. This is done by creating a build time configuration file, .config, in the wpa_supplicant root directory. Configuration options are text lines using following format: CONFIG_<option>=y. Lines starting with # are considered comments and are ignored. See defconfig file for example configuration and list of available option.

The build time configuration can be used to select only the needed features and limit the binary size and requirements for external libraries. The main configuration parts are the selection of which driver interfaces (e.g., hostap, madwifi, ..) and which authentication methods (e.g., EAP-TLS, EAP-PEAP, ..) are included.

Following build time configuration options are used to control IEEE 802.1X/EAPOL and EAP state machines and all EAP methods. Including TLS, PEAP, or TTLS will require linking wpa_supplicant with openssl library for TLS implementation.

```
CONFIG_IEEE8021X_EAPOL=y
CONFIG_EAP_MD5=y
CONFIG_EAP_MSCHAPV2=y
CONFIG_EAP_TLS=y
CONFIG_EAP_TTLS=y
CONFIG_EAP_TTLS=y
CONFIG_EAP_GTC=y
CONFIG_EAP_OTP=y
CONFIG_EAP_SIM=y
CONFIG_EAP_AKA=y
CONFIG_EAP_PSK=y
CONFIG_EAP_PAX=y
CONFIG_EAP_LEAP=y
```

Following option can be used to include GSM SIM/USIM interface for GSM/UMTS authentication algorithm (for EAP-SIM/EAP-AKA). This requires pcsc-lite (http://www.linuxnet.com/) for smart card access.

CONFIG_PCSC=y

Following option can be used to replace the native Linux packet socket interface with libpcap/libdnet.

CONFIG_DNET_PCAP=y

Following options can be added to .config to select which driver interfaces are included. Hermes driver interface needs to be downloaded from Agere (see above). CONFIG_WIRELESS_EXTENSION will be used automatically if any of the selected drivers need it.

```
CONFIG_WIRELESS_EXTENSION=y
CONFIG_DRIVER_HOSTAP=y
CONFIG_DRIVER_HERMES=y
CONFIG_DRIVER_MADWIFI=y
CONFIG_DRIVER_ATMEL=y
CONFIG_DRIVER_WEXT=y
CONFIG_DRIVER_NDISWRAPPER=y
```

```
CONFIG_DRIVER_BROADCOM=y
CONFIG_DRIVER_IPW=y
CONFIG_DRIVER_BSD=y
CONFIG_DRIVER_NDIS=y
```

Following example includes all features and driver interfaces that are included in the wpa_supplicant package:

```
CONFIG_DRIVER_HOSTAP=y
CONFIG DRIVER HERMES=y
CONFIG_DRIVER_MADWIFI=y
CONFIG_DRIVER_ATMEL=y
CONFIG_DRIVER_WEXT=y
CONFIG_DRIVER_NDISWRAPPER=y
CONFIG_DRIVER_BROADCOM=y
CONFIG_DRIVER_IPW=y
CONFIG_DRIVER_BSD=y
CONFIG DRIVER NDIS=y
CONFIG_WIRELESS_EXTENSION=y
CONFIG_IEEE8021X_EAPOL=y
CONFIG EAP MD5=y
CONFIG_EAP_MSCHAPV2=y
CONFIG_EAP_TLS=y
CONFIG EAP PEAP=y
CONFIG_EAP_TTLS=y
CONFIG_EAP_GTC=y
CONFIG_EAP_OTP=y
CONFIG_EAP_SIM=y
CONFIG_EAP_AKA=y
CONFIG_EAP_PSK=y
CONFIG_EAP_PAX=y
CONFIG_EAP_LEAP=y
```

EAP-PEAP and EAP-TTLS will automatically include configured EAP methods (MD5, OTP, GTC, MSCHAPV2) for inner authentication selection.

After you have created a configuration file, you can build wpa_supplicant and wpa_cli with 'make' command. You may then install the binaries to a suitable system directory, e.g., /usr/local/bin.

Example commands:

CONFIG_PCSC=y

```
# build wpa_supplicant and wpa_cli
make# install binaries (this may need root privileges)cp wpa_cli wpa_supplicant /usr/local/bin
```

You will need to make a configuration file, e.g., /etc/wpa_supplicant.conf, with network configuration for the networks you are going to use. Configuration file section below includes explanation fo the configuration file format and includes various examples. Once the configuration is ready, you can test whether the configuration work by first running wpa_supplicant with following command to start it on foreground with debugging enabled:

wpa_supplicant -iwlan0 -c/etc/wpa_supplicant.conf -d

Assuming everything goes fine, you can start using following command to start wpa_supplicant on background without debugging:

wpa_supplicant -iwlan0 -c/etc/wpa_supplicant.conf -B

Please note that if you included more than one driver interface in the build time configuration (.config), you may need to specify which interface to use by including -D<driver name> option on the command line. See following section for more details on command line options for wpa_supplicant.

Command line options

usage:

```
wpa_supplicant [-BddehLqqvw] -i<ifname> -c<config file> [-D<driver>] \
[-N -i<ifname> -c<conf> [-D<driver>] ...]
```

options:

- -B = run daemon in the background
- -d = increase debugging verbosity (-dd even more)
- -K = include keys (passwords, etc.) in debug output
- -t = include timestamp in debug messages
- -h = show this help text
- -L = show license (GPL and BSD)
- -q = decrease debugging verbosity (-qq even less)
- -v = show version
- -w = wait for interface to be added, if needed
- -N =start describing new interface

drivers:

```
hostap = Host AP driver (Intersil Prism2/2.5/3) [default] (this can also be used with Linuxant DriverLoader) hermes = Agere Systems Inc. driver (Hermes-I/Hermes-II)
```

```
madwifi = MADWIFI 802.11 support (Atheros, etc.)
atmel = ATMEL AT76C5XXx (USB, PCMCIA)
wext = Linux wireless extensions (generic)
ndiswrapper = Linux ndiswrapper
broadcom = Broadcom wl.o driver
ipw = Intel ipw2100/2200 driver
wired = wpa_supplicant wired Ethernet driver
bsd = BSD 802.11 support (Atheros, etc.)
ndis = Windows NDIS driver
```

In most common cases, wpa_supplicant is started with

```
wpa_supplicant -Bw -c/etc/wpa_supplicant.conf -iwlan0
```

This makes the process fork into background and wait for the wlan0 interface if it is not available at startup time.

The easiest way to debug problems, and to get debug log for bug reports, is to start wpa_supplicant on foreground with debugging enabled:

```
wpa_supplicant -c/etc/wpa_supplicant.conf -iwlan0 -d
```

wpa_supplicant can control multiple interfaces (radios) either by running one process for each interface separately or by running just one process and list of options at command line. Each interface is separated with -N argument. As an example, following command would start wpa_supplicant for two interfaces:

```
wpa_supplicant \
-c wpa1.conf -i wlan0 -D hostap -N \
-c wpa2.conf -i ath0 -D madwifi
```

Configuration file

wpa_supplicant is configured using a text file that lists all accepted networks and security policies, including pre-shared keys. See example configuration file, wpa_supplicant.conf, for detailed information about the configuration format and supported fields.

Changes to configuration file can be reloaded be sending SIGHUP signal to wpa_supplicant ('killall -HUP wpa_supplicant'). Similarly, reloading can be triggered with 'wpa_cli reconfigure' command.

Configuration file can include one or more network blocks, e.g., one

for each used SSID. wpa_supplicant will automatically select the best betwork based on the order of network blocks in the configuration file, network security level (WPA/WPA2 is prefered), and signal strength.

Example configuration files for some common configurations:

1) WPA-Personal (PSK) as home network and WPA-Enterprise with EAP-TLS as work network # allow frontend (e.g., wpa_cli) to be used by all users in 'wheel' group ctrl_interface=/var/run/wpa_supplicant ctrl_interface_group=wheel # home network; allow all valid ciphers network={ ssid="home" scan ssid=1 key_mgmt=WPA-PSK psk="very secret passphrase" # work network; use EAP-TLS with WPA; allow only CCMP and TKIP ciphers network={ ssid="work" scan ssid=1 key_mgmt=WPA-EAP pairwise=CCMP TKIP group=CCMP TKIP eap=TLS identity="user@example.com" ca_cert="/etc/cert/ca.pem" client_cert="/etc/cert/user.pem" private_key="/etc/cert/user.prv" private_key_passwd="password" 2) WPA-RADIUS/EAP-PEAP/MSCHAPv2 with RADIUS servers that use old peaplabel (e.g., Funk Odyssey and SBR, Meetinghouse Aegis, Interlink RAD-Series) ctrl_interface=/var/run/wpa_supplicant ctrl_interface_group=wheel network={ ssid="example" scan_ssid=1 key_mgmt=WPA-EAP eap=PEAP

```
identity="user@example.com"
password="foobar"
ca_cert="/etc/cert/ca.pem"
phase1="peaplabel=0"
phase2="auth=MSCHAPV2"
3) EAP-TTLS/EAP-MD5-Challenge configuration with anonymous identity for the
 unencrypted use. Real identity is sent only within an encrypted TLS tunnel.
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=wheel
network={
ssid="example"
scan_ssid=1
key_mgmt=WPA-EAP
eap=TTLS
identity="user@example.com"
anonymous_identity="anonymous@example.com"
password="foobar"
ca_cert="/etc/cert/ca.pem"
phase2="auth=MD5"
4) IEEE 802.1X (i.e., no WPA) with dynamic WEP keys (require both unicast and
 broadcast); use EAP-TLS for authentication
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=wheel
network={
ssid="1x-test"
scan_ssid=1
key_mgmt=IEEE8021X
eap=TLS
identity="user@example.com"
ca_cert="/etc/cert/ca.pem"
client_cert="/etc/cert/user.pem"
private_key="/etc/cert/user.prv"
private_key_passwd="password"
eapol_flags=3
```

5) Catch all example that allows more or less all configuration modes. The configuration options are used based on what security policy is used in the selected SSID. This is mostly for testing and is not recommended for normal

```
use.
```

```
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=wheel
network={
ssid="example"
scan ssid=1
key_mgmt=WPA-EAP WPA-PSK IEEE8021X NONE
pairwise=CCMP TKIP
group=CCMP TKIP WEP104 WEP40
psk="very secret passphrase"
eap=TTLS PEAP TLS
identity="user@example.com"
password="foobar"
ca_cert="/etc/cert/ca.pem"
client_cert="/etc/cert/user.pem"
private_key="/etc/cert/user.prv"
private_key_passwd="password"
phase1="peaplabel=0"
ca_cert2="/etc/cert/ca2.pem"
client_cert2="/etc/cer/user.pem"
private_key2="/etc/cer/user.prv"
private_key2_passwd="password"
6) Authentication for wired Ethernet. This can be used with 'wired' interface
 (-Dwired on command line).
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=wheel
ap_scan=0
network={
key_mgmt=IEEE8021X
eap=MD5
identity="user"
password="password"
eapol_flags=0
Certificates
_____
Some EAP authentication methods require use of certificates. EAP-TLS
uses both server side and client certificates whereas EAP-PEAP and
EAP-TTLS only require the server side certificate. When client
```

certificate is used, a matching private key file has to also be included in configuration. If the private key uses a passphrase, this has to be configured in wpa_supplicant.conf ("private_key_passwd").

wpa_supplicant supports X.509 certificates in PEM and DER formats. User certificate and private key can be included in the same file.

If the user certificate and private key is received in PKCS#12/PFX format, they need to be converted to suitable PEM/DER format for wpa_supplicant. This can be done, e.g., with following commands:

convert client certificate and private key to PEM format openssl pkcs12 -in example.pfx -out user.pem -clcerts # convert CA certificate (if included in PFX file) to PEM format openssl pkcs12 -in example.pfx -out ca.pem -cacerts -nokeys

wpa_cli

wpa_cli is a text-based frontend program for interacting with wpa_supplicant. It is used to query current status, change configuration, trigger events, and request interactive user input.

wpa_cli can show the current authentication status, selected security mode, dot11 and dot1x MIBs, etc. In addition, it can configure some variables like EAPOL state machine parameters and trigger events like reassociation and IEEE 802.1X logoff/logon. wpa_cli provides a user interface to request authentication information, like username and password, if these are not included in the configuration. This can be used to implement, e.g., one-time-passwords or generic token card authentication where the authentication is based on a challenge-response that uses an external device for generating the response.

The control interface of wpa_supplicant can be configured to allow non-root user access (ctrl_interface_group in the configuration file). This makes it possible to run wpa_cli with a normal user account.

wpa_cli supports two modes: interactive and command line. Both modes share the same command set and the main difference is in interactive mode providing access to unsolicited messages (event messages, username/password requests).

Interactive mode is started when wpa_cli is executed without including

the command as a command line parameter. Commands are then entered on the wpa_cli prompt. In command line mode, the same commands are entered as command line arguments for wpa_cli.

Interactive authentication parameters request

When wpa_supplicant need authentication parameters, like username and password, which are not present in the configuration file, it sends a request message to all attached frontend programs, e.g., wpa_cli in interactive mode. wpa_cli shows these requests with "CTRL-REQ-<type>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--<id>--</d>--</d>--</d>--</d>--</d>--</d>----
OTP (one-time-password). <id>--<id>--<id>--<id>--<id>--<id>--</d>--</d>--</d>--</d>--</d>--</d>--</d>---
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The reply to these requests can be given with 'identity', 'password', and 'otp' commands. <id> needs to be copied from the the matching request. 'password' and 'otp' commands can be used regardless of whether the request was for PASSWORD or OTP. The main difference between these two commands is that values given with 'password' are remembered as long as wpa_supplicant is running whereas values given with 'otp' are used only once and then forgotten, i.e., wpa_supplicant will ask frontend for a new value for every use. This can be used to implement one-time-password lists and generic token card -based authentication.

Example request for password and a matching reply:

CTRL-REQ-PASSWORD-1:Password needed for SSID foobar > password 1 mysecretpassword

Example request for generic token card challenge-response:

CTRL-REQ-OTP-2:Challenge 1235663 needed for SSID foobar > otp 2 9876

wpa_cli commands

status = get current WPA/EAPOL/EAP status
mib = get MIB variables (dot1x, dot11)
help = show this usage help
interface [ifname] = show interfaces/select interface
level <debug level> = change debug level
license = show full wpa_cli license
logoff = IEEE 802.1X EAPOL state machine logoff
logon = IEEE 802.1X EAPOL state machine logon

```
set = set variables (shows list of variables when run without arguments)
pmksa = show PMKSA cache
reassociate = force reassociation
reconfigure = force wpa_supplicant to re-read its configuration file
preauthenticate <BSSID> = force preauthentication
identity <network id> <identity> = configure identity for an SSID
password <network id> <password> = configure password for an SSID
pin <network id> <pin> = configure pin for an SSID
otp <network id> <password> = configure one-time-password for an SSID
passphrase <network id> <passphrase> = configure private key passphrase
 for an SSID
bssid <network id> <BSSID> = set preferred BSSID for an SSID
list networks = list configured networks
select_network <network id> = select a network (disable others)
enable_network <network id> = enable a network
disable network <network id> = disable a network
add_network = add a network
remove network <network id> = remove a network
set network <network id> <variable> <value> = set network variables (shows
 list of variables when run without arguments)
get network <network id> <variable> = get network variables
save_config = save the current configuration
disconnect = disconnect and wait for reassociate command before connecting
scan = request new BSS scan
scan_results = get latest scan results
get_capability <eap/pairwise/group/key_mgmt/proto/auth_alg> = get capabilies
terminate = terminate wpa_supplicant
quit = exit wpa_cli
wpa_cli command line options
wpa_cli [-p<path to ctrl sockets>] [-i<ifname>] [-hvB] [-a<action file>] \
   [-P<pid file>] [-g<global ctrl>] [command..]
-h = help (show this usage text)
-v = shown version information
-a = run in daemon mode executing the action file based on events from
   wpa_supplicant
-B = run a daemon in the background
default path: /var/run/wpa_supplicant
default interface: first interface found in socket path
Using wpa_cli to run external program on connect/disconnect
wpa_cli can used to run external programs whenever wpa_supplicant
```

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connects or disconnects from a network. This can be used, e.g., to

update network configuration and/or trigget DHCP client to update IP addresses, etc.

One wpa_cli process in "action" mode needs to be started for each interface. For example, the following command starts wpa_cli for the default ingterface (-i can be used to select the interface in case of more than one interface being used at the same time):

```
wpa_cli -a/sbin/wpa_action.sh -B
```

The action file (-a option, /sbin/wpa_action.sh in this example) will be executed whenever wpa_supplicant completes authentication (connect event) or detects disconnection). The action script will be called with two command line arguments: interface name and event (CONNECTED or DISCONNECTED). If the action script needs to get more information about the current network, it can use 'wpa_cli status' to query wpa_supplicant for more information.

Following example can be used as a simple template for an action script:

```
#!/bin/sh
```

fi

```
IFNAME=$1
CMD=$2

if [ "$CMD" == "CONNECTED" ]; then
    SSID='wpa_cli -i$IFNAME status | grep ^ssid= | cut -f2- -d='
    # configure network, signal DHCP client, etc.
fi

if [ "$CMD" == "DISCONNECTED" ]; then
    # remove network configuration, if needed
```

Integrating with pemcia-cs/cardmgr scripts

wpa_supplicant needs to be running when using a wireless network with WPA. It can be started either from system startup scripts or from pcmcia-cs/cardmgr scripts (when using PC Cards). WPA handshake must be completed before data frames can be exchanged, so wpa_supplicant should be started before DHCP client.

Command line option '-w' can be used if wpa_supplicant is started before the wireless LAN interface is present (e.g., before inserting

the PC Card) or is not yet up.

For example, following small changes to pcmcia-cs scripts can be used to enable WPA support:

Add MODE="Managed" and WPA="y" to the network scheme in /etc/pcmcia/wireless.opts.

Add the following block to the end of 'start' action handler in /etc/pcmcia/wireless:

```
if [ "$WPA" = "y" -a -x /usr/local/bin/wpa_supplicant ]; then
/usr/local/bin/wpa_supplicant -Bw -c/etc/wpa_supplicant.conf \
-i$DEVICE
fi
```

Add the following block to the end of 'stop' action handler (may need to be separated from other actions) in /etc/pcmcia/wireless:

```
\label{eq:wpa} \begin{tabular}{ll} if [ "$WPA" = "y" -a -x /usr/local/bin/wpa_supplicant ]; then $$killall wpa_supplicant $fi$
```

This will make cardmgr start wpa_supplicant when the card is plugged in. wpa_supplicant will wait until the interface is set up--either when a static IP address is configured or when DHCP client is started--and will then negotiate keys with the AP.

```
Dynamic interface add and operation without configuration files
```

wpa_supplicant can be started without any configuration files or network interfaces. When used in this way, a global (i.e., per wpa_supplicant process) control interface is used to add and remove network interfaces. Each network interface can then be configured through a per-network interface control interface. For example, following commands show how to start wpa_supplicant without any network interfaces and then add a network interface and configure a network (SSID):

```
# Start wpa_supplicant in the background wpa_supplicant -g/var/run/wpa_supplicant-global -B
```

Add a new interface (wlan0, no configuration file, driver=wext, and # enable control interface)
wpa_cli -g/var/run/wpa_supplicant-global interface_add wlan0 \

```
"" wext /var/run/wpa_supplicant
```

Configure a network using the newly added network interface:

wpa_cli -iwlan0 add_network

wpa_cli -iwlan0 set_network 0 ssid "test"

wpa_cli -iwlan0 set_network 0 key_mgmt WPA-PSK

wpa_cli -iwlan0 set_network 0 psk "'12345678"'

wpa_cli -iwlan0 set_network 0 pairwise TKIP

wpa_cli -iwlan0 set_network 0 group TKIP

wpa_cli -iwlan0 set_network 0 proto WPA

wpa_cli -iwlan0 enable_network 0

At this point, the new network interface should start trying to associate # with the WPA-PSK network using SSID test.

Remove network interface

wpa_cli -g/var/run/wpa_supplicant-global interface_remove wlan0 License

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1.18 openconnect 2.25

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1.19 openIdap 2.3.39

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1.20 openssl 0.9.8k

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1.21 openssl 0.9.8c

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*/

1.22 ppp 2.4.1

1.22.1 Available under license:

/*

* ppp_ahdlc.c - STREAMS module for doing PPP asynchronous HDLC.

*

- * Re-written by Adi Masputra <adi.masputra@sun.com>, based on
- * the original ppp_ahdlc.c

*

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* $Id: ppp_ahdlc.c,v 1.16 2000/03/06 19:38:12 masputra Exp $
**************************
** md5.h -- header file for implementation of MD5
** RSA Data Security, Inc. MD5 Message-Digest Algorithm
** Created: 2/17/90 RLR
** Revised: 12/27/90 SRD.AJ.BSK.JT Reference C version
** Revised (for MD5): RLR 4/27/91
** -- G modified to have y&~z instead of y&z
** -- FF, GG, HH modified to add in last register done
** -- Access pattern: round 2 works mod 5, round 3 works mod 3
** -- distinct additive constant for each step
** -- round 4 added, working mod 7
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**********************
* passprompt.c - pppd plugin to invoke an external PAP password prompter
```

*

* Copyright 1999 Paul Mackerras, Alan Curry.

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/*

- * Database functions
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This is the README file for ppp-2.4, a package which implements the Point-to-Point Protocol (PPP) to provide Internet connections over serial lines.

Introduction.

The Point-to-Point Protocol (PPP) provides a standard way to establish a network connection over a serial link. At present, this package supports IP and the protocols layered above IP, such as TCP and UDP. The Linux and Solaris ports of this package have optional support for IPV6; the Linux port of this package also has support for IPX.

This software consists of two parts:

- Kernel code, which establishes a network interface and passes packets between the serial port, the kernel networking code and the PPP daemon (pppd). This code is implemented using STREAMS modules on Solaris, and as a line discipline under Linux.
- The PPP daemon (pppd), which negotiates with the peer to establish

the link and sets up the ppp network interface. Pppd includes support for authentication, so you can control which other systems may make a PPP connection and what IP addresses they may use.

The platforms supported by this package are Linux and Solaris. I have code for NeXTStep, FreeBSD, SunOS 4.x, SVR4, Tru64 (Digital Unix), AIX and Ultrix but no active maintainers for these platforms. Code for all of these except AIX is included in the ppp-2.3.11 release.

Installation.

The file SETUP contains general information about setting up your system for using PPP. There is also a README file for each supported system, which contains more specific details for installing PPP on that system. The supported systems, and the corresponding README files, are:

Linux README.linux Solaris README.sol2

In each case you start by running the ./configure script. This works out which operating system you are using and creates the appropriate makefiles. You then run `make' to compile the user-level code, and (as root) `make install' to install the user-level programs pppd, chat and pppstats.

N.B. Since 2.3.0, leaving the permitted IP addresses column of the pap-secrets or chap-secrets file empty means that no addresses are permitted. You need to put a "*" in that column to allow the peer to use any IP address. (This only applies where the peer is authenticating itself to you, of course.)

What's new in ppp-2.4.4.

- * Pppd will now run /etc/ppp/ip-pre-up, if it exists, after creating the ppp interface and configuring its IP addresses but before bringing it up. This can be used, for example, for adding firewall rules for the interface.
- * Lots of bugs fixed, particularly in the area of demand-dialled and persistent connections.
- * The rp-pppoe plugin now accepts any interface name (that isn't an existing pppd option name) without putting "nic-" on the front of

it, not just eth*, nas*, tap* and br*.

What was new in ppp-2.4.3.

- * The configure script now accepts --prefix and --sysconfdir options. These default to /usr/local and /etc. If you want pppd put in /usr/sbin as before, use ./configure --prefix=/usr.
- * Doing `make install' no longer puts example configuration files in /etc/ppp. Use `make install-etcppp' if you want that.
- * The code has been updated to work with version 0.8.3 of libpcap. Unfortunately the libpcap maintainers removed support for the "inbound" and "outbound" keywords on PPP links, meaning that if you link pppd with libpcap-0.8.3, you can't use those keywords in the active-filter and pass-filter expressions. The support has been reinstated in the CVS version and should be in future libpcap releases. If you need the in/outbound keywords, use a later release than 0.8.3, or get the CVS version from http://www.tcpdump.org.
- * There is a new option, child-timeout, which sets the length of time that pppd will wait for child processes (such as the command specified with the pty option) to exit before exiting itself. It defaults to 5 seconds. After the timeout, pppd will send a SIGTERM to any remaining child processes and exit. A value of 0 means no timeout.
- * Various bugs have been fixed, including some CBCP packet parsing bugs that could lead to the peer being able to crash pppd if CBCP support is enabled.
- * Various fixes and enhancements to the radius and rp-pppoe plugins have been added.
- * There is a new winbind plugin, from Andrew Bartlet of the Samba team, which provides the ability to authenticate the peer against an NT domain controller using MS-CHAP or MS-CHAPV2.
- * There is a new pppoatm plugin, by various authors, sent in by David Woodhouse.
- * The multilink code has been substantially reworked. The first pppd for a bundle still controls the ppp interface, but it doesn't exit until all the links in the bundle have terminated. If the first pppd is signalled to exit, it signals all the other pppds controlling links in the bundle.

* The TDB code has been updated to the latest version. This should eliminate the problem that some people have seen where the database file (/var/run/pppd.tdb) keeps on growing. Unfortunately, however, the new code uses an incompatible database format. For this reason, pppd now uses /var/run/pppd2.tdb as the database filename.

What was new in ppp-2.4.2. ************

- * The CHAP code has been rewritten. Pppd now has support for MS-CHAP V1 and V2 authentication, both as server and client. The new CHAP code is cleaner than the old code and avoids some copyright problems that existed in the old code.
- * MPPE (Microsoft Point-to-Point Encryption) support has been added, although the current implementation shouldn't be considered completely secure. (There is no assurance that the current code won't ever transmit an unencrypted packet.)
- * James Carlson's implementation of the Extensible Authentication Protocol (EAP) has been added.
- * Support for the Encryption Control Protocol (ECP) has been added.
- * Some new plug-ins have been included:
- A plug-in for kernel-mode PPPoE (PPP over Ethernet)
- A plug-in for supplying the PAP password over a pipe from another process
- A plug-in for authenticating using a Radius server.
- * Updates and bug-fixes for the Solaris port.
- * The CBCP (Call Back Control Protocol) code has been updated. There are new options `remotenumber' and `allow-number'.
- * Extra hooks for plugins to use have been added.
- * There is now a `maxoctets' option, which causes pppd to terminate the link once the number of bytes passed on the link exceeds a given value.
- * There are now options to control whether pppd can use the IPCP IP-Address and IP-Addresses options: `ipcp-no-address' and `ipcp-no-addresses'.
- * Fixed several bugs, including potential buffer overflows in chat.

- * Pppd can now print out the set of options that are in effect. The new `dump' option causes pppd to print out the option values after option parsing is complete. The `dryrun' option causes pppd to print the options and then exit.
- * The option parsing code has been fixed so that options in the per-tty options file are parsed correctly, and don't override values from the command line in most cases.
- * The plugin option now looks in /usr/lib/pppd/<pppd-version> (for example, /usr/lib/pppd/2.4.1b1) for shared objects for plugins if there is no slash in the plugin name.
- * When loading a plugin, pppd will now check the version of pppd for which the plugin was compiled, and refuse to load it if it is different to pppd's version string. To enable this, the plugin source needs to #include "pppd.h" and have a line saying: char pppd_version[] = VERSION;
- * There is a bug in zlib, discovered by James Carlson, which can cause kernel memory corruption if Deflate is used with the lowest setting, 8. As a workaround pppd will now insist on using at least 9.
- * Pppd should compile on Solaris and SunOS again.
- * Pppd should now set the MTU correctly on demand-dialled interfaces.

What was new in ppp-2.4.0.

* Multilink: this package now allows you to combine multiple serial links into one logical link or `bundle', for increased bandwidth and reduced latency. This is currently only supported under the 2.4.x and later Linux kernels.

- * All the pppd processes running on a system now write information into a common database. I used the 'tdb' code from samba for this.
- * New hooks have been added.

For a list of the changes made during the 2.3 series releases of this package, see the Changes-2.3 file.

Compression methods.

This package supports two packet compression methods: Deflate and BSD-Compress. Other compression methods which are in common use include Predictor, LZS, and MPPC. These methods are not supported for two reasons - they are patent-encumbered, and they cause some packets to expand slightly, which pppd doesn't currently allow for. BSD-Compress and Deflate (which uses the same algorithm as gzip) don't ever expand packets.

Patents.

The BSD-Compress algorithm used for packet compression is the same as that used in the Unix "compress" command. It was apparently covered by U.S. patents 4,814,746 (owned by IBM) and 4,558,302 (owned by Unisys), and corresponding patents in various other countries (but not Australia). Apparently the Unisys patent expired in the US on 20 June 2003, but the IBM patent is still pending.

If these patents are of concern in your situation, you can build the package without including BSD-Compress. To do this, edit net/ppp-comp.h to change the definition of DO_BSD_COMPRESS to 0. The bsd-comp.c files are then no longer needed, so the references to bsd-comp.o may optionally be removed from the Makefiles.

Contacts.

The comp.protocols.ppp newsgroup is a useful place to get help if you have trouble getting your ppp connections to work. Please do not send me questions of the form "please help me get connected to my ISP" - I'm sorry, but I simply do not have the time to answer all the questions like this that I get.

If you find bugs in this package, please report them to the maintainer for the port for the operating system you are using:

Linux Paul Mackerras <paulus@samba.org>
Solaris James Carlson <carlson@workingcode.com>

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ftp://ftp.samba.org/pub/ppp/

(\$Id: README,v 1.37 2006/05/29 23:51:29 paulus Exp \$)

1.23 rp-pppoe 3.8

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- /* SASL LDAP auxprop implementation
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*/
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/* CMU libsasl

- * Tim Martin
- * Rob Earhart
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1.27 zlib 1.2.3

1.27.1 Available under license:

/* zlib.h -- interface of the 'zlib' general purpose compression library version 1.2.3, July 18th, 2005

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Jean-loup Gailly Mark Adler

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The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files http://www.ietf.org/rfc/rfc1950.txt (zlib format), rfc1951.txt (deflate format) and rfc1952.txt (gzip format).

*/

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