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5. A program that contains no derivative of any portion of the
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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
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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.
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whether or not they are linked directly with the Library itself.

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* configure.ac, Makefile.am: The original versions were derived from the ones in the XML Catalog Manager project, version 2.2.

Author: Julio Merino <jmmv@users.sourceforge.net>
* atf-c/ui.c: The format_paragraph and format_text functions were derived form the ones in the Monotone project, revision 3a0982da308228d796df35f98d787c5cff2bb5b6.

Author: Julio Merino <jmmv@NetBSD.org>

* atf-c++/detail/io.hpp, atf-c++/detail/io.cpp, atf-c++/detail/io_test.cpp: These files were derived from the file_handle, systembuf, pipe and pistream classes and tests found in the Boost.Process library.

Author: Julio Merino <jmmv84@gmail.com>

* admin/check-style.sh, admin/check-style-common.awk, admin/check-style-cpp.awk, admin/check-style-shell.awk: These files, except the first one, were first implemented in the Buildtool project. They were later adapted to be part of Boost.Process and, during that process, the shell script was created.

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    <xsl:variable name="rest" select="substring-after($text, '&#10;')"/>
    <xsl:if test="translate($rest, '&#9;&#32;', '')">
      <xsl:call-template name="isc.copyright.format">
        <xsl:with-param name="text" select="$rest"/>
      </xsl:call-template>
    </xsl:if>
  </xsl:template>

  <xsl:variable name="isc.copyright.text">
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  </xsl:variable>
</xsl:stylesheet>
1.11 bind 9.11.8

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 */

/*! ile
 * 
 * Notice to programmers: Do not use this code as an example of how to use the ISC library to perform DNS lookups. Dig and Host both operate on the request level, since they allow fine-tuning of output and are intended as debugging tools. As a result, they perform many of the functions which could be better handled using the dns_resolver functions in most applications.
 */

#include <config.h>
#include <inttypes.h>
#include <stdbool.h>
#include <stdlib.h>
#include <unistd.h>
#include <string.h>
#include <limits.h>
#include <errno.h>
#ifdef HAVE_LOCALE_H
#include <locale.h>
#endif
#ifdef WITH_IDN_SUPPORT
#ifdef WITH_IDNKIT
#include <idn/result.h>
#include <idn/log.h>
#include <idn/resconf.h>
#include <idn/api.h>
#endif
#ifdef WITH_LIBIDN2
#include <idn2.h>
#endif
#endif
#include <idn2.h>
#include <isc/timer.h>
#include <isc/types.h>
#include <isc/util.h>

#include <pk11/site.h>

#include <isccfg/namedconf.h>

#include <lwres/lwres.h>
#include <lwres/net.h>

#include <bind9/getaddresses.h>

#include <dig/dig.h>

#ifdef PKCS11CRYPTO
#include <pk11/result.h>
#endif

#if ! defined(NS_INADDRSZ)
#define NS_INADDRSZ 4
#endif

#if ! defined(NS_IN6ADDRSZ)
#define NS_IN6ADDRSZ 16
#endif

static lwres_context_t *lwctx = NULL;
static lwres_conf_t *lwconf;

dig_lookuplist_t lookup_list;
dig_serverlist_t server_list;
dig_searchlistlist_t search_list;

bool
check_ra = false,
have_ipv4 = false,
have_ipv6 = false,
specified_source = false,
free_now = false,
cancel_now = false,
usesearch = false,
showsearch = false,
qr = false,
is_dst_up = false,
keep_open = false,
verbose = false;
in_port_t port = 53;
unsigned int timeout = 0;
unsigned int extrabytes;
isc_mem_t *mctx = NULL;
isc_log_t *lctx = NULL;
isc_taskmgr_t *taskmgr = NULL;
isc_task_t *global_task = NULL;
isc_timermgr_t *timermgr = NULL;
isc_socketmgr_t *socketmgr = NULL;
isc_sockaddr_t bind_address;
int sendcount = 0;
int recvcount = 0;
int sockcount = 0;
int ndots = -1;
int tries = 3;
int lookup_counter = 0;

static char servercookie[256];

#ifdef WITH_IDN_SUPPORT
static void idn_initialize(void);
static isc_result_t idn_locale_to_ace(const char *from,
  char *to,
  size_t tolen);
#endif /* WITH_IDN_SUPPORT */

#ifdef WITH_IDN_OUT_SUPPORT
static isc_result_t idn_ace_to_locale(const char *from,
  char *to,
  size_t tolen);
static isc_result_t output_filter(isc_buffer_t *buffer,
  unsigned int used_org,
  bool absolute);
#define MAXDLEN 256

#endif /* WITH_IDN_OUT_SUPPORT */

#ifdef WITH_IDNKIT
int idnoptions = 0;
#endif
#endif /* WITH_IDN_OUT_SUPPORT */

isc_socket_t *keep = NULL;
isc_sockaddr_t keepaddr;

/*%*/
* Exit Codes:
 *
*\li0  Everything went well, including things like NXDOMAIN
*\li1  Usage error
*li7  Got too many RR's or Names
*li8  Couldn't open batch file
*li9  No reply from server
*li10  Internal error
*/

int exitcode = 0;
int fatalexit = 0;
char keynametext[MXNAME];
char keyfile[MXNAME] = "";
char keysecret[MXNAME] = "";
unsigned char cookie_secret[33];
unsigned char cookie[8];
dns_name_t *hmacname = NULL;
unsigned int digestbits = 0;
isc_buffer_t *namebuf = NULL;
dns_tsigkey_t *tsigkey = NULL;
bool validated = true;
isc_entropy_t *entp = NULL;
isc_mempool_t *commctx = NULL;
bool debugging = false;
bool debugtiming = false;
bool memdebugging = false;
char *progname = NULL;
isc_mutex_t lookup_lock;
dig_lookup_t *current_lookup = NULL;

#ifdef DIG_SIGCHASE

dns_dataset_t get_trusted_key(void);
dns_dataset_t * sigchase_scannamedns_rdataset_t type,
    dns_rdatatype_t covers,
    bool *lookedup,
    dns_name_t *rdata_name);
dns_rdataset_t * chase_scannamedns_message_t *msg,
    dns_name_t *name,
    dns_rdatatype_t type,
    dns_rdatatype_t covers,
    int section);
dns_result_t advanced_rresult_t *rdataset,
    dns_name_t *name,
    dns_rdatatype_t type,
    dns_rdatatype_t covers,
    bool *lookedup);
dns_result_t sigchase_verify_sig_key(dns_name_t *name,
    dns_rdataset_t *rdataset,
    dst_key_t* dnsseckey,
    dns_rdataset_t *sigrdataset);
dns_result_t sigchase_verify_sigsig(dns_name_t *name,
dns_rdataset_t *rdataset,
dns_rdataset_t *keyrdataset,
dns_rdataset_t *sigrdataset);
isc_result_t sigchase_verify_ds(dns_name_t *name,
    dns_rdataset_t *keyrdataset,
    dns_rdataset_t *dsrdataset);
void sigchase(dns_message_t *msg);
void print_rdata(dns_rdata_t *rdata, isc_mem_t *mctx);
void print_rdataset(dns_name_t *name, dns_rdataset_t *rdataset);
void dup_name(dns_name_t *source, dns_name_t * target);
void free_name(dns_name_t *name);
void dump_database(void);
void dump_database_section(dns_message_t *msg, int section);
dns_rdataset_t * search_type(dns_name_t *name, dns_rdatatype_t type,
    dns_rdatatype_t covers);
isc_result_t contains_trusted_key(dns_name_t *name,
    dns_rdataset_t *rdataset,
    dns_rdataset_t *sigrdataset);
void print_type(dns_rdatatype_t type);
isc_result_t prove_nx_domain(dns_message_t * msg,
    dns_name_t *name,
    dns_name_t *rdata_name,
    dns_rdataset_t **rdataset,
    dns_rdataset_t **sigrdataset);
isc_result_t prove_nx_type(dns_message_t * msg, dns_name_t *name,
    dns_rdataset_t *nsec,
    dns_rdataclass_t rdclass,
    dns_rdatatype_t type,
    dns_name_t * rdata_name,
    dns_rdataset_t ** rdataset,
    dns_rdataset_t ** sigrdataset);
isc_result_t prove_nx(dns_message_t * msg, dns_name_t * name,
    dns_rdataclass_t rdclass,
    dns_rdatatype_t type,
    dns_name_t * rdata_name,
    dns_rdataset_t ** rdataset,
    dns_rdataset_t ** sigrdataset);
static void nameFromString(const char *str, dns_name_t *p_ret);
int inf_name(dns_name_t * name1, dns_name_t * name2);
isc_result_t removetmpkey(const char *file);
void clean_trustedkey(void);
isc_result_t insert_trustedkey(void *arg, dns_name_t *name,
    dns_rdataset_t *rdataset);
#if DIG_SIGCHASE_BU
isc_result_t getneededrr(dns_message_t *msg);
void sigchase_bottom_up(dns_message_t *msg);
void sigchase_bu(dns_message_t *msg);
#endif
#if DIG_SIGCHASE_TD
isc_result_t initialization(dns_name_t *name);
isc_result_t prepare_lookup(dns_name_t *name);
isc_result_t grandfather_pb_test(dns_name_t * zone_name,
    dns_rdataset_t *sigrdataset);
isc_result_t child_of_zone(dns_name_t *name,
    dns_name_t *zone_name,
    dns_name_t *child_name);
void sigchase_td(dns_message_t *msg);
#endif
char trustedkey[MXNAME] = "";
dns_rdataset_t *chase_rdataset = NULL;
dns_rdataset_t *chase_sigrdataset = NULL;
dns_rdataset_t *chase_dsrdataset = NULL;
dns_rdataset_t *chase_sigdsrdataset = NULL;
dns_rdataset_t *chase_keyrdataset = NULL;
dns_rdataset_t *chase_sigkeyrdataset = NULL;
dns_rdataset_t *chase_nsrdataset = NULL;
dns_name_t chase_name; /* the query name */
#if DIG_SIGCHASE_TD
/*
 * the current name is the parent name when we follow delegation
 */
dns_name_t chase_current_name;
/*
 * the child name is used for delegation (NS DS responses in AUTHORITY section)
 */
dns_name_t chase_authority_name;
#endif
#if DIG_SIGCHASE_BU
dns_name_t chase_signame;
#endif
bool chase_siglookedup = false;
bool chase_keylookedup = false;
bool chase_sigkeylookedup = false;
bool chase_dslookedup = false;
bool chase_sigdslookedup = false;
#if DIG_SIGCHASE_TD
bool chase_nsonlookedup = false;
bool chase_lookedup = false;
#endif
bool delegation_follow = false;
bool grandfather_pb = false;
bool have_response = false;
bool have_delegation_ns = false;
dns_message_t * error_message = NULL;
#endif

bool dsvalidating = false;
bool chase_name_dup = false;

ISC_LIST(dig_message_t) chase_message_list;
ISC_LIST(dig_message_t) chase_message_list2;

#define MAX_TRUSTED_KEY 5
typedef struct struct_trusted_key_list {
dst_key_t * key[MAX_TRUSTED_KEY];
int nb_tk;
} struct_tk_list;

struct_tk_list tk_list = { {NULL, NULL, NULL, NULL, NULL}, 0};
#endif

#define DIG_MAX_ADDRESSES 20

/*%*
  * Apply and clear locks at the event level in global task.
  * Can I get rid of these using shutdown events? XXX
  */
#define LOCK_LOOKUP {
  debug("lock_lookup %s:%d", __FILE__, __LINE__);
  check_result(isc_mutex_lock((&lookup_lock)), "isc_mutex_lock");
  debug("success");
}
#define UNLOCK_LOOKUP {
  debug("unlock_lookup %s:%d", __FILE__, __LINE__);
  check_result(isc_mutex_unlock((&lookup_lock)), "isc_mutex_unlock");
}

/* dynamic callbacks */

#if defined DIG_SIGCHASE
isc_result_t
(*dighost_printrdataset)(dns_name_t *owner_name, dns_rdataset_t *rdataset,
   isc_buffer_t *target);
#endif

isc_result_t
(*dighost_printmessage)(dig_query_t *query, dns_message_t *msg, bool headers);

void
(*dighost_received)(unsigned int bytes, isc_sockaddr_t *from, dig_query_t *query);

void
(*dighost_trying)(char *frm, dig_lookup_t *lookup);

void
(*dighost_shutdown)(void);

/* forward declarations */

static void
cancel_lookup(dig_lookup_t *lookup);

static void
recv_done(isc_task_t *task, isc_event_t *event);

static void
send_udp(dig_query_t *query);

static void
connect_timeout(isc_task_t *task, isc_event_t *event);

static void
launch_next_query(dig_query_t *query, bool include_question);

static void
check_next_lookup(dig_lookup_t *lookup);

static bool
next_origin(dig_lookup_t *oldlookup);

static void *
mem_alloc(void *arg, size_t size) {
   return (isc_mem_get(arg, size));
}

static void
mem_free(void *arg, void *mem, size_t size) {
   isc_mem_put(arg, mem, size);
}

char *
next_token(char **stringp, const char *delim) {
   char *res;
do {
    res = strsep(stringp, delim);
    if (res == NULL)
        break;
} while (*res == '\0');
return (res);
}

static int
count_dots(char *string) {
    char *s;
    int i = 0;

    s = string;
    while (*s != '\0') {
        if (*s == '.')
            i++;
        s++;
    }
    return (i);
}

static void
hex_dump(isc_buffer_t *b) {
    unsigned int len, i;
    isc_region_t r;

    isc_buffer_usedregion(b, &r);
    printf("%u bytes\n", r.length);
    for (len = 0; len < r.length; len++) {
        printf("%02x ", r.base[len]);
        if (len % 16 == 15) {
            puts("         ", stdout);
            for (i = len - 15; i <= len; i++) {
                if (r.base[i] >= '!' && r.base[i] <= ')
                    putchar(r.base[i]);
                else
                    putchar('.');
            }
            printf("\n");
        }
    }
    if (len % 16 != 0) {
        for (i = len; (i % 16) != 0; i++)
            puts("   ", stdout);
        puts("         ", stdout);
    }
for (i = ((len>>4)<<4); i < len; i++) {
if (r.base[i] >= '!' && r.base[i] <= '}')
putchar(r.base[i]);
else
putchar('.');
}
printf("\n");
}
}
/*%
* Append 'len' bytes of 'text' at '*p', failing with
* ISC_R_NOSPACE if that would advance p past 'end'.
*/
static isc_result_t
append(const char *text, size_t len, char **p, char *end) {
if (*p + len > end)
return (ISC_R_NOSPACE);
memmove(*p, text, len);
*p += len;
return (ISC_R_SUCCESS);
}
static isc_result_t
reverse_octets(const char *in, char **p, char *end) {
const char *dot = strchr(in, '.');
size_t len;
if (dot != NULL) {
isc_result_t result;
result = reverse_octets(dot + 1, p, end);
if (result != ISC_R_SUCCESS)
return (result);
result = append(".", 1, p, end);
if (result != ISC_R_SUCCESS)
return (result);
len = (int) (dot - in);
} else {
len = (int) strlen(in);
}
return (append(in, len, p, end));
}
isc_result_t
get_reverse(char *reverse, size_t len, char *value, bool ip6_int,
bool strict)
{
int r;
isc_result_t result;

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isc_netaddr_t addr;

addr.family = AF_INET6;
r = inet_pton(AF_INET6, value, &addr.type.in6);
if (r > 0) {
    /* This is a valid IPv6 address. */
    dns_fixedname_t fname;
    dns_name_t *name;
    unsigned int options = 0;

    if (ip6_int)
        options |= DNS_BYADDROPT_IPV6INT;
    name = dns_fixedname_initname(&fname);
    result = dns_byaddr_createptrname2(&addr, options, name);
    if (result != ISC_R_SUCCESS)
        return (result);
    dns_name_format(name, reverse, (unsigned int)len);
    return (ISC_R_SUCCESS);
} else {
    /* Not a valid IPv6 address. Assume IPv4.
     * If 'strict' is not set, construct the
     * in-addr.arpa name by blindly reversing
     * octets whether or not they look like integers,
     * so that this can be used for RFC2317 names
     * and such.
     */
    char *p = reverse;
    char *end = reverse + len;
    if (strict && inet_pton(AF_INET, value, &addr.type.in) != 1)
        return (DNS_R_BADDOTTEDQUAD);
    result = reverse_octets(value, &p, end);
    if (result != ISC_R_SUCCESS)
        return (result);
    /* Append .in-addr.arpa. and a terminating NUL. */
    result = append(".in-addr.arpa.", 15, &p, end);
    if (result != ISC_R_SUCCESS)
        return (result);
    return (ISC_R_SUCCESS);
}

void
fatal(const char *format, ...) {
    va_list args;

    fflush(stdout);
    fprintf(stderr, "%s: ", progname);
va_start(args, format);
vfprintf(stderr, format, args);
va_end(args);
fprintf(stderr, "\n");
if (exitcode < 10)
exitcode = 10;
if (fatalexit != 0)
exitcode = fatalexit;
exit(exitcode);
}

void
debug(const char *format, ...) {
va_list args;

isc_time_t t;

if (debugging) {
fflush(stdout);
if (debugtiming) {
TIME_NOW(&t);
fprintf(stderr, "%u.%06u: ", isc_time_seconds(&t),
isc_time_nanoseconds(&t) / 1000);
}
va_start(args, format);
va_end(args);
fprintf(stderr, "\n");
}

void
check_result(isc_result_t result, const char *msg) {
if (result != ISC_R_SUCCESS) {
fatal("%s: %s", msg, isc_result_totext(result));
}
}

/*%
 * Create a server structure, which is part of the lookup structure.
 * This is little more than a linked list of servers to query in hopes
 * of finding the answer the user is looking for
 */
dig_server_t *
make_server(const char *servname, const char *userarg) {
dig_server_t *srv;

REQUIRE(servname != NULL);
debug("make_server(%s)", servname);
srv = isc_mem_allocate(mctx, sizeof(struct dig_server));
if (srv == NULL)
fatal("memory allocation failure in %s:%d",
        __FILE__, __LINE__);
strlcpy(srv->servername, servname, MXNAME);
strlcpy(srv->userarg, userarg, MXNAME);
ISC_LINK_INIT(srv, link);
return (srv);
}

static int
addr2af(int lwresaddrtype)
{
int af = 0;

switch (lwresaddrtype) {
    case LWRES_ADDRTYPE_V4:
        af = AF_INET;
        break;
    case LWRES_ADDRTYPE_V6:
        af = AF_INET6;
        break;
}

return (af);
}

/*% *
 * Create a copy of the server list from the lwres configuration structure.
 * The dest list must have already had ISC_LIST_INIT applied.
 */

static void
copy_server_list(lwres_conf_t *confdata, dig_serverlist_t *dest) {
    dig_server_t *newsrv;
    char tmp[256];
    int af;
    int i;

    debug("copy_server_list()");
    for (i = 0; i < confdata->nsnext; i++) {
        af = addr2af(confdata->nameservers[i].family);

        if (af == AF_INET && !have_ipv4)
            continue;

        if (af == AF_INET6 && !have_ipv6)
lwres_net_ntop(af, confdata->nameservers[i].address, 
    tmp, sizeof(tmp));
if (af == AF_INET6 && confdata->nameservers[i].zone != 0) {
    char buf[sizeof("%4000000000")];
    snprintf(buf, sizeof(buf), "%%%u",
        confdata->nameservers[i].zone);
    strlcat(tmp, buf, sizeof(tmp));
}
newsrv = make_server(tmp, tmp);
ISC_LINK_INIT(newsrv, link);
ISC_LIST_ENQUEUE(*dest, newsrv, link);
}

void
flush_server_list(void) {
    dig_server_t *s, *ps;

dump("flush_server_list()");
    s = ISC_LIST_HEAD(server_list);
    while (s != NULL) {
        ps = s;
        s = ISC_LIST_NEXT(s, link);
        ISC_LIST_DEQUEUE(server_list, ps, link);
        isc_mem_free(mctx, ps);
    }
}

void
set_nameserver(char *opt) {
    isc_result_t result;
    isc_sockaddr_t sockaddr[DIG_MAX_ADDRESSES];
    isc_netaddr_t netaddr;
    int count, i;
    dig_server_t *srv;
    char tmp[ISC_NETADDR_FORMATSIZE];

    if (opt == NULL)
        return;

    result = bind9_getaddresses(opt, 0, sockaddr,
        DIG_MAX_ADDRESSES, &count);
    if (result != ISC_R_SUCCESS)
        fatal("couldn't get address for '%s'; %s",
            opt, isc_result_totext(result));
flush_server_list();

for (i = 0; i < count; i++) {
    isc_netaddr_fromsockaddr(&netaddr, &sockaddrs[i]);
    isc_netaddr_format(&netaddr, tmp, sizeof(tmp));
    srv = make_server(tmp, opt);
    if (srv == NULL)
        fatal("memory allocation failure");
    ISC_LIST_APPEND(server_list, srv, link);
}

static isc_result_t
add_nameserver(lwres_conf_t *confdata, const char *addr, int af) {

    int i = confdata->nsnext;

    if (confdata->nsnext >= LWRES_CONFMAXNAMESERVERS)
        return (ISC_R_FAILURE);

    switch (af) {
    case AF_INET:
        confdata->nameservers[i].family = LWRES_ADDRTYPE_V4;
        confdata->nameservers[i].length = NS_INADDRSZ;
        break;
    case AF_INET6:
        confdata->nameservers[i].family = LWRES_ADDRTYPE_V6;
        confdata->nameservers[i].length = NS_IN6ADDRSZ;
        break;
    default:
        return (ISC_R_FAILURE);
    }

    if (lwres_net_pton(af, addr, &confdata->nameservers[i].address) == 1) {
        confdata->nsnext++;
        return (ISC_R_SUCCESS);
    }

    return (ISC_R_FAILURE);
}

/*%
 * Produce a cloned server list. The dest list must have already had
 * ISC_LIST_INIT applied.
 */

void
clone_server_list(dig_serverlist_t src, dig_serverlist_t *dest) {
    dig_server_t *srv, *newsrv;
debug("clone_server_list()");
sv = ISC_LIST_HEAD(src);
while (sv != NULL) {
    newsrv = make_server(sv->servername, sv->userarg);
    ISC_LINK_INIT(newsrv, link);
    ISC_LIST_ENQUEUE(*dest, newsrv, link);
    sv = ISC_LIST_NEXT(sv, link);
}

/*%
* Create an empty lookup structure, which holds all the information needed
* to get an answer to a user's question. This structure contains two
* linked lists: the server list (servers to query) and the query list
* (outstanding queries which have been made to the listed servers).
*/
dig_lookup_t *
make_empty_lookup(void) {
    dig_lookup_t *looknew;

debug("make_empty_lookup()");

    INSIST(!free_now);

    looknew = isc_mem_allocate(mctx, sizeof(struct dig_lookup));
    if (looknew == NULL)
        fatal("memory allocation failure in %s:%d",
             __FILE__, __LINE__);
    looknew->pending = true;
    looknew->textname[0] = 0;
    looknew->cmdline[0] = 0;
    looknew->rdtype = dns_rdatatype_a;
    looknew->qrdtype = dns_rdatatype_a;
    looknew->rdclass = dns_rdataclass_in;
    looknew->rdtypeset = false;
    looknew->rdclassset = false;
    looknew->sendspace = NULL;
    looknew->sendmsg = NULL;
    looknew->name = NULL;
    looknew->oname = NULL;
    looknew->xfr_q = NULL;
    looknew->current_query = NULL;
    looknew->doing_xfr = false;
    looknew->ixfr_serial = 0;
    looknew->trace = false;
    looknew->trace_root = false;
    looknew->identify = false;
    looknew->identify_previous_line = false;
looknew->ignore = false;
looknew->servfail_stops = true;
looknew->besteffort = true;
looknew->dnssec = false;
looknew->ednsflags = 0;
looknew->opcode =_dns_opcode_query;
looknew->expire = false;
looknew->nsid = false;
looknew->header_only = false;
looknew->sendcookie = false;
looknew->seenbadcookie = false;
looknew->badcookie = true;
#ifdef WITH_IDN_SUPPORT
looknew->idnin = isatty(1)?(getenv("IDN_DISABLE") == NULL):false;
#else
looknew->idnin = false;
#endif
#ifdef WITH_IDN_OUT_SUPPORT
looknew->idnout = looknew->idnin;
#else
looknew->idnout = false;
#endif
#ifdef DIG_SIGCHASE
looknew->sigchase = false;
#else
looknew->sigchase = false;
#endif
#ifdef DIG_SIGCHASE_TD
looknew->do_topdown = false;
looknew->trace_root_sigchase = false;
looknew->rdtype_sigchaseset = false;
looknew->rdtype_sigchase = dns_rdatatype_any;
looknew->qrdtype_sigchase = dns_rdatatype_any;
looknew->rdclass_sigchase = dns_rdataclass_in;
looknew->rdclass_sigchaseset = false;
#endif
looknew->udpsize = 0;
looknew->edns = -1;
looknew->recurse = true;
looknew->aaonly = false;
looknew->adflag = false;
looknew->cdflag = false;
looknew->print_unknown_format = false;
looknew->zflag = false;
looknew->ns_search_only = false;
looknew->origin = NULL;
looknew->tsigctx = NULL;
looknew->querysig = NULL;
looknew->retries = tries;
looknew->nsfound = 0;
looknew->tcp_mode = false;
looknew->tcp_mode_set = false;
looknew->ip6_int = false;
looknew->comments = true;
looknew->stats = true;
looknew->section_question = true;
looknew->section_answer = true;
looknew->section_authority = true;
looknew->section_additional = true;
looknew->new_search = false;
looknew->done_as_is = false;
looknew->need_search = false;
looknew->ecs_addr = NULL;
looknew->cookie = NULL;
looknew->ednsopts = NULL;
looknew->ednsoptscnt = 0;
looknew->ednsneg = true;
looknew->mapped = true;
looknew->dscp = -1;
looknew->eoferr = 0;
dns_fixedname_init(&looknew->fdomain);
ISC_LINK_INIT(looknew, link);
ISC_LIST_INIT(looknew->q);
ISC_LIST_INIT(looknew->connecting);
ISC_LIST_INIT(looknew->my_server_list);
return (looknew);
}

#define EDNSOPT_OPTIONS 100U

static void
cloneopts(dig_lookup_t *looknew, dig_lookup_t *lookold) {
  size_t len = sizeof(looknew->ednsopts[0]) * EDNSOPT_OPTIONS;
  size_t i;
  looknew->ednsopts = isc_mem_allocate(mctx, len);
  if (looknew->ednsopts == NULL)
    fatal("out of memory");
  for (i = 0; i < EDNSOPT_OPTIONS; i++) {
    looknew->ednsopts[i].code = 0;
    looknew->ednsopts[i].length = 0;
    looknew->ednsopts[i].value = NULL;
  }
  looknew->ednsoptscnt = 0;
  if (lookold == NULL || lookold->ednsopts == NULL)
    return;
  for (i = 0; i < lookold->ednsoptscnt; i++) {
    len = lookold->ednsopts[i].length;
    }
if (len != 0) {
    INSIST(lookold->ednsopts[i].value != NULL);
    looknew->ednsopts[i].value =
        isc_mem_allocate(mctx, len);
    if (looknew->ednsopts[i].value == NULL)
        fatal("out of memory");
    memmove(looknew->ednsopts[i].value,
            lookold->ednsopts[i].value, len);
}
looknew->ednsopts[i].code = lookold->ednsopts[i].code;
looknew->ednsopts[i].length = len;
}
looknew->ednsoptscnt = lookold->ednsoptscnt;
}

/*%
* Clone a lookup, perhaps copying the server list.  This does not clone
* the query list, since it will be regenerated by the setup_lookup()
* function, nor does it queue up the new lookup for processing.
* Caution: If you don't clone the servers, you MUST clone the server
* list separately from somewhere else, or construct it by hand.
*/
dig_lookup_t *
clone_lookup(dig_lookup_t *lookold, bool servers) {
    dig_lookup_t *looknew;

dbg("clone_lookup()");

    INSIST(!free_now);

    looknew = make_empty_lookup();
    INSIST(looknew != NULL);
    strlcpy(looknew->textname, lookold->textname, MXNAME);
    #if DIG_SIGCHASE_TD
    strlcpy(looknew->textnamesigchase, lookold->textnamesigchase, MXNAME);
    #endif
    strlcpy(looknew->cmdline, lookold->cmdline, MXNAME);
    looknew->textname[MXNAME-1] = 0;
    looknew->rdtype = lookold->rdtype;
    looknew->qrdtype = lookold->qrdtype;
    looknew->rdclass = lookold->rdclass;
    looknew->rdtypeset = lookold->rdtypeset;
    looknew->rdclassset = lookold->rdclassset;
    looknew->doing_xfr = lookold->doing_xfr;
    looknew->ixfr_serial = lookold->ixfr_serial;
    looknew->trace = lookold->trace;
    looknew->trace_root = lookold->trace_root;
    looknew->identify = lookold->identify;
looknew->identify_previous_line = lookold->identify_previous_line;
looknew->ignore = lookold->ignore;
looknew->servfail_stops = lookold->servfail_stops;
looknew->besteffort = lookold->besteffort;
looknew->dnssec = lookold->dnssec;
looknew->ednsflags = lookold->ednsflags;
looknew->opcode = lookold->opcode;
looknew->expire = lookold->expire;
looknew->nsid = lookold->nsid;
looknew->besteffort = lookold->besteffort;
looknew->dnssec = lookold->dnssec;
looknew->ednsflags = lookold->ednsflags;
looknew->opcode = lookold->opcode;
looknew->expire = lookold->expire;
looknew->nsid = lookold->nsid;
looknew->header_only = lookold->header_only;
looknew->sendcookie = lookold->sendcookie;
looknew->seenbadcookie = lookold->seenbadcookie;
looknew->badcookie = lookold->badcookie;
looknew->cookie = lookold->cookie;
if (lookold->ednsopts != NULL) {
    cloneopts(looknew, lookold);
} else {
    looknew->ednsopts = NULL;
    looknew->ednsoptscnt = 0;
}
looknew->ednsneg = lookold->ednsneg;
looknew->mapped = lookold->mapped;
looknew->idnin = lookold->idnin;
looknew->idnout = lookold->idnout;
#endif
looknew->sigchase = lookold->sigchase;
#endif
looknew->do_topdown = lookold->do_topdown;
looknew->trace_root_sigchase = lookold->trace_root_sigchase;
looknew->rdtype_sigchaseset = lookold->rdtype_sigchaseset;
looknew->rdclass_sigchase = lookold->rdclass_sigchase;
looknew->qrdtype_sigchase = lookold->qrdtype_sigchase;
looknew->rdclass_sighache = lookold->rdclass_sighache;
looknew->rdclass_sighacheset = lookold->rdclass_sighacheset;
#endif
looknew->udpsize = lookold->udpsize;
looknew->edns = lookold->edns;
looknew->recurse = lookold->recurse;
looknew->aaonly = lookold->aaonly;
looknew->adflag = lookold->adflag;
looknew->cdflag = lookold->cdflag;
looknew->print_unknown_format = lookold->print_unknown_format;
looknew->zflag = lookold->zflag;
looknew->ns_search_only = lookold->ns_search_only;
looknew->tcp_mode = lookold->tcp_mode;
looknew->tcp_mode_set = lookold->tcp_mode_set;
looknew->comments = lookold->comments;
looknew->stats = lookold->stats;
looknew->section_question = lookold->section_question;
looknew->section_answer = lookold->section_answer;
looknew->section_authority = lookold->section_authority;
looknew->section_additional = lookold->section_additional;
looknew->origin = lookold->origin;
looknew->retries = lookold->retries;
looknew->tsigctx = NULL;
looknew->need_search = lookold->need_search;
looknew->done_as_is = lookold->done_as_is;
looknew->dscp = lookold->dscp;
looknew->eoferr = lookold->eoferr;

if (lookold->ecs_addr != NULL) {
    size_t len = sizeof(isc_sockaddr_t);
    looknew->ecs_addr = isc_mem_allocate(mctx, len);
    if (looknew->ecs_addr == NULL)
        fatal("out of memory");
    memmove(looknew->ecs_addr, lookold->ecs_addr, len);
}

dns_name_copy(dns_fixedname_name(&lookold->fdomain),
               dns_fixedname_name(&looknew->fdomain), NULL);

if (servers)
    clone_server_list(lookold->my_server_list,
                     &looknew->my_server_list);
return (looknew);
}

/*%
 * Requeue a lookup for further processing, perhaps copying the server
 * list. The new lookup structure is returned to the caller, and is
 * queued for processing. If servers are not cloned in the requeue, they
 * must be added before allowing the current event to complete, since the
 * completion of the event may result in the next entry on the lookup
 * queue getting run.
 */

dig_lookup_t *
requeue_lookup(dig_lookup_t *lookold, bool servers) {
    dig_lookup_t *looknew;

dbg("requeue_lookup()");

    lookup_counter++;
    if (lookup_counter > LOOKUP_LIMIT)
        fatal("too many lookups");
void
setup_text_key(void)
{
    isc_result_t result;
    dns_name_t keyname;
    isc_buffer_t secretbuf;
    unsigned int secretsize;
    unsigned char *secretstore;

dbug("setup_text_key()");
result = isc_buffer_allocate(mctx, &namebuf, MXNAME);
check_result(result, "isc_buffer_allocate");
dns_name_init(&keyname, NULL);
check_result(result, "dns_name_init");
isc_buffer_putstr(namebuf, keynametext);
secretsize = (unsigned int) strlen(keysecret) * 3 / 4;
secretstore = isc_mem_allocate(mctx, secretsize);
if (secretstore == NULL)
fatal("memory allocation failure in %s:%d",
    __FILE__, __LINE__);  
isc_buffer_init(&secretbuf, secretstore, secretsize);
result = isc_base64_decodestring(keysecret, &secretbuf);
if (result != ISC_R_SUCCESS)
goto failure;
secretsize = isc_buffer_usedlength(&secretbuf);

if (hmacname == NULL) {
    result = DST_R_UNSUPPORTEDALG;
goto failure;
}
result = dns_name_fromtext(&keyname, namebuf, dns_rootname, 0, namebuf);
if (result != ISC_R_SUCCESS)
goto failure;

result = dns_tsigkey_create(&keyname, hmacname, secretstore,
(int)secretsize, false, NULL, 0, 0,
    mctx, NULL, &tsigkey);

failure:
if (result != ISC_R_SUCCESS)
    printf(";; Couldn't create key %s: %s\n",
          keynametext, isc_result_totext(result));
else
dst_key_setbits(tsigkey->key, digestbits);

isc_mem_free(mctx, secretstore);
dns_name_invalidate(&keyname);
isc_buffer_free(&namebuf);
}

static isc_result_t
parse_uint_helper(uint32_t *uip, const char *value, uint32_t max,
    const char *desc, int base) {
    uint32_t n;
    isc_result_t result = isc_parse_uint32(&n, value, base);
    if (result == ISC_R_SUCCESS && n > max)
        result = ISC_R_RANGE;
    if (result != ISC_R_SUCCESS) {
        printf("invalid %s '%s': %s\n", desc,
          value, isc_result_totext(result));
        return (result);
    }
    *uip = n;
    return (ISC_R_SUCCESS);
}

isc_result_t
parse_uint(uint32_t *uip, const char *value, uint32_t max,
    const char *desc) {
    return (parse_uint_helper(uip, value, max, desc, 10));
}

isc_result_t
parse_xint(uint32_t *uip, const char *value, uint32_t max,
    const char *desc) {
    return (parse_uint_helper(uip, value, max, desc, 0));
}

static uint32_t
parse_bits(char *arg, const char *desc, uint32_t max) {
    isc_result_t result;
    uint32_t tmp;

    result = parse_uint(&tmp, arg, max, desc);
if (result != ISC_R_SUCCESS)
    fatal("couldn't parse digest bits");
    tmp = (tmp + 7) & ~0x7U;
    return (tmp);
}

isc_result_t
parse_netprefix(isc_sockaddr_t **sap, const char *value) {
    isc_result_t result = ISC_R_SUCCESS;
    isc_sockaddr_t *sa = NULL;
    struct in_addr in4;
    struct in6_addr in6;
    uint32_t prefix_length = 0xffffffff;
    char *slash = NULL;
    bool parsed = false;
    bool prefix_parsed = false;

    REQUIRE(sap != NULL && *sap == NULL);

    if (strlcpy(buf, value, sizeof(buf)) >= sizeof(buf))
        fatal("invalid prefix '%s'", value);

    sa = isc_mem_allocate(mctx, sizeof(*sa));
    if (sa == NULL)
        fatal("out of memory");
    memset(sa, 0, sizeof(*sa));

    if (strcmp(buf, "0") == 0) {
        sa->type.sa.sa_family = AF_UNSPEC;
        prefix_length = 0;
        goto done;
    }

    slash = strchr(buf, '/');
    if (slash != NULL) {
        *slash = '\0';
        result = isc_parse_uint32(&prefix_length, slash + 1, 10);
        if (result != ISC_R_SUCCESS) {
            fatal("invalid prefix length in '%s': %s", value, isc_result_totext(result));
            value, isc_result_totext(result));
        }
        prefix_parsed = true;
    }

    if (inet_pton(AF_INET6, buf, &in6) == 1) {
        parsed = true;
        isc_sockaddr_fromin6(sa, &in6, 0);
        goto done;
    }

done: ...
if (prefix_length > 128)
    prefix_length = 128;
} else if (inet_pton(AF_INET, buf, &in4) == 1) {
parsed = true;
isc_sockaddr_fromin(sa, &in4, 0);
if (prefix_length > 32)
    prefix_length = 32;
} else if (prefix_parsed) {
    int i;

    for (i = 0; i < 3 && strlen(buf) < sizeof(buf) - 2; i++) {
        strlcat(buf, ".0", sizeof(buf));
        if (inet_pton(AF_INET, buf, &in4) == 1) {
            parsed = true;
            isc_sockaddr_fromin(sa, &in4, 0);
            break;
        }
    }

    if (prefix_length > 32)
        prefix_length = 32;
}

if (!parsed)
fatal("invalid address '%s'", value);

done:
    sa->length = prefix_length;
    *sap = sa;

    return (ISC_R_SUCCESS);
}

/*
 * Parse HMAC algorithm specification
 */
void
parse_hmac(const char *hmac) {
    char buf[20];
    size_t len;

    REQUIRE(hmac != NULL);

    len = strlen(hmac);
    if (len >= sizeof(buf))
        fatal("unknown key type ".s", (int)len, hmac);
    strcpy(buf, hmac, sizeof(buf));
digestbits = 0;

#ifndef PK11_MD5_DISABLE
if (strcasecmp(buf, "hmac-md5") == 0) {
hmacname = DNS_TSIG_HMACMD5_NAME;
} else if (strncasecmp(buf, "hmac-md5", 9) == 0) {
hmacname = DNS_TSIG_HMACMD5_NAME;
digestbits = parse_bits(&buf[9], "digest-bits [0..128]", 128);
} else
#endif
if (strcasecmp(buf, "hmac-sha1") == 0) {
hmacname = DNS_TSIG_HMACSHA1_NAME;
digestbits = 0;
} else if (strncasecmp(buf, "hmac-sha1-", 10) == 0) {
hmacname = DNS_TSIG_HMACSHA1_NAME;
digestbits = parse_bits(&buf[10], "digest-bits [0..160]", 160);
} else if (strncasecmp(buf, "hmac-sha224") == 0) {
hmacname = DNS_TSIG_HMACSHA224_NAME;
} else if (strncasecmp(buf, "hmac-sha224-", 12) == 0) {
hmacname = DNS_TSIG_HMACSHA224_NAME;
digestbits = parse_bits(&buf[12], "digest-bits [0..224]", 224);
} else if (strncasecmp(buf, "hmac-sha256") == 0) {
hmacname = DNS_TSIG_HMACSHA256_NAME;
} else if (strncasecmp(buf, "hmac-sha256-", 12) == 0) {
hmacname = DNS_TSIG_HMACSHA256_NAME;
digestbits = parse_bits(&buf[12], "digest-bits [0..256]", 256);
} else if (strncasecmp(buf, "hmac-sha384") == 0) {
hmacname = DNS_TSIG_HMACSHA384_NAME;
} else if (strncasecmp(buf, "hmac-sha384-", 12) == 0) {
hmacname = DNS_TSIG_HMACSHA384_NAME;
digestbits = parse_bits(&buf[12], "digest-bits [0..384]", 384);
} else if (strncasecmp(buf, "hmac-sha512") == 0) {
hmacname = DNS_TSIG_HMACSHA512_NAME;
} else if (strncasecmp(buf, "hmac-sha512-", 12) == 0) {
hmacname = DNS_TSIG_HMACSHA512_NAME;
digestbits = parse_bits(&buf[12], "digest-bits [0..512]", 512);
} else {
fprintf(stderr, ";; Warning, ignoring 
"invalid TSIG algorithm %s\n", buf);
}
 */
* Get a key from a named.conf format keyfile */
static isc_result_t
read_confkey(void) {
cfg_parser_t *pctx = NULL;

cfg_obj_t *file = NULL;
const cfg_obj_t *keyobj = NULL;
const cfg_obj_t *secretobj = NULL;
const cfg_obj_t *algorithmobj = NULL;
const char *keyname;
const char *secretstr;
const char *algorithm;
isc_result_t result;

if (! isc_file_exists(keyfile))
    return (ISC_R_FILENOTFOUND);

result = cfg_parser_create(mctx, NULL, &pctx);
if (result != ISC_R_SUCCESS)
goto cleanup;

result = cfg_parse_file(pctx, keyfile, &cfg_type_sessionkey,
&file);
if (result != ISC_R_SUCCESS)
goto cleanup;

result = cfg_map_get(file, "key", &keyobj);
if (result != ISC_R_SUCCESS)
goto cleanup;

(void) cfg_map_get(keyobj, "secret", &secretobj);
(void) cfg_map_get(keyobj, "algorithm", &algorithmobj);
if (secretobj == NULL || algorithmobj == NULL)
fatal("key must have algorithm and secret");

keyname = cfg_obj_asstring(cfg_map_getname(keyobj));
secretstr = cfg_obj_asstring(secretobj);
algorithm = cfg_obj_asstring(algorithmobj);

strlcpy(keynametext, keyname, sizeof(keynametext));
strlcpy(keysecret, secretstr, sizeof(keysecret));
parse_hmac(algorithm);
setup_text_key();

cleanup:
if (pctx != NULL) {
    if (file != NULL)
        cfg_obj_destroy(pctx, &file);
    cfg_parser_destroy(&pctx);
}

return (result);
void
setup_file_key(void) {
isc_result_t result;
dst_key_t *dstkey = NULL;

debug("setup_file_key()");

/* Try reading the key from a K* pair */
result = dst_key_fromnamedfile(keyfile, NULL,
    DST_TYPE_PRIVATE | DST_TYPE_KEY, mctx,
    &dstkey);

/* If that didn't work, try reading it as a session.key keyfile */
if (result != ISC_R_SUCCESS) {
    result = read_confkey();
    if (result == ISC_R_SUCCESS)
        return;
}

if (result != ISC_R_SUCCESS) {
    fprintf(stderr, "Couldn't read key from %s: %s\n",
        keyfile, isc_result_totext(result));
    goto failure;
}

switch (dst_key_alg(dstkey)) {
#ifndef PK11_MD5_DISABLE
    case DST_ALG_HMACMD5:
        hmacname = DNS_TSIG_HMACMD5_NAME;
        break;
#endif
    case DST_ALG_HMACSHA1:
        hmacname = DNS_TSIG_HMACSHA1_NAME;
        break;
    case DST_ALG_HMACSHA224:
        hmacname = DNS_TSIG_HMACSHA224_NAME;
        break;
    case DST_ALG_HMACSHA256:
        hmacname = DNS_TSIG_HMACSHA256_NAME;
        break;
    case DST_ALG_HMACSHA384:
        hmacname = DNS_TSIG_HMACSHA384_NAME;
        break;
    case DST_ALG_HMACSHA512:
        hmacname = DNS_TSIG_HMACSHA512_NAME;
        break;
    default:
printf(";; Couldn't create key %s: bad algorithm\n", keynametext);
goto failure;
}
result = dns_tsigkey_createfromkey(dst_key_name(dstkey), hmacname, dstkey, false, NULL, 0, 0, mctx, NULL, &tsigkey);
if (result != ISC_R_SUCCESS) {
    printf(";; Couldn't create key %s: %s\n", keynametext, isc_result_totext(result));
goto failure;
}
}
failure:
if (dstkey != NULL) dst_key_free(&dstkey);
}

static dig_searchlist_t *
make_searchlist_entry(char *domain) {
    dig_searchlist_t *search;
    search = isc_mem_allocate(mctx, sizeof(*search));
    if (search == NULL)
        fatal("memory allocation failure in %s:%d", __FILE__, __LINE__);
    strlcpy(search->origin, domain, MXNAME);
    search->origin[MXNAME-1] = 0;
    ISC_LINK_INIT(search, link);
    return (search);
}

static void
create_search_list(lwres_conf_t *confdata) {
    int i;
    dig_searchlist_t *search;

debug("create_search_list()");
clear_searchlist();

    for (i = 0; i < confdata->searchnxt; i++) {


search = make_searchlist_entry(confdata->search[i]);
ISC_LIST_APPEND(search_list, search, link);
}
}

/*%
 * Setup the system as a whole, reading key information and resolv.conf
 * settings.
 */
void
setup_system(bool ipv4only, bool ipv6only) {
dig_searchlist_t *domain = NULL;
lwres_result_t lwresult;
unsigned int lwresflags;
isc_result_t result;

dbg("setup_system()");

if (ipv4only) {
if (have_ipv4) {
isc_net_disableipv6();
have_ipv6 = false;
} else {
fatal("can't find IPv4 networking");
}
}

if (ipv6only) {
if (have_ipv6) {
isc_net_disableipv4();
have_ipv4 = false;
} else {
fatal("can't find IPv6 networking");
}
}

lwresflags = LWRES_CONTEXT_SERVERMODE;
if (have_ipv4)
lwresflags |= LWRES_CONTEXT_USEIPV4;
if (have_ipv6)
lwresflags |= LWRES_CONTEXT_USEIPV6;

lwresult = lwres_context_create(&lwctx, mctx, mem_alloc, mem_free,
lwresflags);
if (lwresult != LWRES_R_SUCCESS)
fatal("lwres_context_create failed");

lwresult = lwres_conf_parse(lwctx, RESOLV_CONF);
if (lwresult != LWRES_R_SUCCESS && lwresult != LWRES_R_NOTFOUND)
fatal("parse of %s failed", RESOLV_CONF);

lwconf = lwres_conf_get(lwctx);

/* Make the search list */
if (lwconf->searchnxt > 0)
create_search_list(lwconf);
else { /* No search list. Use the domain name if any */
if (lwconf->domainname != NULL) {
    domain = make_searchlist_entry(lwconf->domainname);
    ISC_LIST_APPEND(search_list, domain, link);
    domain = NULL;
}
}

if (lwconf->resdebug) {
    verbose = true;
    debug("verbose is on");
}
if (ndots == -1) {
    ndots = lwconf->ndots;
    debug("ndots is %d.", ndots);
}
if (lwconf->attempts) {
    tries = lwconf->attempts + 1;
    if (tries < 2)
        tries = 2;
    debug("tries is %d.", tries);
}
if (lwconf->timeout) {
    timeout = lwconf->timeout;
    debug("timeout is %d.", timeout);
}

/* If user doesn’t specify server use nameservers from resolv.conf. */
if (ISC_LIST_EMPTY(server_list))
copy_server_list(lwconf, &server_list);

/* If we don’t find a nameserver fall back to localhost */
if (ISC_LIST_EMPTY(server_list)) {
    if (have_ipv4) {
        lwresult = add_nameserver(lwconf, "127.0.0.1", AF_INET);
        if (lwresult != ISC_R_SUCCESS)
            fatal("add_nameserver failed");
    }
    if (have_ipv6) {
        lwresult = add_nameserver(lwconf, ":1", AF_INET6);
    }
if (lwresult != ISC_R_SUCCESS)
  fatal("add_nameserver failed");
}
copy_server_list(lwconf, &server_list);
}

#ifdef HAVE_SETLOCALE
/* Set locale */
(void)setlocale(LC_ALL, "");
#endif

#ifdef WITH_IDN_SUPPORT
idn_initialize();
#endif

#ifdef WITH_IDN_OUT_SUPPORT
/* Set domain name -> text post-conversion filter. */
result = dns_name_settotextfilter(output_filter);
check_result(result, "dns_name_settotextfilter");
#endif

if (keyfile[0] != 0)
  setup_file_key();
else if (keysecret[0] != 0)
  setup_text_key();
#ifdef DIG_SIGCHASE
/* Setup the list of messages for +sigchase */
ISC_LIST_INIT(chase_message_list);
ISC_LIST_INIT(chase_message_list2);
dns_name_init(&chase_name, NULL);
#ifdef DIG_SIGCHASE_TD
  dns_name_init(&chase_current_name, NULL);
dns_name_init(&chase_authority_name, NULL);
#endif
#ifdef DIG_SIGCHASE_BU
  dns_name_init(&chase_signame, NULL);
#endif
#endif
result = isc_entropy_getdata(entp, cookie_secret,
    sizeof(cookie_secret), NULL, 0);
if (result != ISC_R_SUCCESS)
  fatal("unable to generate cookie secret");
}

/*%
 * Override the search list derived from resolv.conf by 'domain'.
*/
/**
void set_search_domain(char *domain) {
  dig_searchlist_t *search;

clear_searchlist();
search = make_searchlist_entry(domain);
ISC_LIST_APPEND(search_list, search, link);
}

/**%
* Setup the ISC and DNS libraries for use by the system.
*/
void setup_libs(void) {
  isc_result_t result;
  isc_logconfig_t *logconfig = NULL;

debug("setup_libs()");

#ifdef PKCS11CRYPTO
pk11_result_register();
#endif
  dns_result_register();

  result = isc_net_probeipv4();
  if (result == ISC_R_SUCCESS)
    have_ipv4 = true;

  result = isc_net_probeipv6();
  if (result == ISC_R_SUCCESS)
    have_ipv6 = true;
  if (!have_ipv6 && !have_ipv4)
    fatal("can't find either v4 or v6 networking");

  result = isc_mem_create(0, 0, &mctx);
  check_result(result, "isc_mem_create");
  isc_mem_setname(mctx, "dig", NULL);

  result = isc_log_create(mctx, &lctx, &logconfig);
  check_result(result, "isc_log_create");

  isc_log_setcontext(lctx);
  dns_log_init(lctx);
  dns_log_setcontext(lctx);

  result = isc_log_usechannel(logconfig, "default_debug", NULL, NULL);
  check_result(result, "isc_log_usechannel");
isc_log_setdebuglevel(lctx, 0);

result = isc_taskmgr_create(mctx, 1, 0, &taskmgr);
check_result(result, "isc_taskmgr_create");

result = isc_task_create(taskmgr, 0, &global_task);
check_result(result, "isc_task_create");
isc_task_setname(global_task, "dig", NULL);

result = isc_timermgr_create(mctx, &timermgr);
check_result(result, "isc_timermgr_create");

result = isc_socketmgr_create(mctx, &socketmgr);
check_result(result, "isc_socketmgr_create");

result = isc_entropy_create(mctx, &entp);
check_result(result, "isc_entropy_create");

result = dst_lib_init(mctx, entp, 0);
check_result(result, "dst_lib_init");
is_dst_up = true;

result = isc_mempool_create(mctx, COMMSIZE, &commctx);
check_result(result, "isc_mempool_create");
isc_mempool_setname(commctx, "COMMPool");
/*
 * 6 and 2 set as reasonable parameters for 3 or 4 nameserver
 * systems.
 */
isc_mempool_setfreemax(commctx, 6);
isc_mempool_setfillcount(commctx, 2);

result = isc_mutex_init(&lookup_lock);
check_result(result, "isc_mutex_init");
}

typedef struct dig_ednsoptname {
    uint32_t code;
    const char *name;
} dig_ednsoptname_t;

dig_ednsoptname_t optnames[] = {
    { 3, "NSID" },/*@ RFC 5001 */
    { 5, "DAU" },/*@ RFC 6975 */
    { 6, "DHU" },/*@ RFC 6975 */
    { 7, "N3U" },/*@ RFC 6975 */
    { 8, "ECS" },/*@ RFC 7871 */
}
{ 9, "EXPIRE" },/* RFC 7314 */
{ 10, "COOKIE" },/* RFC 7873 */
{ 11, "KEEPALIVE" },/* RFC 7828 */
{ 12, "PADDING" },/* RFC 7830 */
{ 12, "PAD" },/* shorthand */
{ 13, "CHAIN" },/* RFC 7901 */
{ 14, "KEY-TAG" },/* RFC 8145 */
{ 16, "CLIENT-TAG" },/* draft-bellis-dnsop-edns-tags */
{ 17, "SERVER-TAG" },/* draft-bellis-dnsop-edns-tags */
{ 26946, "DEVICEID" },/* Brian Hartvigsen */
};

#define N_EDNS_OPTNAMES (sizeof(optnames) / sizeof(optnames[0]))

void
save_opt(dig_lookup_t *lookup, char *code, char *value) {
    isc_result_t result;
    uint32_t num = 0;
    isc_buffer_t b;
    bool found = false;
    unsigned int i;

    if (lookup->ednsoptscnt >= EDNSOPT_OPTIONS)
        fatal("too many ednsopts");

    for (i = 0; i < N_EDNS_OPTNAMES; i++) {
        if (strcasecmp(code, optnames[i].name) == 0) {
            num = optnames[i].code;
            found = true;
            break;
        }
    }

    if (!found) {
        result = parse_uint(&num, code, 65535, "ednsopt");
        if (result != ISC_R_SUCCESS)
            fatal("bad edns code point: %s", code);
    }

    if (lookup->ednsopts == NULL) {
        cloneopts(lookup, NULL);
    }

    if (lookup->ednsopts[lookup->ednsoptscnt].value != NULL)
        isc_mem_free(mctx, lookup->ednsopts[lookup->ednsoptscnt].value);

    lookup->ednsopts[lookup->ednsoptscnt].code = num;
    lookup->ednsopts[lookup->ednsoptscnt].length = 0;
lookup->ednsopts[lookup->ednsoptscnt].value = NULL;

if (value != NULL) {
    char *buf;
    buf = isc_mem_allocate(mctx, strlen(value)/2 + 1);
    if (buf == NULL)
        fatal("out of memory");
    isc_buffer_init(&b, buf, (unsigned int) strlen(value)/2 + 1);
    result = isc_hex_decodestring(value, &b);
    check_result(result, "isc_hex_decodestring");
    lookup->ednsopts[lookup->ednsoptscnt].value =
        isc_buffer_base(&b);
    lookup->ednsopts[lookup->ednsoptscnt].length =
        isc_buffer_usedlength(&b);
}
lookup->ednsoptscnt++;
}

/*%
 * Add EDNS0 option record to a message. Currently, the only supported
 * options are UDP buffer size, the DO bit, and EDNS options
 * (e.g., NSID, COOKIE, client-subnet)
 */
static void
add_opt(dns_message_t *msg, uint16_t udpsize, uint16_t edns,
        unsigned int flags, dns_ednsopt_t *opts, size_t count)
{
    dns_rdataset_t *rdataset = NULL;
    isc_result_t result;

dbg("add_opt()");
    result = dns_message_buildopt(msg, &rdataset, edns, udpsize, flags,
        opts, count);
    check_result(result, "dns_message_buildopt");
    result = dns_message_setopt(msg, rdataset);
    check_result(result, "dns_message_setopt");
}

/*%
 * Add a question section to a message, asking for the specified name,
 * type, and class.
 */
static void
add_question(dns_message_t *message, dns_name_t *name,
             dns_rdataclass_t rdclass, dns_rdatatype_t rdtype)
{
    dns_rdataset_t *rdataset;

isc_result_t result;

d debug("add_question()");
rdataset = NULL;
result = dns_message_gettemp(rdataset(message, &rdataset));
check_result(result, "dns_message_gettemp()" );
dns_rdataset_makequestion(rdataset, rdclass, rdtype);
ISC_LIST_APPEND(name->list, rdataset, link);
}

/*%
 * Check if we're done with all the queued lookups, which is true iff
 * all sockets, sends, and recvs are accounted for (counters == 0),
 * and the lookup list is empty.
 * If we are done, pass control back out to dighost_shutdown() (which is
 * part of dig.c, host.c, or nslookup.c) to either shutdown the system as
 * a whole or reseed the lookup list.
 */
static void
check_if_done(void) {
  debug("check_if_done()");
d debug("list %s", ISC_LIST_EMPTY(lookup_list) ? "empty" : "full");
if (ISC_LIST_EMPTY(lookup_list) && current_lookup == NULL &&
    sendcount == 0) {
  INSIST(sockcount == 0);
  INSIST(revcvcount == 0);
  debug("shutting down");
dighost_shutdown();
}

/*%
 * Clear out a query when we're done with it.  WARNING: This routine
 * WILL invalidate the query pointer.
 */
static void
clear_query(dig_query_t *query) {
  dig_lookup_t *lookup;

  REQUIRE(query != NULL);

d debug("clear_query%p", query);
if (query->timer != NULL)
  isc_timer_detach(&query->timer);
lookup = query->lookup;

if (lookup->current_query == query)
lookup->current_query = NULL;

if (ISC_LINK_LINKED(query, link))
ISC_LIST_UNLINK(lookup->q, query, link);
if (ISC_LINK_LINKED(query, clink))
ISC_LIST_UNLINK(lookup->connecting, query, clink);
if (ISC_LINK_LINKED(&query->recvbuf, link))
ISC_LIST_DEQUEUE(query->recvlist, &query->recvbuf, link);
if (ISC_LINK_LINKED(&query->lengthbuf, link))
ISC_LIST_DEQUEUE(query->lengthlist, &query->lengthbuf, link);
INSIST(query->recvspace != NULL);

if (query->sock != NULL) {
    isc_socket_detach(&query->sock);
    sockcount--;
    debug("sockcount=%d", sockcount);
}
isc_mempool_put(commctx, query->recvspace);
isc_buffer_invalidate(&query->recvbuf);
isc_buffer_invalidate(&query->lengthbuf);
if (query->waiting_senddone)
    query->pending_free = true;
else
    isc_mem_free(mctx, query);
}

/*%
 * Try and clear out a lookup if we're done with it. Return true if
 * the lookup was successfully cleared. If true is returned, the
 * lookup pointer has been invalidated.
 */
static bool
try_clear_lookup(dig_lookup_t *lookup) {
    dig_query_t *q;

    REQUIRE(lookup != NULL);

dbglp("try_clear_lookup(%p)", lookup);

    if (ISC_LIST_HEAD(lookup->q) != NULL ||
       ISC_LIST_HEAD(lookup->connecting) != NULL)
        {
        if (debugging) {
            q = ISC_LIST_HEAD(lookup->q);
            while (q != NULL) {
                debug("query to %s still pending", q->servname);
        }
q = ISC_LIST_NEXT(q, link);
}

q = ISC_LIST_HEAD(lookup->connecting);
while (q != NULL) {
    debug("query to %s still connecting",
          q->servname);
    q = ISC_LIST_NEXT(q, clink);
}
return (false);
}

/*
  * At this point, we know there are no queries on the lookup,
  * so can make it go away also.
  */
destroy_lookup(lookup);
return (true);
}

void
destroy_lookup(dig_lookup_t *lookup) {
    dig_server_t *s;
    void *ptr;

destroy;
    s = ISC_LIST_HEAD(lookup->my_server_list);
    while (s != NULL) {
        debug("freeing server %p belonging to %p", s, lookup);
        ptr = s;
        s = ISC_LIST_NEXT(s, link);
        ISC_LIST_DEQUEUE(lookup->my_server_list,
                         (dig_server_t *)ptr, link);
        isc_mem_free(mctx, ptr);
    }
    if (lookup->sendmsg != NULL)
        dns_message_destroy(&lookup->sendmsg);
    if (lookup->querysig != NULL) {
        debug("freeing buffer %p", lookup->querysig);
        isc_buffer_free(&lookup->querysig);
    }
    if (lookup->sendspace != NULL)
        isc_mempool_put(commctx, lookup->sendspace);
    if (lookup->tsigctx != NULL)
        dst_context_destroy(&lookup->tsigctx);
if (lookup->ecs_addr != NULL)
isc_mem_free(mctx, lookup->ecs_addr);

if (lookup->ednsopts != NULL) {
size_t i;
for (i = 0; i < EDNSOPT_OPTIONS; i++) {
if (lookup->ednsopts[i].value != NULL)
isc_mem_free(mctx, lookup->ednsopts[i].value);
}
isc_mem_free(mctx, lookup->ednsopts);
}

isc_mem_free(mctx, lookup);
}

/*%
 * If we can, start the next lookup in the queue running.
 * This assumes that the lookup on the head of the queue hasn't been
 * started yet. It also removes the lookup from the head of the queue,
 * setting the current_lookup pointer pointing to it.
 */
void
start_lookup(void) {
d debug("start_lookup()");
if (cancel_now)
return;

/*
 * If there's a current lookup running, we really shouldn't get
 * here.
 */
INSIST(current_lookup == NULL);

current_lookup = ISC_LIST_HEAD(lookup_list);
/*
 * Put the current lookup somewhere so cancel_all can find it
 */
if (current_lookup != NULL) {
ISC_LIST_DEQUEUE(lookup_list, current_lookup, link);
#if DIG_SIGCHASE_TD
if (current_lookup->do_topdown &&
 !current_lookup->rdtype_sigchaseset) {
    dst_key_t *dstkey = NULL;
    isc_buffer_t *b = NULL;
    isc_region_t r;
    isc_result_t result;
    dns_name_t query_name;
    dns_name_t *key_name;
    */
}
int i;

result = get_trusted_key();
if (result != ISC_R_SUCCESS) {
    printf("\n; No trusted key, ",
    "+sigchase option is disabled\n");
    current_lookup->sigchase = false;
    goto novalidation;
}
dns_name_init(&query_name, NULL);
nameFromString(current_lookup->textname, &query_name);

for (i = 0; i < tk_list.nb_tk; i++) {
    key_name = dst_key_name(tk_list.key[i]);
    /*
     * Verify temp is really the lowest
     * WARNING
     */
}
if (dstkey == NULL) {
    printf("\n; The queried zone: ",
    dns_name_print(&query_name, stdout);
    printf(" isn't a subdomain of any Trusted Keys" 
    "; +sigchase option is disabled\n");
    current_lookup->sigchase = false;
    free_name(&query_name);
    goto novalidation;
}
free_name(&query_name);

current_lookup->rdtype_sigchase
    = current_lookup->rdtype;
current_lookup->rdtype_sigchaseset
    = current_lookup->rdtypeset;
current_lookup->rdtype = dns_rdatatype_ns;

current_lookup->qrdtype_sigchase
    = current_lookup->qrdtype;
current_lookup->qrdtype = dns_rdatatype_ns;

current_lookup->rdclass_sigchase
    = current_lookup->rdclass;
current_lookup->rdclass_sigchaseset
    = current_lookup->rdclassset;
current_lookup->rdclass = dns_rdataclass_in;

strlcpy(current_lookup->textnamesigchase, current_lookup->textname, MXNAME);

current_lookup->trace_root_sigchase = true;

result = isc_buffer_allocate(mctx, &b, BUFSIZE);
check_result(result, "isc_buffer_allocate");
result = dns_name_totext(dst_key_name(dstkey), false, b);
check_result(result, "dns_name_totext");
isc_buffer_usedregion(b, &r);
r.base[r.length] = '\0';
strlcpy(current_lookup->textname, (char*)r.base, MXNAME);
isc_buffer_free(&b);

nameFromString(current_lookup->textnamesigchase, &chase_name);

dns_name_init(&chase_authority_name, NULL);
}

novalidation:
#endif
if (setup_lookup(current_lookup))
do_lookup(current_lookup);
else if (next_origin(current_lookup))
check_next_lookup(current_lookup);
} else {
check_if_done();
}

/*% *
 * If we can, clear the current lookup and start the next one running.
 * This calls try_clear_lookup, so may invalidate the lookup pointer.
 */
static void
check_next_lookup(dig_lookup_t *lookup) {

INSIST(!free_now);

dump("check_next_lookup(%p)", lookup);

if (ISC_LIST_HEAD(lookup->q) != NULL) {
    dump("still have a worker");
    return;
}
if (try_clear_lookup(lookup)) {
    current_lookup = NULL;
    start_lookup();
}

/*%
* Create and queue a new lookup as a followup to the current lookup,
* based on the supplied message and section. This is used in trace and
* name server search modes to start a new lookup using servers from
* NS records in a reply. Returns the number of followup lookups made.
*/
static int
followup_lookup(dns_message_t *msg, dig_query_t *query, dns_section_t section)
{
    dig_lookup_t *lookup = NULL;
    dig_server_t *srv = NULL;
    dns_rdataset_t *rdataset = NULL;
    dns_rdata_t rdata = DNS_RDATA_INIT;
    dns_name_t *name = NULL;
    isc_result_t result;
    bool success = false;
    int numLookups = 0;
    int num;
    isc_result_t lresult, addresses_result;
    char bad_namestr[DNS_NAME_FORMATSIZE];
    dns_name_t *domain;
    bool horizontal = false, bad = false;

    INSIST(!free_now);

    debug("following up %s", query->lookup->textname);

    addresses_result = ISC_R_SUCCESS;
    bad_namestr[0] = '\0';
    for (result = dns_message_firstname(msg, section);
         result == ISC_R_SUCCESS;
         result = dns_message_nextname(msg, section)) {
        name = NULL;
        dns_message_currentname(msg, section, &name);
        if (section == DNS_SECTION_AUTHORITY) {
            rdataset = NULL;
            result = dns_message_findtype(name, dns_rdatatype_soa,
                0, &rdataset);
            if (result == ISC_R_SUCCESS)
                return (0);
        }
    }

    numLookups = 0;
    for (result = ISC_R_SUCCESS;
         result == ISC_R_SUCCESS;
         result = dns_message_nextname(msg, section)) {
        name = NULL;
        dns_message_currentname(msg, section, &name);
        if (section == DNS_SECTION_AUTHORITY) {
            rdataset = NULL;
            result = dns_message_findtype(name, dns_rdatatype_soa,
                0, &rdataset);
            if (result == ISC_R_SUCCESS)
                return (0);
        }
    }

    return (0);
}
rdataset = NULL;
result = dns_message_findtype(name, dns_rdatatype_ns, 0,
    &rdataset);
if (result != ISC_R_SUCCESS)
    continue;

debug("found NS set");

if (query->lookup->trace && !query->lookup->trace_root) {
    dns_namereln_t namereln;
    unsigned int nlabels;
    int order;

    domain = dns_fixedname_name(&query->lookup->fdomain);
    namereln = dns_name_fullcompare(name, domain,
        &order, &nlabels);
    if (namereln == dns_namereln_equal) {
        if (!horizontal)
            printf(";; BAD (HORIZONTAL) REFERRAL\n");
        horizontal = true;
    } else if (namereln != dns_namereln_subdomain) {
        if (!bad)
            printf(";; BAD REFERRAL\n");
        bad = true;
        continue;
    }
}

for (result = dns_rdataset_first(rdataset);
    result == ISC_R_SUCCESS;
    result = dns_rdataset_next(rdataset)) {
    char namestr[DNS_NAME_FORMATSIZE];
    dns_rdata_ns_t ns;

    if (query->lookup->trace_root &&
        query->lookup->nsfound >= MXSERV)
        break;

    dns_rdataset_current(rdataset, &rdataset);

    query->lookup->nsfound++;
    result = dns_rdata_tostruct(&rdata, &ns, NULL);
    check_result(result, "dns_rdata_tostruct");
    dns_name_format(&ns.name, namestr, sizeof(namestr));
    dns_rdata_freestruct(&ns);

    /* Initialize lookup if we've not yet */
debug("found NS %s", namestr);
if (!success) {
  success = true;
  lookup_counter++;
  lookup = requeue_lookup(query->lookup, false);
  cancel_lookup(query->lookup);
  lookup->doing_xfr = false;
  if (!(lookup->trace_root &&
    section == DNS_SECTION_ANSWER))
    lookup->trace = false;
  else
    lookup->trace = query->lookup->trace;
  lookup->ns_search_only =
    query->lookup->ns_search_only;
  lookup->trace_root = false;
  if (lookup->ns_search_only)
    lookup->recurse = false;
  domain = dns_fixedname_name(&lookup->fdomain);
  dns_name_copy(name, domain, NULL);
}
debug("adding server %s", namestr);
num = getaddresses(lookup, namestr, &lresult);
if (lresult != ISC_R_SUCCESS) {
  printf("couldn't get address for '%s': %s\n",
    namestr, isc_result_totext(lresult));
  if (addresses_result == ISC_R_SUCCESS) {
    addresses_result = lresult;
    strlcpy(bad_namestr, namestr, sizeof(bad_namestr));
  }
}
numLookups += num;
dns_rdata_reset(&rdata);
}

if (numLookups == 0 && addresses_result != ISC_R_SUCCESS) {
  fatal("couldn't get address for '%s': %s",
    bad_namestr, isc_result_totext(result));
}

if (lookup == NULL &&
  section == DNS_SECTION_ANSWER &&
  (query->lookup->trace || query->lookup->ns_search_only))
return (followup_lookup(msg, query, DNS_SECTION_AUTHORITY));

/*
 * Randomize the order the nameserver will be tried.
 */
/*
  if (numLookups > 1) {
    uint32_t i, j;
    dig_serverlist_t my_server_list;
    dig_server_t *next;

    ISC_LIST_INIT(my_server_list);

    i = numLookups;
    for (srv = ISC_LIST_HEAD(lookup->my_server_list);
      srv != NULL;
        srv = ISC_LIST_HEAD(lookup->my_server_list)) {
      INSIST(i > 0);
      isc_random_get(&j);
      j %= i;
      next = ISC_LIST_NEXT(srv, link);
      while (j-- > 0 && next != NULL) {
        srv = next;
        next = ISC_LIST_NEXT(srv, link);
      }
    ISC_LIST_DEQUEUE(lookup->my_server_list, srv, link);
    ISC_LIST_APPEND(my_server_list, srv, link);
    i--;
  }
  ISC_LIST_APPENDLIST(lookup->my_server_list,
    my_server_list, link);
  }

  return (numLookups);
}

//% *
* Create and queue a new lookup using the next origin from the search
* list, read in setup_system().
*
* Return true iff there was another searchlist entry.
*/
static bool
next_origin(dig_lookup_t *oldlookup) {
  dig_lookup_t *newlookup;
  dig_searchlist_t *search;
  dns_fixedname_t fixed;
  dns_name_t *name;
  isc_result_t result;
  INSIST(!free_now);

  debug("next_origin()");

  }
debug("following up \%s", oldlookup->textname);

if (!usesearch)
/*
 * We're not using a search list, so don't even think
 * about finding the next entry.
 */
return (false);

/*
 * Check for a absolute name or ndots being met.
 */
name = dns_fixedname_initname(&fixed);
result = dns_name_fromstring2(name, oldlookup->textname, NULL, 0, NULL);
if (result == ISC_R_SUCCESS &&
(dns_name_isabsolute(name) ||
(int)dns_name_countlabels(name) > ndots))
return (false);

if (oldlookup->origin == NULL && !oldlookup->need_search)
/*
 * Then we just did rootorg; there's nothing left.
 */
return (false);
if (oldlookup->origin == NULL && oldlookup->need_search) {
newlookup = requeue_lookup(oldlookup, true);
newlookup->origin = ISC_LIST_HEAD(search_list);
newlookup->need_search = false;
} else {
search = ISC_LIST_NEXT(oldlookup->origin, link);
if (search == NULL && oldlookup->done_as_is)
return (false);
newlookup = requeue_lookup(oldlookup, true);
newlookup->origin = search;
}
cancel_lookup(oldlookup);
return (true);
}

/*%
 * Insert an SOA record into the sendmessage in a lookup. Used for
 * creating IXFR queries.
 */
static void
insert_soa(dig_lookup_t *lookup) {
isc_result_t result;
dns_rdata_soa_t soa;


dns_rdata_t *rdata = NULL;
dns_rdatalist_t *rdatalist = NULL;
dns_rdataset_t *rdataset = NULL;
dns_name_t *soaname = NULL;

d.debug("insert_soa()");
soa.mctx = mctx;
soa.serial = lookup->ixfr_serial;
soa.refresh = 0;
soa.retry = 0;
soa.expire = 0;
soa.minimum = 0;
soa.common.rdclass = lookup->rdclass;
soa.common.rdtype = dns_rdatatype_soa;

dns_name_init(&soa.origin, NULL);
dns_name_init(&soa.contact, NULL);

dns_name_clone(dns_rootname, &soa.origin);
dns_name_clone(dns_rootname, &soa.contact);

isc_buffer_init(&lookup->rdatabuf, lookup->rdatastore,
sizeof(lookup->rdatastore));

result = dns_message_gettemprdata(lookup->sendmsg, &rdata);
check_result(result, "dns_message_gettemprdata");

result = dns_rdata_fromstruct(rdata, lookup->rdclass,
&lookup->rdatabuf);
check_result(result, "isc_rdata_fromstruct");

result = dns_message_gettemprdatalist(lookup->sendmsg, &rdatalist);
check_result(result, "dns_message_gettemprdatalist");

result = dns_message_gettemprdataset(lookup->sendmsg, &rdataset);
check_result(result, "dns_message_gettemprdataset");

dns_rdatalist_init(rdatalist);
rdatalist->type = dns_rdatatype_soa;
rdatalist->rdclass = lookup->rdclass;
ISC_LIST_APPEND(rdatalist->rdata, rdata, link);

dns_rdatalist_tordataset(rdatalist, rdataset);

result = dns_message_gettempname(lookup->sendmsg, &soaname);
check_result(result, "dns_message_gettempname");
dns_name_init(soaname, NULL);
dns_name_clone(lookup->name, soaname);
ISC_LIST_INIT(soaname->list);
ISC_LIST_APPEND(soaname->list, rdataset, link);
dns_message_addname(lookup->sendmsg, soaname, DNS_SECTION_AUTHORITY);
}

static void
compute_cookie(unsigned char *clientcookie, size_t len) {
    /* XXXMPA need to fix, should be per server. */
    INSIST(len >= 8U);
    memmove(clientcookie, cookie_secret, 8);
}

/*%
 * Setup the supplied lookup structure, making it ready to start sending
 * queries to servers. Create and initialize the message to be sent as
 * well as the query structures and buffer space for the replies. If the
 * server list is empty, clone it from the system default list.
 */
bool
setup_lookup(dig_lookup_t *lookup) {
    isc_result_t result;
    uint32_t id;
    unsigned int len;
    dig_server_t *serv;
    dig_query_t *query;
    isc_buffer_t b;
    dns_compress_t cctx;
    char store[MXNAME];
    char ecsbuf[20];
    char cookiebuf[256];
    char *origin = NULL;
    char *textname = NULL;
    #ifdef WITH_IDN_SUPPORT
    char idn_origin[MXNAME], idn_textname[MXNAME];
    #endif
    #ifdef WITH_IDN_OUT_SUPPORT
    result = dns_name_settotextfilter(lookup->idnout ?
        output_filter : NULL);
    check_result(result, "dns_name_settotextfilter");
    #endif
    REQUIRE(lookup != NULL);
    INSIST(!free_now);
    debug("setup_lookup(%p)", lookup);

    /*
    * XXXMPA need to fix, should be per server. */
    INSIST(len >= 8U);
    memmove(clientcookie, cookie_secret, 8);
}
result = dns_message_create(mctx, DNS_MESSAGE_INTENTRENDER, 
&lookup->sendmsg);
check_result(result, "dns_message_create");

if (lookup->new_search) {
    debug("resetting lookup counter.");
    lookup_counter = 0;
}
if (ISC_LIST_EMPTY(lookup->my_server_list)) {
    debug("cloning server list");
    clone_server_list(server_list, &lookup->my_server_list);
}
result = dns_message_gettempname(lookup->sendmsg, &lookup->name);
check_result(result, "dns_message_gettempname");
dns_name_init(lookup->name, NULL);

isc_buffer_init(&lookup->namebuf, lookup->name_space,
sizeof(lookup->name_space));
isc_buffer_init(&lookup->onamebuf, lookup->oname_space,
sizeof(lookup->oname_space));

/*
 * We cannot convert `textname' and `origin' separately.
 * `textname' doesn't contain TLD, but local mapping needs
 * TLD.
 */
textname = lookup->textname;
#ifdef WITH_IDN_SUPPORT
if (lookup->idnin) {
    result = idn_locale_to_ace(textname, idn_textname, sizeof(idn_textname));
    check_result(result, "convert textname to IDN encoding");
done debug("idn_textname: %s", idn_textname);
textname = idn_textname;
}
#endif

/*
 * If the name has too many dots, force the origin to be NULL
 * (which produces an absolute lookup). Otherwise, take the origin
 * we have if there's one in the struct already. If it's NULL,
 * take the first entry in the searchlist iff either usesearch
 * is TRUE or we got a domain line in the resolv.conf file.
 */
if (lookup->new_search) {
    if ((count_dots(textname) >= ndots) || !usesearch)
    {
        lookup->origin = NULL; /* Force abs lookup */
lookup->done_as_is = true;
lookup->need_search = usesearch;
} else if (lookup->origin == NULL && usesearch) {
lookup->origin = ISC_LIST_HEAD(search_list);
lookup->need_search = false;
}
}

if (lookup->origin != NULL) {
    debug("trying origin %s", lookup->origin->origin);
    result = dns_message_gettempname(lookup->sendmsg,
&lookup->oname);
    check_result(result, "dns_message_gettempname");
    dns_name_init(lookup->oname, NULL);
    /* XXX Helper funct to conv char* to name? */
    origin = lookup->origin->oname;
#ifdef WITH_IDN_SUPPORT
    if (lookup->idnin) {
        result = idn_locale_to_ace(origin, idn_origin, sizeof(idn_origin));
        check_result(result, "convert origin to IDN encoding");
        debug("trying idn origin %s", idn_origin);
        origin = idn_origin;
    }
#endif
    len = (unsigned int) strlen(origin);
    isc_buffer_init(&b, origin, len);
    isc_buffer_add(&b, len);
    result = dns_name_fromtext(lookup->oname, &b, dns_rootname,
0, &lookup->onamebuf);
    if (result != ISC_R_SUCCESS) {
        dns_message_puttempname(lookup->sendmsg,
&lookup->name);
        dns_message_puttempname(lookup->sendmsg,
&lookup->oname);
        fatal("'%s' is not in legal name syntax (%s)",
origin,
    isc_result_totext(result));
}
    if (lookup->trace && lookup->trace_root) {
        dns_name_clone(dns_rootname, lookup->name);
    } else {
        dns_fixedname_t fixed;
        dns_name_t *name;
        name = dns_fixedname_initname(&fixed);
        len = (unsigned int) strlen(textname);
        isc_buffer_init(&b, textname, len);
        isc_buffer_add(&b, len);
        name = dns_fixedname_initname(&fixed);
        len = (unsigned int) strlen(textname);
        isc_buffer_init(&b, textname, len);
        isc_buffer_add(&b, len);
result = dns_name_fromtext(name, &b, NULL, 0, NULL);
if (result == ISC_R_SUCCESS &&
!dns_name_isabsolute(name))
result = dns_name_concatenate(name,
  lookup->oname,
  lookup->name,
  &lookup->namebuf);
else if (result == ISC_R_SUCCESS)
result = dns_name_copy(name, lookup->name,
  &lookup->namebuf);
if (result != ISC_R_SUCCESS) {
  dns_message_puttempname(lookup->sendmsg,
    &lookup->name);
  if (result == DNS_R_NAMETOOLONG)
    return (false);
  fatal("'%s' is not in legal name syntax (%s)",
    lookup->textname,
    isc_result_totext(result));
}
}
dns_message_puttempname(lookup->sendmsg, &lookup->oname);
} else {
  debug("using root origin");
  if (lookup->trace && lookup->trace_root)
    dns_name_clone(dns_rootname, lookup->name);
  else {
    len = (unsigned int) strlen(textname);
    isc_buffer_init(&b, textname, len);
    isc_buffer_add(&b, len);
    result = dns_name_fromtext(lookup->name, &b,
      dns_rootname, 0,
      &lookup->namebuf);
  }
  if (result != ISC_R_SUCCESS) {
    dns_message_puttempname(lookup->sendmsg, &lookup->oname);
    fatal("'%s' is not a legal name "
      "("%s"), lookup->textname,
      isc_result_totext(result));
  }
  dns_name_format(lookup->name, store, sizeof(store));
dighostTrying(store, lookup);
INSIST(dns_name_isabsolute(lookup->name));

isc_random_get(&id);
lookup->sendmsg->id = (unsigned short)id & 0xFFFF;
lookup->sendmsg->opcode = lookup->opcode;
lookup->msgcounter = 0;

/*
 * If this is a trace request, completely disallow recursion after
 * looking up the root name servers, since it's meaningless for traces.
 */
if ((lookup->trace || lookup->ns_search_only) && !lookup->trace_root) {
    lookup->recurse = false;
}

if (lookup->recurse &&
    lookup->rdtype != dns_rdatatype_axfr &&
    lookup->rdtype != dns_rdatatype_ixfr) {
    debug("recursive query");
    lookup->sendmsg->flags |= DNS_MESSAGEFLAG_RD;
}

/* XXX aaflag */
if (lookup->aaonly) {
    debug("AA query");
    lookup->sendmsg->flags |= DNS_MESSAGEFLAG_AA;
}

if (lookup->adflag) {
    debug("AD query");
    lookup->sendmsg->flags |= DNS_MESSAGEFLAG_AD;
}

if (lookup->cdflag) {
    debug("CD query");
    lookup->sendmsg->flags |= DNS_MESSAGEFLAG_CD;
}

if (lookup->zflag) {
    debug("Z query");
    lookup->sendmsg->flags |= 0x0040U;
}

dns_message_addname(lookup->sendmsg, lookup->name,
    DNS_SECTION_QUESTION);

if (lookup->trace && lookup->trace_root) {
    lookup->qrdtype = lookup->rdtype;
    lookup->rdtype = dns_rdatatype_ns;
}
if ((lookup->rdtype == dns_rdatatype_axfr) ||
    (lookup->rdtype == dns_rdatatype_ixfr)) {
/*
 * Force TCP mode if we're doing an axfr.
 */
if (lookup->rdtype == dns_rdatatype_axfr) {
    lookup->doing_xfr = true;
    lookup->tcp_mode = true;
} else if (lookup->tcp_mode) {
    lookup->doing_xfr = true;
}
}

if (!lookup->header_only)
    add_question(lookup->sendmsg, lookup->name, lookup->rdclass,
                  lookup->rdtype);

/* add soa */
if (lookup->rdtype == dns_rdatatype_ixfr)
    insert_soa(lookup);

/* XXX Insist this? */
lookup->tsigctx = NULL;
lookup->querysig = NULL;
if (tsigkey != NULL) {
    debug("initializing keys");
    result = dns_message_settsigkey(lookup->sendmsg, tsigkey);
    check_result(result, "dns_message_settsigkey");
}

lookup->sendspace = isc_mempool_get(commctx);
if (lookup->sendspace == NULL)
    fatal("memory allocation failure");

result = dns_compress_init(&cctx, -1, mctx);
check_result(result, "dns_compress_init");

ddebug("starting to render the message");
isc_buffer_init(&lookup->renderbuf, lookup->sendspace, COMMSIZE);
result = dns_message_renderbegin(lookup->sendmsg, &cctx,
                                 &lookup->renderbuf);
check_result(result, "dns_message_renderbegin");
if (lookup->udpsize > 0 || lookup->dnssec ||
    lookup->edns > -1 || lookup->ecs_addr != NULL)
{
    #define MAXOPTS (EDNSOPT_OPTIONS + DNS_EDNSOPTIONS)
    dns_ednsopt_t opts[MAXOPTS];
    unsigned int flags;
unsigned int i = 0;

if (lookup->udpsize == 0)
lookup->udpsize = 4096;
if (lookup->edns < 0)
lookup->edns = 0;

if (lookup->nsid) {
INSIST(i < MAXOPTS);
opts[i].code = DNS_OPT_NSID;
opts[i].length = 0;
opts[i].value = NULL;
i++;
}

if (lookup->ecs_addr != NULL) {
uint8_t addr[16];
uint16_t family = 0;
uint32_t plen;
struct sockaddr *sa;
struct sockaddr_in *sin;
struct sockaddr_in6 *sin6;
size_t addrl;

sa = &lookup->ecs_addr->type.sa;
plen = lookup->ecs_addr->length;

/* Round up prefix len to a multiple of 8 */
addrl = (plen + 7) / 8;

INSIST(i < MAXOPTS);
opts[i].code = DNS_OPT_CLIENT_SUBNET;
opts[i].length = (uint16_t) addrl + 4;
check_result(result, "isc_buffer_allocate");

/*
 * XXXMUKS: According to RFC7871, "If there is
 * no ADDRESS set, i.e., SOURCE PREFIX-LENGTH is
 * set to 0, then FAMILY SHOULD be set to the
 * transport over which the query is sent."
 *
 * However, at this point we don't know what
 * transport(s) we'll be using, so we can't
 * set the value now. For now, we're using
 * IPv4 as the default the +subnet option
 * used an IPv4 prefix, or for +subnet=0,
 * and IPv6 if the +subnet option used an
 * IPv6 prefix.
 */
(For future work: preserve the offset into
the buffer where the family field is;
that way we can update it in send_udp()
or send_tcp_connect() once we know
what it ought to be.)
*/
switch (sa->sa_family) {
    case AF_UNSPEC:
        INSIST(plen == 0);
        family = 1;
        break;
    case AF_INET:
        INSIST(plen <= 32);
        family = 1;
        sin = (struct sockaddr_in *) sa;
        memmove(addr, &sin->sin_addr, addrl);
        break;
    case AF_INET6:
        INSIST(plen <= 128);
        family = 2;
        sin6 = (struct sockaddr_in6 *) sa;
        memmove(addr, &sin6->sin6_addr, addrl);
        break;
    default:
        ISC_UNREACHABLE();
        break;
}
isc_buffer_init(&b, ecsbuf, sizeof(ecsbuf));
/* family */
isc_buffer_putuint16(&b, family);
/* source prefix-length */
isc_buffer_putuint8(&b, plen);
/* scope prefix-length */
isc_buffer_putuint8(&b, 0);
/* address */
if (addrl > 0) {
    /* Mask off last address byte */
    if ((plen % 8) != 0)
        addr[addrl - 1] &= ~0U << (8 - (plen % 8));
    isc_buffer_putmem(&b, addr,
        (unsigned)addrl);
}
opts[i].value = (uint8_t *) ecsbuf;
i++;}

if (lookupSendcookie) {
INSIST(i < MAXOPTS);
opts[i].code = DNS_OPT_COOKIE;
if (lookupSendcookie != NULL) {
isc_buffer_init(&b, cookiebuf, sizeof(cookiebuf));
result = isc_hex_decodestring(lookupSendcookie, &b);
check_result(result, "isc_hex_decodestring");
opts[i].value = isc_buffer_base(&b);
opts[i].length = isc_buffer_usedlength(&b);
} else {
compute_cookie(cookie, sizeof(cookie));
opts[i].length = 8;
opts[i].value = cookie;
} i++;
}

if (lookup->expire) {
INSIST(i < MAXOPTS);
opts[i].code = DNS_OPT_EXPIRE;
opts[i].length = 0;
opts[i].value = NULL;
i++;
}

if (lookup->ednsoptscnt != 0) {
INSIST(i + lookupSendnsoptscnt <= MAXOPTS);
memmove(&opts[i], lookup->ednsopts, sizeof(dns_ednsopt_t) * lookupSendnsoptscnt);
i += lookupSendnsoptscnt;
}

flags = lookup->ednsflags;
flags &= ~DNS_MESSAGEEXTFLAG_DO;
if (lookupSendnssec)
flags |= DNS_MESSAGEEXTFLAG_DO;
add_opt(lookupSendsendmsg, lookupSendudpsize, lookupSendns, flags, opts, i);
}

result = dns_message_rendersection(lookupSendsendmsg, DNS_SECTION_QUESTION, 0);
check_result(result, "dns_message_rendersection");
result = dns_message_rendersection(lookup->sendmsg, DNS_SECTION_AUTHORITY, 0);
check_result(result, "dns_message_rendersection");
result = dns_message_renderend(lookup->sendmsg);
check_result(result, "dns_message_renderend");
dbg(\"done rendering\")

dns_compress.invalidate(&cctx)

/ *
  * Force TCP mode if the request is larger than 512 bytes.
  */
if (isc.buffer_usedlength(&lookup->renderbuf) > 512)
lookup->tcp_mode = true;

lookup->pending = false;

for (serv = ISC_LIST_HEAD(lookup->my_server_list);
    serv != NULL;
    serv = ISC_LIST_NEXT(serv, link)) {
query = isc.mem.allocate(mctx, sizeof(dig_query_t));
if (query == NULL)
fatal("memory allocation failure in \%s:\%d", __FILE__, __LINE__);
dbg("create query \%p linked to lookup \%p", query, lookup);
query->lookup = lookup;
query->timer = NULL;
query->waiting_connect = false;
query->waiting_senddone = false;
query->pending_free = false;
query->recv.made = false;
query->first_pass = true;
query->first.soa.rcvd = false;
query->second.rr.rcvd = false;
query->first.repeat.rcvd = false;
query->warn_id = true;
query->timedout = false;
query->first.rr.serial = 0;
query->second.rr.serial = 0;
query->servname = serv->servername;
query->userarg = serv->userarg;
query->rr_count = 0;
query->msg_count = 0;
query->byte_count = 0;
query->ixfr_axfr = false;
ISC_LIST_INIT(query->recvlist);
ISC_LIST_INIT(query->lengthlist);
query->sock = NULL;
query->recvspace = isc_mempool_get(commctx);
if (query->recvspace == NULL)
fatal("memory allocation failure");

isc_buffer_init(&query->recvbuf, query->recvspace, COMMSIZE);
isc_buffer_init(&query->lengthbuf, query->lengthspace, 2);
isc_buffer_init(&query->slbuf, query->slspace, 2);
query->sendbuf = lookup->renderbuf;

ISC_LINK_INIT(query, clink);
ISC_LINK_INIT(query, link);
ISC_LIST_ENQUEUE(lookup->q, query, link);
}

/* XXX qrflag, print_query, etc... */
if (!ISC_LIST_EMPTY(lookup->q) && qr) {
extrabytes = 0;
dighost_printmessage(ISC_LIST_HEAD(lookup->q), lookup->sendmsg,
true);
if (lookup->stats)
printf(";; QUERY SIZE: %u\n\n",
isc_buffer_usedlength(&lookup->renderbuf));
}
return (true);
}

/*%*/
* Event handler for send completion.  Track send counter, and clear out
* the query if the send was canceled.
*/
static void
send_done(isc_task_t *task, isc_event_t *event) {
isc_socketevent_t *sevent = (isc_socketevent_t *)event;
isc_buffer_t *b = NULL;
dig_query_t *query, *next;
dig_lookup_t *lookup = NULL;

REQUIRE(event->ev_type == ISC_SOCKEVENT_SENDDONE);

UNUSED(_task);

LOCK_LOOKUP;

debug("send_done()");
sendcount--;
debug("sendcount=%d", sendcount);
INSIST(sendcount >= 0);
for (b = ISC_LIST_HEAD(sevent->bufferlist);
    b != NULL;
    b = ISC_LIST_HEAD(sevent->bufferlist)) {
    ISC_LIST_DEQUEUE(sevent->bufferlist, b, link);
    isc_mem_free(mctx, b);
}

query = event->ev_arg;
query->waiting_senddone = false;
l = query->lookup;

if (l->ns_search_only && !l->trace_root && !l->tcp_mode) {
    debug("sending next, since searching");
    next = ISC_LIST_NEXT(query, link);
    if (next != NULL)
        send_udp(next);
}

isc_event_free(&event);

if (query->pending_free)
    isc_mem_free(mctx, query);

check_if_done();
UNLOCK_LOOKUP;
}

/*%
* Cancel a lookup, sending isc_socket_cancel() requests to all outstanding
* IO sockets. The cancel handlers should take care of cleaning up the
* query and lookup structures
*/
static void
cancel_lookup(dig_lookup_t *lookup) {
    dig_query_t *query, *next;

dbg("cancel_lookup()");
query = ISC_LIST_HEAD(lookup->q);
    while (query != NULL) {
next = ISC_LIST_NEXT(query, link);
if (query->sock != NULL) {
    isc_socket_cancel(query->sock, global_task,
    ISC_SOCKCANCEL_ALL);
check_if_done();
} else {
    clear_query(query);
}

}
query = next;
}
lookup->pending = false;
lookup->retries = 0;
}

static void
bringup_timer(dig_query_t *query, unsigned int default_timeout) {
    dig_lookup_t *l;
    unsigned int local_timeout;
    isc_result_t result;

    debug("bringup_timer()");
    /*
     * If the timer already exists, that means we're calling this
     * a second time (for a retry). Don't need to recreate it,
     * just reset it.
     */
    l = query->lookup;
    if (ISC_LINK_LINKED(query, link) && ISC_LIST_NEXT(query, link) != NULL)
        local_timeout = SERVER_TIMEOUT;
    else {
        if (timeout == 0)
            local_timeout = default_timeout;
        else
            local_timeout = timeout;
    }
    debug("have local timeout of %d", local_timeout);
    isc_interval_set(&l->interval, local_timeout, 0);
    if (query->timer != NULL)
        isc_timer_detach(&query->timer);
    result = isc_timer_create(timermgr, isc_timertype_once, NULL,
                              &l->interval, global_task, connect_timeout,
                              query, &query->timer);
    check_result(result, "isc_timer_create");
}

static void
force_timeout(dig_query_t *query) {
    isc_event_t *event;

    debug("force_timeout ()");
    event = isc_event_allocate(mctx, query, ISC_TIMEREVENT_IDLE,
                               connect_timeout, query, sizeof(isc_event_t));
    if (event == NULL) {
        fatal("isc_event_allocate: %s", isc_result_totext(ISC_R_NOMEMORY));
    }
isc_task_send(global_task, &event);

/*
 * The timer may have expired if, for example, get_address() takes
 * long time and the timer was running on a different thread.
 * We need to cancel the possible timeout event not to confuse
 * ourselves due to the duplicate events.
 */
if (query->timer != NULL)
isc_timer_detach(&query->timer);
}

static void
connect_done(isc_task_t *task, isc_event_t *event);

/*%
 * Unlike send_udp, this can't be called multiple times with the same
 * query.  When we retry TCP, we requeue the whole lookup, which should
 * start anew.
 */
static void
send_tcp_connect(dig_query_t *query) {
isc_result_t result;
dig_query_t *next;
dig_lookup_t *l;

dump("send_tcp_connect(%p)", query);

l = query->lookup;
query->waiting_connect = true;
query->lookup->current_query = query;
result = get_address(query->servname, port, &query->sockaddr);
if (result != ISC_R_SUCCESS) {
/*
 * This servname doesn't have an address.  Try the next server
 * by triggering an immediate 'timeout' (we lie, but the effect
 * is the same).
 */
force_timeout(query);
return;
}

if (!l->mapped && isc_sockaddr_pf(&query->sockaddr) == AF_INET6 &&
IN6_IS_ADDR_V4MAPPED(&query->sockaddr.type.sin6.sin6_addr)) {
isc_netaddr_t netaddr;
char buf[ISC_NETADDR_FORMATSIZE];
isc_netaddr_fromsockaddr(&netaddr, &query->sockaddr);
isc_netaddr_format(&netaddr, buf, sizeof(buf));
printf(";; Skipping mapped address \\
%s\n", buf);

query->waiting_connect = false;
if (ISC_LINK_LINKED(query, link))
next = ISC_LIST_NEXT(query, link);
else
next = NULL;
l = query->lookup;
clear_query(query);
if (next == NULL) {
printf(";; No acceptable nameservers\n");
check_next_lookup(l);
return;
}
send_tcp_connect(next);
return;
}

INSIST(query->sock == NULL);

if (keep != NULL && isc_sockaddr_equal(&keepaddr, &query->sockaddr)) {
sockcount++;
isc_socket_attach(keep, &query->sock);
query->waiting_connect = false;
launch_next_query(query, true);
goto search;
}

result = isc_socket_create(socketmgr,
isc_sockaddr_pf(&query->sockaddr),
isc_sockettype_tcp, &query->sock);
check_result(result, "isc_socket_create");
sockcount++;
debug("sockcount=%d", sockcount);
if (query->lookup->dscp != -1)
isc_socket_dscp(query->sock, query->lookup->dscp);
isc_socket_ipv6only(query->sock, !query->lookup->mapped);
if (specified_source)
result = isc_socket_bind(query->sock, &bind_address,
ISC_SOCKET_REUSEADDRESS);
else {
if ((isc_sockaddr_pf(&query->sockaddr) == AF_INET) &&
    have_ipv4)
isc_sockaddr_any(&bind_addr);
else

}
isc_sockaddr_any6(&bind_any);
result = isc_socket_bind(query->sock, &bind_any, 0);
}
check_result(result, "isc_socket_bind");
bringup_timer(query, TCP_TIMEOUT);
result = isc_socket_connect(query->sock, &query->sockaddr,
    global_task, connect_done, query);
check_result(result, "isc_socket_connect");
search:
/*
 * If we're at the endgame of a nameserver search, we need to
 * immediately bring up all the queries.  Do it here.
 */
if (l->ns_search_only && !l->trace_root) {
    debug("sending next, since searching");
    if (ISC_LINK_LINKED(query, link)) {
        next = ISC_LIST_NEXT(query, link);
        ISC_LIST_DEQUEUE(l->q, query, link);
    } else
        next = NULL;
    ISC_LIST_ENQUEUE(l->connecting, query, clink);
    if (next != NULL)
        send_tcp_connect(next);
}

static isc_buffer_t *
clone_buffer(isc_buffer_t *source) {
    isc_buffer_t *buffer;
    buffer = isc_mem_allocate(mctx, sizeof(*buffer));
    if (buffer == NULL)
        fatal("memory allocation failure in %s:%d",
            __FILE__, __LINE__);
    *buffer = *source;
    return (buffer);
}

/*% 
 * Send a UDP packet to the remote nameserver, possible starting the
 * recv action as well.  Also make sure that the timer is running and
 * is properly reset.
 */
static void
send_udp(dig_query_t *query) {
    dig_lookup_t *l = NULL;
    isc_result_t result;
    isc_buffer_t *sendbuf;
    dig_query_t *next;
debug("send_udp(%p)", query);

l = query->lookup;
bringup_timer(query, UDP_TIMEOUT);
l->current_query = query;
debug("working on lookup %p, query %p", query->lookup, query);
if (!query->recv_made) {
    /* XXX Check the sense of this, need assertion? */
    query->waiting_connect = false;
    result = get_address(query->servname, port, &query->sockaddr);
    if (result != ISC_R_SUCCESS) {
        /* This servname doesn't have an address. */
        force_timeout(query);
        return;
    }
}
if (!l->mapped &&
    isc_sockaddr_pf(&query->sockaddr) == AF_INET6 &&
    IN6_IS_ADDR_V4MAPPED(&query->sockaddr.type.sin6.sin6_addr)) {
    isc_netaddr_t netaddr;
    char buf[ISC_NETADDR_FORMATSIZE];

    isc_netaddr_fromsockaddr(&netaddr, &query->sockaddr);
    isc_netaddr_format(&netaddr, buf, sizeof(buf));
    printf(";; Skipping mapped address '%s'", buf);

    next = ISC_LIST_NEXT(query, link);
    l = query->lookup;
clear_query(query);
    if (next == NULL) {
        printf(";; No acceptable nameservers\n");
        check_next_lookup(l);
    } else {
        send_udp(next);
    }
}
return;

result = isc_socket_create(socketmgr,
    isc_sockaddr_pf(&query->sockaddr),
    isc_sockettype_udp, &query->sock);
check_result(result, "isc_socket_create");
sockcount++;
debug("sockcount=%d", sockcount);
if (query->lookup->dscp != -1)
    isc_socket_dscp(query->sock, query->lookup->dscp);
    isc_socket_ipv6only(query->sock,
if (specified_source) {
  result = isc_socket_bind(query->sock, &bind_address,
    ISC_SOCKET_REUSEADDRESS);
} else {
  isc_sockaddr_anyofpf(&bind_any,
    isc_sockaddr_pf(&query->sockaddr));
  result = isc_socket_bind(query->sock, &bind_any, 0);
}
check_result(result, "isc_socket_bind");

 ISC_LINK_INIT(&query->recvbuf, link);
ISC_LIST_ENQUEUE(query->recvlist, &query->recvbuf, link);
  debug("recving with lookup=%p, query=%p, sock=%p",
    query->lookup, query, query->sock);
  result = isc_socket_recvq(query->sock, &query->recvlist, 1,
    global_task, recv_done, query);
  check_result(result, "isc_socket_recvq");
  recvcount++;
  debug("recvcount=%d", recvcount);
}
ISC_LIST_INIT(query->sendlist);
sendbuf = clone_buffer(&query->sendbuf);
ISC_LIST_ENQUEUE(query->sendlist, sendbuf, link);
  debug("sending a request");
TIME_NOW(&query->time_sent);
INSIST(query->sock != NULL);
query->waiting_senddone = true;
result = isc_socket_sendsqv2(query->sock, &query->sendlist,
  current_query = lookup->mapped);
  if (specified_source) {
    result = isc_socket_bind(query->sock, &bind_address,
      ISC_SOCKET_REUSEADDRESS);
  } else {
    isc_sockaddr_anyofpf(&bind_any,
      isc_sockaddr_pf(&query->sockaddr));
    result = isc_socket_bind(query->sock, &bind_any, 0);
  }
check_result(result, "isc_socket_bind");

 query->recv_make = true;
 ISC_LINK_INIT(&query->recvbuf, link);
ISC_LIST_ENQUEUE(query->recvlist, &query->recvbuf, link);
  debug("recving with lookup=%p, query=%p, sock=%p",
    query->lookup, query, query->sock);
  result = isc_socket_recvq(query->sock, &query->recvlist, 1,
    global_task, recv_done, query);
  check_result(result, "isc_socket_recvq");
  recvcount++;
  debug("recvcount=%d", recvcount);
}
ISC_LIST_INIT(query->sendlist);
sendbuf = clone_buffer(&query->sendbuf);
ISC_LIST_ENQUEUE(query->sendlist, sendbuf, link);
  debug("sending a request");
TIME_NOW(&query->time_sent);
INSIST(query->sock != NULL);
query->waiting_senddone = true;
result = isc_socket_sendsqv2(query->sock, &query->sendlist,
  global_task, send_done, query,
  &query->sockaddr, NULL,
    ISC_SOCKFLAG_NORETRY);
check_result(result, "isc_socket_sendsqv");
  sendcount++;
}

 /*%
 * If there are more servers available for querying within 'lookup', initiate a
 * TCP or UDP query to the next available server and return true; otherwise,
 * return false.
 */

 static bool
 try_next_server(dig_lookup_t *lookup) {
   dig_query_t *current_query, *next_query;
   current_query = lookup->current_query;
if (current_query == NULL || !ISC_LINK_LINKED(current_query, link)) {
    return (false);
}

next_query = ISC_LIST_NEXT(current_query, link);
if (next_query == NULL) {
    return (false);
}

ddebug("trying next server...");

if (lookup->tcp_mode) {
    send_tcp_connect(next_query);
} else {
    send_udp(next_query);
}

return (true);
}

/ *
* IO timeout handler, used for both connect and recv timeouts. If
* retries are still allowed, either resend the UDP packet or queue a
* new TCP lookup. Otherwise, cancel the lookup.
*/
static void
connect_timeout(isc_task_t *task, isc_event_t *event) {
    dig_lookup_t *l = NULL;
    dig_query_t *query = NULL;
    UNUSED(task);
    REQUIRE(event->ev_type == ISC_TIMEREVENT_IDLE);
    debug("connect_timeout()");
    LOCK_LOOKUP;
    query = event->ev_arg;
    l = query->lookup;
    isc_event_free(&event);
    INSIST(!free_now);
    if (cancel_now) {
        UNLOCK_LOOKUP;
        return;
    }
    if (try_next_server(l)) {

if (l->tcp_mode) {
    if (query->sock != NULL) {
        isc_socket_cancel(query->sock, NULL,
            ISC_SOCKCANCEL_ALL);
    } else {
        clear_query(query);
    }
}

UNLOCK_LOOKUP;
return;

if (l->tcp_mode && query->sock != NULL) {
    query->timedout = true;
    isc_socket_cancel(query->sock, NULL, ISC_SOCKCANCEL_ALL);
}

if (l->retries > 1) {
    if (!l->tcp_mode) {
        l->retries--;
        debug("resending UDP request to first server");
        send_udp(ISC_LIST_HEAD(l->q));
    } else {
        debug("making new TCP request, %d tries left",
            l->retries);
        l->retries--;
        requeue_lookup(l, true);
        cancel_lookup(l);
        check_next_lookup(l);
    }
} else {
    if (!l->ns_search_only) {
        fputs(l->cmdline, stdout);
        printf(";; connection timed out; no servers could be "
            "reached\n");
    }
    cancel_lookup(l);
    check_next_lookup(l);
    if (exitcode < 9)
        exitcode = 9;
}
UNLOCK_LOOKUP;

/*%
 * Event handler for the TCP recv which gets the length header of TCP
 * packets. Start the next recv of length bytes.
 */
static void
tcp_length_done(isc_task_t *task, isc_event_t *event) {
isc_socketevent_t *sevent;
isc_buffer_t *b = NULL;
isc_result_t result;
dig_query_t *query = NULL;
dig_lookup_t *l, *n;
uint16_t length;

REQUIRE(event->ev_type == ISC_SOCKEVENT_RECVDONE);
INSIST(!free_now);

UNUSED(task);

debug("tcp_length_done()");

LOCK_LOOKUP;
sevent = (isc_socketevent_t *)event;
query = event->ev_arg;

recvcount--;
INSIST(recvcount >= 0);

b = ISC_LIST_HEAD(sevent->bufferlist);
INSIST(b == &query->lengthbuf);
ISC_LIST_DEQUEUE(sevent->bufferlist, b, link);

if (sevent->result == ISC_R_CANCELED) {
isc_event_free(&event);
l = query->lookup;
clear_query(query);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
if (sevent->result != ISC_R_SUCCESS) {
char sockstr[ISC_SOCKADDR_FORMATSIZE];
isc_sockaddr_format(&query->sockaddr, sockstr,
        sizeof(sockstr));
printf(";; communications error to %s: %s\n",
        sockstr, isc_result_totext(sevent->result));
if (keep != NULL)
isc_socket_detach(&keep);
l = query->lookup;
isc_socket_detach(&query->sock);
sockcount--;
debug("sockcount=%d", sockcount);
INSIST(sockcount >= 0);
}
if (sevent->result == ISC_R_EOF && l->eoferr == 0U) {
    n = requeue_lookup(l, true);
    n->eoferr++;
    isc_event_free(&event);
    clear_query(query);
    cancel_lookup(l);
    check_next_lookup(l);
    UNLOCK_LOOKUP;
    return;
}
length = isc_buffer_getuint16(b);
if (length == 0) {
    isc_event_free(&event);
    launch_next_query(query, false);
    UNLOCK_LOOKUP;
    return;
}

/*
 * Even though the buffer was already init'ed, we need
 * to redo it now, to force the length we want.
 */
isc_buffer_invalidate(&query->recvbuf);
isc_buffer_init(&query->recvbuf, query->recvspace, length);
ENSURE(ISC_LIST_EMPTY(query->recvlist));
ISC_LINK_INIT(&query->recvbuf, link);
ISC_LIST_ENQUEUE(query->recvlist, &query->recvbuf, link);
debug("recving with lookup=%p, query=%p", query->lookup, query);
result = isc_socket_recvv(query->sock, &query->recvlist, length, task,
    recv_done, query);
check_result(result, "isc_socket_recvv");
recvcount++;
debug("resubmitted recv request with length %d, recvcount=%d",
    length, recvcount);
isc_event_free(&event);
UNLOCK_LOOKUP;
}

/*%
 * For transfers that involve multiple recvs (XFR's in particular),
 * launch the next recv.
 */
static void
launch_next_query(dig_query_t *query, bool include_question) {
    isc_result_t result;
    dig_lookup_t *l;
    isc_buffer_t *buffer;
INSIST(!free_now);

dbg("launch_next_query()");

if (!query->lookup->pending) {
    dbg("ignoring launch_next_query because !pending");
    isc_socket_detach(&query->sock);
    sockcount--;
    dbg("sockcount=%d", sockcount);
    INSIST(sockcount >= 0);
    query->waiting_connect = false;
    l = query->lookup;
    clear_query(query);
    check_next_lookup(l);
    return;
}

isc_buffer_clear(&query->slbuf);
isc_buffer_clear(&query->lengthbuf);
isc_buffer_putuint16(&query->slbuf, (uint16_t) query->sendbuf.used);
ISC_LIST_INIT(query->sendlist);
ISC_LINK_INIT(&query->slbuf, link);
if (!query->first_soa_rcvd) {
    buffer = clone_buffer(&query->slbuf);
    ISC_LIST_ENQUEUE(query->sendlist, buffer, link);
    if (include_question) {
        buffer = clone_buffer(&query->sendbuf);
        ISC_LIST_ENQUEUE(query->sendlist, buffer, link);
    }
}

ISC_LINK_INIT(&query->lengthbuf, link);
ISC_LIST_ENQUEUE(query->lengthlist, &query->lengthbuf, link);

result = isc_socket_recvv(query->sock, &query->lengthlist, 0,
    global_task, tcp_length_done, query);
check_result(result, "isc_socket_recvv");
recvcount++;
dbg("recvcount=%d", recvcount);
if (!query->first_soa_rcvd) {
    dbg("sending a request in launch_next_query");
    TIME_NOW(&query->time_sent);
    query->waiting_senddone = true;
    result = isc_socket_sendv(query->sock, &query->sendlist,
        global_task, send_done, query);
    check_result(result, "isc_socket_sendv");
    sendcount++;
debug("sendcount=%d", sendcount);
}
query->waiting_connect = false;
#endif
check_next_lookup(query->lookup);
#endif
return;
}
/*%
* Event handler for TCP connect complete. Make sure the connection was
* successful, then pass into launch_next_query to actually send the
* question.
* /
static void
connect_done(isc_task_t *task, isc_event_t *event) {
char sockstr[ISC_SOCKADDR_FORMATSIZE];
isc_socketevent_t *sevent = NULL;
dig_query_t *query = NULL, *next;
dig_lookup_t *l;
LOCK_LOOKUP;
sevent = (isc_socketevent_t *)event;
query = sevent->ev_arg;
INSIST(query->waiting_connect);
query->waiting_connect = false;

if (sevent->result == ISC_R_CANCELED) {
    debug("in cancel handler");
    isc_sockaddr_format(&query->sockaddr, sockstr, sizeof(sockstr));
    if (query->timedout)
        printf(";; Connection to %s(%s) for %s failed: %s.\n", 
            sockstr, query->servname,
            query->lookup->textname,
            isc_result_totext(ISC_R_TIMEDOUT));
    isc_socket_detach(&query->sock);
    INSIST(sockcount > 0);
    sockcount--;
    debug("sockcount=%d", sockcount);
}
query->waiting_connect = false;
isc_event_free(&event);
l = query->lookup;
clear_query(query);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
if (sevent->result != ISC_R_SUCCESS) {

debug("unsuccessful connection: %s",
    isc_result_totext(sevent->result));
isc_sockaddr_format(&query->sockaddr, sockstr, sizeof(sockstr));
if (sevent->result != ISC_R_CANCELED)
    printf(";; Connection to %s(%s) for %s failed: ",
        "\n", sockstr,
        query->servname, query->lookup->textname,
        isc_result_totext(sevent->result));
isc_socket_detach(&query->sock);
INSIST(sockcount > 0);
sockcount--;
/* XXX Clean up exitcodes */
if (exitcode < 9)
    exitcode = 9;
debug("sockcount=%d", sockcount);
query->waiting_connect = false;
isc_event_free(&event);
l = query->lookup;
if ((l->current_query != NULL) &&
    (ISC_LINK_LINKED(l->current_query, link)))
    next = ISC_LIST_NEXT(l->current_query, link);
else
    next = NULL;
clear_query(query);
if (next != NULL) {
    bringup_timer(next, TCP_TIMEOUT);
send_tcp_connect(next);
} else
    check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
exitcode = 0;
if (keep_open) {
    if (keep != NULL)
        isc_socket_detach(&keep);
    isc_socket_attach(query->sock, &keep);
    keepaddr = query->sockaddr;
static bool check_for_more_data(dig_query_t *query, dns_message_t *msg, isc_socketevent_t *sevent)
{

dns_rdataset_t *rdataset = NULL;
dns_rdata_t rdata = DNS_RDATA_INIT;
dns_rdata_soa_t soa;
uint32_t ixfr_serial = query->lookup->ixfr_serial, serial;
isc_result_t result;
bool ixfr = query->lookup->rdtype == dns_rdatatype_ixfr;
bool axfr = query->lookup->rdtype == dns_rdatatype_axfr;

if (ixfr)
axfr = query->ixfr_axfr;

ddebug("check_for_more_data()");

/*
 * By the time we're in this routine, we know we're doing
 * either an AXFR or IXFR. If there's no second_rr_type,
 * then we don't yet know which kind of answer we got back
 * from the server. Here, we're going to walk through the
 * rr's in the message, acting as necessary whenever we hit
 * an SOA rr.
 */

query->msg_count++;
query->byte_count += sevent->n;
result = dns_message_firstname(msg, DNS_SECTION_ANSWER);
if (result != ISC_R_SUCCESS) {
puts("; Transfer failed.");
return (true);
}
do {
    dns_name_t *name;
    name = NULL;

dns_message_currentname(msg, DNS_SECTION_ANSWER, &name);
for (rdataset = ISC_LIST_HEAD(name->list);
    rdataset != NULL;
    rdataset = ISC_LIST_NEXT(rdataset, link)) { 
result = dns_rdataset_first(rdataset);
if (result != ISC_R_SUCCESS)
continue;
do {
query->rr_count++;
dns_rdata_reset(&rdata);
dns_rdataset_current(rdataset, &rdata);
/*
 * If this is the first rr, make sure
 * it's an SOA
 */
if ((!query->first_soa_rcvd) &&
    (rdata.type != dns_rdatatype_soa)) {
    puts("; Transfer failed. ");
    "Didn't start with SOA answer.");
return (true);
}
if ((!query->second_rr_rcvd) &&
    (rdata.type != dns_rdatatype_soa)) {
query->second_rr_rcvd = true;
query->second_rr_serial = 0;
derbug("got the second rr as nonsoa");
axfr = query->ixfr_axfr = true;
goto next_rdata;
}
/*
 * If the record is anything except an SOA
 * now, just continue on...
 */
if (rdata.type != dns_rdatatype_soa)
goto next_rdata;

/* Now we have an SOA. Work with it. */
derbug("got an SOA");
result = dns_rdata_tostruct(&rdata, &soa, NULL);
check_result(result, "dns_rdata_tostruct");
serial = soa.serial;
dns_rdata_freestruct(&soa);
if (!query->first_soa_rcvd) {
    query->first_soa_rcvd = true;
query->first_rr_serial = serial;
derbug("this is the first serial ",

serial);
if (ixfr && isc_serial_ge(ixfr_serial,
    serial)) {
    debug("got up to date ",
          "response");
go to doexit;
} 
go to next_rdata;
}
if (axfr) {
    debug("doing axfr, got second SOA");
go to doexit;
}
if (!query->second_rr_rcvd) {
    if (query->first_rr_serial == serial) {
        debug("doing ixfr, got ",
              "empty zone");
go to doexit;
    }
    debug("this is the second serial %u", serial);
    query->second_rr_rcvd = true;
    query->second_rr_serial = serial;
go to next_rdata;
}
/*
 * If we get to this point, we're doing an
 * IXFR and have to start really looking
 * at serial numbers.
 */
if (query->first_rr_serial == serial) {
    debug("got a match for ixfr");
    if (!query->first_repeat_rcvd) {
        query->first_repeat_rcvd =
            true;
go to next_rdata;
    }
    debug("done with ixfr");
go to doexit;
}
debug("meaningless soa %u", serial);
next_rdata:
result = dns_rdataset_next(rdataset);
} while (result == ISC_R_SUCCESS);
result = dns_message_nextname(msg, DNS_SECTION_ANSWER);
} while (result == ISC_R_SUCCESS);
launch_next_query(query, false);
return (false);
doeexit:
dighost_received(sevent->n, &sevent->address, query);
return (true);
}

static void
process_cookie(dig_lookup_t *l, dns_message_t *msg,
    isc_buffer_t *optbuf, size_t optlen)
{
    char bb[256];
    isc_buffer_t hexbuf;
    size_t len;
    const unsigned char *sent;
    bool copy = true;
    isc_result_t result;

    if (l->cookie != NULL) {
        isc_buffer_init(&hexbuf, bb, sizeof(bb));
        result = isc_hex_decodestring(l->cookie, &hexbuf);
        check_result(result, "isc_hex_decodestring");
        sent = isc_buffer_base(&hexbuf);
        len = isc_buffer_usedlength(&hexbuf);
    } else {
        sent = cookie;
        len = sizeof(cookie);
    }

    INSIST(msg->cc_ok == 0 && msg->cc_bad == 0);
    if (len >= 8 && optlen >= 8U) {
        if (isc_safe_memequal(isc_buffer_current(optbuf), sent, 8)) {
            msg->cc_ok = 1;
        } else {
            printf(";; Warning: Client COOKIE mismatch\n");
            msg->cc_bad = 1;
            copy = false;
        }
    } else {
        printf(";; Warning: COOKIE bad token (too short)\n");
        msg->cc_bad = 1;
        copy = false;
    }
    if (copy) {
        isc_region_t r;
        r.base = isc_buffer_current(optbuf);
        r.length = (unsigned int)optlen;
        isc_buffer_init(&hexbuf, servercookie, sizeof(servercookie));
result = isc_hex_totext(&r, 2, "", &hexbuf);
check_result(result, "isc_hex_totext");
if (isc_buffer_availablelength(&hexbuf) > 0) {
    isc_buffer_putuint8(&hexbuf, 0);
l->cookie = servercookie;
}
isc_buffer_forward(optbuf, (unsigned int)optlen);
}

static void
process_opt(dig_lookup_t *l, dns_message_t *msg) {
dns_rdata_t rdata;
isc_result_t result;
isc_buffer_t optbuf;
uint16_t optcode, optlen;
dns_rdataset_t *opt = msg->opt;
bool seen_cookie = false;

result = dns_rdataset_first(opt);
if (result == ISC_R_SUCCESS) {
dns_rdata_init(&rdata);
dns_rdataset_current(opt, &rdata);
isc_buffer_init(&optbuf, rdata.data, rdata.length);
isc_buffer_add(&optbuf, rdata.length);
while (isc_buffer_remaininglength(&optbuf) >= 4) {
    optcode = isc_buffer_getuint16(&optbuf);
    optlen = isc_buffer_getuint16(&optbuf);
    switch (optcode) {
    case DNS_OPT_COOKIE:
    /*
     * Only process the first cookie option.
     */
    if (seen_cookie) {
        isc_buffer_forward(&optbuf, optlen);
        break;
    }
    process_cookie(l, msg, &optbuf, optlen);
    seen_cookie = true;
    break;
    default:
    break;
    }
    isc_buffer_forward(&optbuf, optlen);
    break;
}
}
static int
ednsvers(dns_rdataset_t *opt) {
    return ((opt->ttl >> 16) & 0xff);
}

/*%
 * Event handler for recv complete. Perform whatever actions are necessary,
 * based on the specifics of the user's request.
 */
static void
recv_done(isc_task_t *task, isc_event_t *event) {
    isc_socketevent_t *sevent = NULL;
dig_query_t *query = NULL;
    isc_buffer_t *b = NULL;
dns_message_t *msg = NULL;
#ifdef DIG_SIGCHASE
dig_message_t *chase_msg = NULL;
dig_message_t *chase_msg2 = NULL;
#endif
    isc_result_t result;
dig_lookup_t *n, *l;
    bool docancel = false;
    bool match = true;
    bool done_process_opt = false;
    unsigned int parseflags;
    dns_messageid_t id;
    unsigned int msgflags;
#ifdef DIG_SIGCHASE
    isc_result_t do_sigchase = false;
#endif
dns_message_t *msg_temp = NULL;
    isc_region_t r;
    isc_buffer_t *buf = NULL;
#endif
    int newedns;

    UNUSED(task);
    INSIST(!free_now);

dbg("recv_done()");

    LOCK_LOOKUP;
    recvcount--;
    dbg("recvcount=%d", recvcount);
    INSIST(recvcount >= 0);

    query = event->ev_arg;
    TIME_NOW(&query->time_recv);
debug("lookup=%p, query=%p", query->lookup, query);

l = query->lookup;

REQUIRE(event->ev_type == ISC_SOCKEVENT_RECVDONE);
sevent = (isc_socketevent_t *)event;

b = ISC_LIST_HEAD(sevent->bufferlist);
INSIST(b == &query->recvbuf);
ISC_LIST_DEQUEUE(sevent->bufferlist, &query->recvbuf, link);

if ((l->tcp_mode) && (query->timer != NULL))
isc_timer_touch(query->timer);
if (((!l->pending && (!l->ns_search_only) || cancel_now))
debug("no longer pending.  Got %s",
isc_result_totext(sevent->result));
query->waiting_connect = false;
isc_event_free(&event);
clear_query(query);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}

if (sevent->result != ISC_R_SUCCESS) {
if (sevent->result == ISC_R_CANCELED) {
debug("in recv cancel handler");
query->waiting_connect = false;
} else {
printf(";; communications error: %s
",
isc_result_totext(sevent->result));
if (keep != NULL)
isc_socket_detach(&keep);
isc_socket_detach(&query->sock);
sockcount--;
debug("sockcount=%d", sockcount);
INSIST(sockcount >= 0);
}
if (sevent->result == ISC_R_EOF && l->eoferr == 0U) {
  n = requeue_lookup(l, true);
n->eoferr++;
}
isc_event_free(&event);
clear_query(query);
cancel_lookup(l);
check_next_lookup(l);
UNLOCK_LOOKUP;
if (!l->tcp_mode &&
    !isc_sockaddr_compare(&sevent->address, &query->sockaddr,
    ISC_SOCKADDR_CMPADDR|
    ISC_SOCKADDR_CMPPORT|
    ISC_SOCKADDR_CMPSCOPE|
    ISC_SOCKADDR_CMPSCOPEZERO)) {
    char buf1[ISC_SOCKADDR_FORMATSIZE];
    char buf2[ISC_SOCKADDR_FORMATSIZE];
    isc_sockaddr_t any;

    if (isc_sockaddr_pf(&query->sockaddr) == AF_INET)
        isc_sockaddr_any(&any);
    else
        isc_sockaddr_any6(&any);

    /*
     * We don't expect a match when the packet is
     * sent to 0.0.0.0, :: or to a multicast addresses.
     * XXXMPA broadcast needs to be handled here as well.
     */
    if ((!isc_sockaddr_eqaddr(&query->sockaddr, &any) &&
        !isc_sockaddr_ismulticast(&query->sockaddr)) ||
        isc_sockaddr_getport(&query->sockaddr) !=
        isc_sockaddr_getport(&sevent->address)) {
        isc_sockaddr_format(&sevent->address, buf1,
            sizeof(buf1));
        isc_sockaddr_format(&query->sockaddr, buf2,
            sizeof(buf2));
        printf(";; reply from unexpected source: %s,
            expected %s\n", buf1, buf2);
        match = false;
    }
}

result = dns_message_peekheader(b, &id, &msgflags);
if (result != ISC_R_SUCCESS || l->sendmsg->id != id) {
    match = false;
if (l->tcp_mode) {
    bool fail = true;
if (result == ISC_R_SUCCESS) {
    if (!query->first_soa_rcvd ||
        query->warn_id)
        printf(";; %s: ID mismatch: ",
            "expected %u", buf1, buf2);
    query->first_soa_rcvd ?
"WARNING" : "ERROR",
l->sendmsg->id, id);
if (query->first_soa_rcvd)
fail = false;
query->warn_id = false;
} else
printf(";; ERROR: short 
" "(< header size) message\n");
if (fail) {
isc_event_free(&event);
clear_query(query);
cancel_lookup(l);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
match = true;
} else if (result == ISC_R_SUCCESS)
printf(";; Warning: ID mismatch: 
" "expected ID %u, got %u\n", l->sendmsg->id, id);
else
printf(";; Warning: short 
" "(< header size) message received\n");
}
if (result == ISC_R_SUCCESS && (msgflags & DNS_MESSAGEFLAG_QR) == 0)
printf(";; Warning: query response not set\n");
if (!match)
goto udp_mismatch;
result = dns_message_create(mctx, DNS_MESSAGE_INTENTPARSE, &msg);
check_result(result, "dns_message_create");
if (tsigkey != NULL) {
if (l->querysig == NULL) {
debug("getting initial querysig");
result = dns_message_getquerytsig(l->sendmsg, mctx,
   &l->querysig);
check_result(result, "dns_message_getquerytsig");
}
result = dns_message_setquerytsig(msg, l->querysig);
check_result(result, "dns_message_setquerytsig");
result = dns_message_settsigkey(msg, tsigkey);
check_result(result, "dns_message_settsigkey");
msg->tsigctx = l->tsigctx;
l->tsigctx = NULL;
if (l->msgcounter != 0)
parsedContinuation = 1;
l->msgcounter++;
}

dbglf("before parse starts");
parseflags = DNS_MESSAGEPARSE_PRESERVEORDER;
#ifdef DIG_SIGCHASE
if (!l->sigchase) {
do_sigchase = false;
} else {
parseflags = 0;
do_sigchase = true;
}
#endif
if (l->besteffort) {
parseflags |= DNS_MESSAGEPARSE_BESTEFFORT;
parseflags |= DNS_MESSAGEPARSE_IGNORETRUNCATION;
} result = dns_message_parse(msg, b, parseflags);
if (result == DNS_R_RECOVERABLE) {
printf(";; Warning: Message parser reports malformed \\
" message packet.
");
result = ISC_R_SUCCESS;
}
if (result != ISC_R_SUCCESS) {
printf(";; Got bad packet: %s
", isc_result_totext(result));
hex_dump(b);
query->waiting_connect = false;
dns_message_destroy(&msg);
isc_event_free(&event);
clear_query(query);
cancel_lookup(l);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
if (msg->counts[DNS_SECTION_QUESTION] != 0) {
match = true;
for (result = dns_message_firstname(msg, DNS_SECTION_QUESTION);
result == ISC_R_SUCCESS && match;
result = dns_message_nextname(msg, DNS_SECTION_QUESTION)) {
dns_name_t *name = NULL;
dns_rdataset_t *rdataset;

dns_message_currentname(msg, DNS_SECTION_QUESTION, 
&name);
for (rdataset = ISC_LIST_HEAD(name->list);
    rdataset != NULL;
    rdataset ! = NULL;
}
rdataset = ISC_LIST_NEXT(rdataset, link)) {  
if (l->rdtype != rdataset->type ||  
    l->rdclass != rdataset->rdclass ||  
    !dns_name_equal(l->name, name)) {
    char namestr[DNS_NAME_FORMATSIZE];
    char typebuf[DNS_RDATATYPE_FORMATSIZE];
    char classbuf[DNS_RDATACLASS_FORMATSIZE];
    dns_name_format(name, namestr, sizeof(namestr));
    dns_rdatatype_format(rdataset->type, typebuf, sizeof(typebuf));
    dns_rdataclass_format(rdataset->rdclass, classbuf, sizeof(classbuf));
    printf(";; Question section mismatch: ",
           namestr, typebuf, classbuf);
    match = false;
}

if (!match) {
    dns_message_destroy(&msg);
    if (l->tcp_mode) {
        isc_event_free(&event);
        clear_query(query);
        cancel_lookup(l);
        check_next_lookup(l);
        UNLOCK_LOOKUP;
        return;
    } else
        goto udp_mismatch;
}

if (msg->rcode == dns_rcode_badvers && msg->opt != NULL &&
    (newedns = ednsvers(msg->opt)) < l->edns && l->ednsneg) {
/*
   * Add minimum EDNS version required checks here if needed.
   */
    if (l->comments)
        printf(";; BADVERS, retrying with EDNS version %u\n",
               (unsigned int)newedns);
    l->edns = newedns;
    n = requeue_lookup(l, true);
    if (l->trace && l->trace_root)
        n->rdtype = l->qrdtype;
    dns_message_destroy(&msg);
isc_event_free(&event);
clear_query(query);
cancel_lookup(l);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
if ((msg->flags & DNS_MESSAGEFLAG_TC) != 0 &&
    l->ignore && !l->tcp_mode) {
    if (l->cookie == NULL && !l->sendcookie && msg->opt != NULL)
        process_opt(l, msg);
    if (l->comments)
        printf(";; Truncated, retrying in TCP mode.\n");
    n = requeue_lookup(l, true);
n->tcp_mode = true;
    if (l->trace && l->trace_root)
        n->rdtype = l->qrdtype;
    dns_message_destroy(&msg);
    isc_event_free(&event);
clear_query(query);
cancel_lookup(l);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
if (msg->rcode == dns_rcode_badcookie && !l->tcp_mode &&
    l->sendcookie && l->badcookie) {
    process_opt(l, msg);
    if (msg->cc_ok) {
        if (l->comments)
            printf(";; BADCOOKIE, retrying%s.\n", l->seenbadcookie ? " in TCP mode" : "");
        n = requeue_lookup(l, true);
        if (l->seenbadcookie)
            n->tcp_mode = true;
        n->seenbadcookie = true;
        if (l->trace && l->trace_root)
            n->rdtype = l->qrdtype;
        dns_message_destroy(&msg);
        isc_event_free(&event);
clear_query(query);
cancel_lookup(l);
check_next_lookup(l);
UNLOCK_LOOKUP;
return;
}
done_process_opt = true;
}
if ((msg->rcode == dns_rcode_servfail && !l->servfail_stops) ||
    (check_ra && (msg->flags & DNS_MESSAGEFLAG_RA) == 0 && l->recurse))
{
    dig_query_t *next = ISC_LIST_NEXT(query, link);
    if (l->current_query == query)
        l->current_query = NULL;
    if (next != NULL) {
        debug("sending query %p\n", next);
        if (l->tcp_mode)
            send_tcp_connect(next);
        else
            send_udp(next);
    }
/*
 * If our query is at the head of the list and there
 * is no next, we're the only one left, so fall
 * through to print the message.
 */
if ((ISC_LIST_HEAD(l->q) != query) ||
    (ISC_LIST_NEXT(query, link) != NULL)) {
    if (l->comments)
        printf(";; Got %s from %s, 
            "trying next server\n",
            msg->rcode == dns_rcode_servfail ?
            "SERVFAIL reply":
            "recursion not available",
            query->servname);
    clear_query(query);
    check_next_lookup(l);
    dns_message_destroy(&msg);
    isc_event_free(&event);
    UNLOCK_LOOKUP;
    return;
}
}

if (tsigkey != NULL) {
    result = dns_tsig_verify(&query->recvbuf, msg, NULL, NULL);
    if (result != ISC_R_SUCCESS) {
        printf(";; Couldn't verify signature: %s\n",
            isc_result_totext(result));
        validated = false;
    }
    l->tsigctx = msg->tsigctx;
    msg->tsigctx = NULL;
    if (l->querysig != NULL) {
        debug("freeing querysig buffer %p", l->querysig);
        isc_buffer_free(&l->querysig);
    }
    }
result = dns_message_getquerytsig(msg, mctx, &l->querysig);
check_result(result, "dns_message_getquerytsig");
}

extrabytes = isc_buffer_remaininglength(b);

dbg("after parse");
if (l->doing_xfr && l->xfr_q == NULL) {
    l->xfr_q = query;
/*
 * Once we are in the XFR message, increase
 * the timeout to much longer, so brief network
 * outages won't cause the XFR to abort
 */
    if (timeout != INT_MAX && query->timer != NULL) {
        unsigned int local_timeout;
        if (timeout == 0) {
            if (l->tcp_mode)
                local_timeout = TCP_TIMEOUT * 4;
            else
                local_timeout = UDP_TIMEOUT * 4;
        } else {
            if (timeout < (INT_MAX / 4))
                local_timeout = timeout * 4;
            else
                local_timeout = INT_MAX;
        }
        dbg("have local timeout of %d", local_timeout);
        isc_interval_set(&l->interval, local_timeout, 0);
        result = isc_timer_reset(query->timer,
            isc_timertype_once,
            NULL,
            &l->interval,
            false);
        check_result(result, "isc_timer_reset");
    }
}

if (!done_process_opt) {
    if (l->cookie != NULL) {
        if (msg->opt == NULL) {
            printf(";; expected opt record in response\n");
        } else {
            process_opt(l, msg);
        }
    } else if (l->sendcookie && msg->opt != NULL) {

process_opt(l, msg);
}

if (!l->doing_xfr || l->xfr_q == query) {
if (msg->rcode == dns_rcode_nxdomain &&
    (!l->origin != NULL || l->need_search)) {
if (!next_origin(query->lookup) || showsearch) {
dighost_printmessage(query, msg, true);
dighost_received(b->used, &sevent->address, query);
}
} else if (!l->trace && !l->ns_search_only) {
#ifdef DIG_SIGCHASE
#endif
dighost_printmessage(query, msg, true);
} else if (l->trace) {
int nl = 0;
int count = msg->counts[DNS_SECTION_ANSWER];

ddebug("in TRACE code");
if (!l->ns_search_only)
dighost_printmessage(query, msg, true);

l->rdtype = l->qrdtype;
if (l->trace_root || l->ns_search_only && count > 0)) {
if (!l->trace_root)
l->rdtype = dns_rdatatype_soa;
nl = followup_lookup(msg, query,
    DNS_SECTION_ANSWER);
l->trace_root = false;
} else if (count == 0)
nl = followup_lookup(msg, query,
    DNS_SECTION_AUTHORITY);
if (nl == 0)
docancel = true;
} else {
ddebug("in NSSEARCH code");

if (l->trace_root) {
/*
 * This is the initial NS query.
 */
int nl;

l->rdtype = dns_rdatatype_soa;
nl = followup_lookup(msg, query,
    DNS_SECTION_ANSWER);
if (nl == 0)
#ifdef DIG_SIGCHASE
if (!do_sigchase)
#endif
{
    dighost_printmessage(query, msg, true);
}
#endif

#ifdef DIG_SIGCHASE
if (do_sigchase) {
    chase_msg = isc_mem_allocate(mctx,
        sizeof(dig_message_t));
    if (chase_msg == NULL) {
        fatal("Memory allocation failure in %s:%d",
            __FILE__, __LINE__);
    }
    ISC_LIST_INITANDAPPEND(chase_message_list, chase_msg,
        link);
    if (dns_message_create(mctx, DNS_MESSAGE_INTENTPARSE,
        &msg_temp) != ISC_R_SUCCESS) {
        fatal("dns_message_create in %s:%d",
            __FILE__, __LINE__);
    }
    isc_buffer_usedregion(b, &r);
    result = isc_buffer_allocate(mctx, &buf, r.length);
    check_result(result, "isc_buffer_allocate");
    result = isc_buffer_copyregion(buf, &r);
    check_result(result, "isc_buffer_copyregion");
    result = dns_message_parse(msg_temp, buf, 0);
    isc_buffer_free(&buf);
    chase_msg->msg = msg_temp;
}
#endif

chase_msg2 = isc_mem_allocate(mctx,
    sizeof(dig_message_t));
if (chase_msg2 == NULL) {
    fatal("Memory allocation failure in %s:%d",
        __FILE__, __LINE__);
}
ISC_LIST_INITANDAPPEND(chase_message_list2, chase_msg2,
    link);
chase_msg2->msg = msg;
ifdef DIG_SIGCHASE
if (l->sigchase && ISC_LIST_EMPTY(lookup_list)) {
sigchase(msg_temp);
}
#endif

if (l->pending)
dbg("still pending.");
if (l->doing_xfr) {
if (query != l->xfr_q) {
dns_message_destroy(&msg);
isc_event_free(&event);
query->waiting_connect = false;
UNLOCK_LOOKUP;
return;
}
if (!docancel)
docancel = check_for_more_data(query, msg, sevent);
if (docancel) {
dns_message_destroy(&msg);
clear_query(query);
cancel_lookup(l);
check_next_lookup(l);
}
else {
if (msg->rcode == dns_rcode_noerror || l->origin == NULL) {
#ifdef DIG_SIGCHASE
if (!l->sigchase)
#endif
dighost_received(b->used, &sevent->address, query);
}
if (!query->lookup->ns_search_only)
query->lookup->pending = false;
if (!query->lookup->ns_search_only ||
query->lookup->trace_root || docancel) {
#ifdef DIG_SIGCHASE
if (!do_sigchase)
#endif
dns_message_destroy(&msg);
cancel_lookup(l);
}
clear_query(query);
check_next_lookup(l);
}  
if (msg != NULL) {
#ifdef DIG_SIGCHASE
if (do_sigchase)
msg = NULL;
else
#endif
dns_message_destroy(&msg);
}
isc_event_free(&event);
UNLOCK_LOOKUP;
return;

udp_mismatch:
isc_buffer.invalidate(&query->recvbuf);
isc_buffer.init(&query->recvbuf, query->recvspace, COMMSIZE);
ISC_LIST_ENQUEUE(query->recvlist, &query->recvbuf, link);
result = isc_socket_recv(query->sock, &query->recvlist, 1,
    global_task, recv_done, query);
check_result(result, "isc_socket_recv");
recvcount++;
isc_event_free(&event);
UNLOCK_LOOKUP;
return;
}

/*%
* Turn a name into an address, using system-supplied routines. This is
* used in looking up server names, etc... and needs to use system-supplied
* routines, since they may be using a non-DNS system for these lookups.
*/
isc_result_t
get_address(char *host, in_port_t myport, isc_sockaddr_t *sockaddr) {
    int count;
    isc_result_t result;
    bool is_running;

    is_running = isc_app_isrunning();
if (is_running)
    isc_app_block();
result = bind9_getaddresses(host, myport, sockaddr, 1, &count);
if (is_running)
    isc_app_unblock();
if (result != ISC_R_SUCCESS)
    return (result);

    INSIST(count == 1);
int
getaddresses(dig_lookup_t *lookup, const char *host, isc_result_t *resultp) {
    isc_result_t result;
    isc_sockaddr_t sockaddrs[DIG_MAX_ADDRESSES];
    isc_netaddr_t netaddr;
    int count, i;
    dig_server_t *srv;
    char tmp[ISC_NETADDR_FORMATSIZE];

    result = bind9_getaddresses(host, 0, sockaddrs,
                                DIG_MAX_ADDRESSES, &count);
    if (resultp != NULL)
        *resultp = result;
    if (result != ISC_R_SUCCESS) {
        if (resultp == NULL)
            fatal("couldn't get address for '%s': %s",
                 host, isc_result_totext(result));
        return (0);
    }

    for (i = 0; i < count; i++) {
        isc_netaddr_fromsockaddr(&netaddr, &sockaddrs[i]);
        isc_netaddr_format(&netaddr, tmp, sizeof(tmp));
        srv = make_server(tmp, host);
        ISC_LIST_APPEND(lookup->my_server_list, srv, link);
    }

    return (count);
}

/*%*/
* Initiate either a TCP or UDP lookup
*/
void
do_lookup(dig_lookup_t *lookup) {
    dig_query_t *query;

    REQUIRE(lookup != NULL);

    debug("do_lookup()");
    lookup->pending = true;
    query = ISC_LIST_HEAD(lookup->q);
    if (query != NULL) {
        if (lookup->tcp_mode)
send_tcp_connect(query);
else
send_udp(query);
}

/*%
 * Start everything in action upon task startup.
 */
void
onrun_callback(isc_task_t *task, isc_event_t *event) {
    UNUSED(task);

    isc_event_free(&event);
    LOCK_LOOKUP;
    start_lookup();
    UNLOCK_LOOKUP;
}

/*%
 * Make everything on the lookup queue go away. Mainly used by the
 * SIGINT handler.
 */
void
cancel_all(void) {
    dig_lookup_t *l, *n;
    dig_query_t *q, *nq;

    debug("cancel_all()");

    LOCK_LOOKUP;
    if (free_now) {
        UNLOCK_LOOKUP;
        return;
    }
    cancel_now = true;
    if (current_lookup != NULL) {
        for (q = ISC_LIST_HEAD(current_lookup->q);
            q != NULL;
            q = nq)
        {
            nq = ISC_LIST_NEXT(q, link);
            debug("canceling pending query %p, belonging to %p",
                   q, current_lookup);
            if (q->sock != NULL)
                isc_socket_cancel(q->sock, NULL,
                                  ISC_SOCKCANCEL_ALL);
            else
                isc_socket_cancel(q->sock, NULL, 0);
        }
    }
}

clear_query(q);
}
for (q = ISC_LIST_HEAD(current_lookup->connecting);
    q != NULL;
    q = nq)
{
    nq = ISC_LIST_NEXT(q, clink);
    debug("canceling connecting query %p, belonging to %p",
         q, current_lookup);
    if (q->sock != NULL)
        isc_socket_cancel(q->sock, NULL,
            ISC_SOCKCANCEL_ALL);
    else
        clear_query(q);
}
}
l = ISC_LIST_HEAD(lookup_list);
while (l != NULL) {
    n = ISC_LIST_NEXT(l, link);
    ISC_LIST_DEQUEUE(lookup_list, l, link);
    try_clear_lookup(l);
    l = n;
}
UNLOCK_LOOKUP;
/*%
 * Destroy all of the libs we are using, and get everything ready for a 
 * clean shutdown.
 */
void
destroy_libs(void) {
#ifdef DIG_SIGCHASE
void * ptr;
dig_message_t *chase_msg;
#endif
#ifdef WITH_IDN_SUPPORT
isc_result_t result;
#endif
if (keep != NULL)
    isc_socket_detach(&keep);
debug("destroy_libs()");
if (global_task != NULL) {
    debug("freeing task");
    isc_task_detach(&global_task);
}
/*
* The taskmgr_destroy() call blocks until all events are cleared
* from the task.
*/
if (taskmgr != NULL) {
d debug("freeing taskmgr");
isc_taskmgr_destroy(&taskmgr);
}

LOCK_LOOKUP;
REQUIRE(sockcount == 0);
REQUIRE(recvcount == 0);
REQUIRE(sendcount == 0);

INSIST(ISC_LIST_HEAD(lookup_list) == NULL);
INSIST(current_lookup == NULL);
INSIST(!free_now);

free_now = true;

lwres_conf_clear(lwctx);
lwres_context_destroy(&lwctx);

flush_server_list();
clear_searchlist();

#ifdef WITH_IDN_SUPPORT
result = dns_name_settotextfilter(NULL);
check_result(result, "dns_name_settotextfilter");
#endif
dns_name_destroy();

if (commctx != NULL) {
d debug("freeing commctx");
isc_mempool_destroy(&commctx);
}
if (socketmgr != NULL) {
d debug("freeing socketmgr");
isc_socketmgr_destroy(&socketmgr);
}
if (timermgr != NULL) {
d debug("freeing timermgr");
isc_timermgr_destroy(&timermgr);
}
if (tsigkey != NULL) {
d debug("freeing key %p", tsigkey);
dns_tsigkey_detach(&tsigkey);
}
if (namebuf != NULL) {
isc_buffer_free(&namebuf);

if (is_dst_up) {
    debug("destroy DST lib");
dst_lib_destroy();
    is_dst_up = false;
}
if (entp != NULL) {
    debug("detach from entropy");
    isc_entropy_detach(&entp);
}

UNLOCK_LOOKUP;
DESTROYLOCK(&lookup_lock);
#ifdef DIG_SIGCHASE

debug("Destroy the messages kept for sigchase");
/* Destroy the messages kept for sigchase */
chase_msg = ISC_LIST_HEAD(chase_message_list);

while (chase_msg != NULL) {
    INSIST(chase_msg->msg != NULL);
dns_message_destroy(&(chase_msg->msg));
    ptr = chase_msg;
    chase_msg = ISC_LIST_NEXT(chase_msg, link);
    isc_mem_free(mctx, ptr);
}

chase_msg = ISC_LIST_HEAD(chase_message_list2);

while (chase_msg != NULL) {
    INSIST(chase_msg->msg != NULL);
dns_message_destroy(&(chase_msg->msg));
    ptr = chase_msg;
    chase_msg = ISC_LIST_NEXT(chase_msg, link);
    isc_mem_free(mctx, ptr);
}

if (dns_name_dynamic(&chase_name))
    free_name(&chase_name);
#endif
#endif
#ifdef DIG_SIGCHASE_TD
    if (dns_name_dynamic(&chase_current_name))
        free_name(&chase_current_name);
    if (dns_name_dynamic(&chase_authority_name))
        free_name(&chase_authority_name);
#endif
#endif
#ifdef DIG_SIGCHASE_BU
    if (dns_name_dynamic(&chase_signame))
        free_name(&chase_signame);
#ifdef WITH_IDN_OUT_SUPPORT
static isc_result_t
output_filter(isc_buffer_t *buffer, unsigned int used_org,
       bool absolute)
{
    char tmp1[MAXDLEN], tmp2[MAXDLEN];
    size_t fromlen, tolen;
    bool end_with_dot;
    isc_result_t result;

    /*
     * Copy contents of 'buffer' to 'tmp1', supply trailing dot
     * if 'absolute' is true, and terminate with NUL.
     *
     */
    fromlen = isc_buffer_usedlength(buffer) - used_org;
    if (fromlen >= MAXDLEN)
        return (ISC_R_SUCCESS);
    memmove(tmp1, (char *)isc_buffer_base(buffer) + used_org, fromlen);
    end_with_dot = (tmp1[fromlen - 1] == '.') ? true : false;
    if (absolute && !end_with_dot) {
        fromlen++;
        if (fromlen >= MAXDLEN)
            return (ISC_R_SUCCESS);
        tmp1[fromlen - 1] = '.';
    }
    tmp1[fromlen] = '\0';

    /*
     * Convert contents of 'tmp1' to local encoding.
     */
    result = idn_ace_to_locale(tmp1, tmp2, sizeof(tmp2));
    if (result != ISC_R_SUCCESS) {
        return (ISC_R_SUCCESS);
    }
}
#endif
/*
 * Copy the converted contents in 'tmp1' back to 'buffer'.
 * If we have appended trailing dot, remove it.
 */
tolen = strlen(tmp2);
if (absolute && !end_with_dot && tmp2[tolen - 1] == '.
    tolen--;

    if (isc_buffer_length(buffer) < used_org + tolen)
        return (ISC_R_NOSPACE);

    isc_buffer_subtract(buffer, isc_buffer_usedlength(buffer) - used_org);
    memmove(isc_buffer_used(buffer), tmp2, tolen);
    isc_buffer_add(buffer, (unsigned int)tolen);

    return (ISC_R_SUCCESS);
}
#endif

#ifdef WITH_IDN_SUPPORT
    #ifdef WITH_IDNKIT

        static void
            idnkit_check_result(idn_result_t result, const char *msg) {
                if (result != idn_success) {
                    fatal("%s: %s", msg, idn_result_tostring(result));
                }

        static void
            idn_initialize(void) {
                idn_result_t result;

                /* Create configuration context. */
                result = idn_nameinit(1);
                idnkit_check_result(result, "idnkit api initialization failed");
                return (ISC_R_SUCCESS);

        static isc_result_t
            idn_locale_to_ace(const char *from, char *to, size_t tolen) {
                char utf8_textname[MXNAME];
                idn_result_t result;

                result = idn_encodename(IDN_LOCALCONV | IDN_DELIMMAP, from,
                                        utf8_textname, sizeof(utf8_textname));
                idnkit_check_result(result, "idnkit idn_encodename to utf8 failed");
    

result = idn_encodename(idnoptions | IDN_LOCALMAP | IDN_NAMEPREP | IDN_IDNCONV | IDN_LENCHECK,
utf8_textname, to, tolen);
idnkit_check_result(result, "idnkit idn_encodename to idn failed");
return (ISC_R_SUCCESS);
}

static isc_result_t
idn_ace_to_locale(const char *from, char *to, size_t tolen) {
idn_result_t result;

result = idn_decodename(IDN DECODE_APP, from, to, tolen);
if (result != idn_success) {
dbg("idnkit idn_decodename failed: %s",
    idn_result_tostring(result));
return (ISC_R_FAILURE);
}
return (ISC_R_SUCCESS);
}
#endif /* WITH_IDNKIT */

#ifdef WITH_LIBIDN2
static void
idn_initialize(void) {
}

static isc_result_t
idn_locale_to_ace(const char *from, char *to, size_t tolen) {
int res;
char *tmp_str = NULL;
res = idn2_to_ascii_lz(from, &tmp_str, IDN2_NONTRANSITIONAL|IDN2_NFC_INPUT);
if (res == IDN2_DISALLOWED) {
    res = idn2_to_ascii_lz(from, &tmp_str, IDN2_TRANSITIONAL|IDN2_NFC_INPUT);
}
if (res == IDN2_OK) {
/*
 * idn2_to_ascii_lz() normalizes all strings to lowerl case,
 * but we generally don't want to lowercase all input strings;
 * make sure to return the original case if the two strings
 * differ only in case
 */
    if (!strcasecmp(from, tmp_str)) {
        if (strlen(from) >= tolen) {
dbg("from string is too long");
        idn2_free(tmp_str);
        return ISC_R_NOSPACE;
    }

result = idn_decodename(IDN_DECODE_APP, from, to, tolen);
if (result != idn_success) {
dbg("idnkit idn_decodename failed: %s",
    idn_result_tostring(result));
return (ISC_R_FAILURE);
}
return (ISC_R_SUCCESS);
}
idn2_free(tmp_str);
(void) strlcpy(to, from, tolen);
return ISC_R_SUCCESS;
}

/* check the length */
if (strlen(tmp_str) >= tolen) {
    debug("ACE string is too long");
    idn2_free(tmp_str);
    return ISC_R_NOSPACE;
}

(void) strlcpy(to, tmp_str, tolen);
idn2_free(tmp_str);
return ISC_R_SUCCESS;
}

fatal("'%s' is not a legal IDN name (%s), use +noidnin", from, idn2_strerror(res));
return ISC_R_FAILURE;
}

#ifdef WITH_IDN_OUT_SUPPORT
static isc_result_t
idn_ace_to_locale(const char *from, char *to, size_t tolen) {
    int res;
    char *utf8_src, *tmp_str = NULL;

    /*
     * We need to:
     * 1) check whether 'from' is a valid IDNA2008 name,
     * 2) if it is, output it in the current locale's character encoding.
     * Unlike idn2_to_ascii_*, idn2_to_unicode_*() functions are unable
     * to perform IDNA2008 validity checks. Thus, we need to decode any
     * Punycode in 'from', check if the resulting name is a valid IDNA2008
     * name, and only once we ensure it is, output that name in the current
     * locale's character encoding.
     * We could just use idn2_to_unicode_8zIz() + idn2_to_ascii_lz(), but
     * then we would not be able to universally tell invalid names and
     * character encoding errors apart (if the current locale uses ASCII
     * for character encoding, the former function would fail even for a
     * valid IDNA2008 name, as long as it contained any non-ASCII
     * character). Thus, we need to take a longer route.
     * First, convert 'from' to UTF-8, ignoring the current locale.
     */
    */

    /*
     * We need to:
     * 1) check whether 'from' is a valid IDNA2008 name,
     * 2) if it is, output it in the current locale's character encoding.
     * Unlike idn2_to_ascii_*, idn2_to_unicode_*() functions are unable
     * to perform IDNA2008 validity checks. Thus, we need to decode any
     * Punycode in 'from', check if the resulting name is a valid IDNA2008
     * name, and only once we ensure it is, output that name in the current
     * locale's character encoding.
     * We could just use idn2_to_unicode_8zIz() + idn2_to_ascii_lz(), but
     * then we would not be able to universally tell invalid names and
     * character encoding errors apart (if the current locale uses ASCII
     * for character encoding, the former function would fail even for a
     * valid IDNA2008 name, as long as it contained any non-ASCII
     * character). Thus, we need to take a longer route.
     */

    /*
     * We need to:
     * 1) check whether 'from' is a valid IDNA2008 name,
     * 2) if it is, output it in the current locale's character encoding.
     * Unlike idn2_to_ascii_*, idn2_to_unicode_*() functions are unable
     * to perform IDNA2008 validity checks. Thus, we need to decode any
     * Punycode in 'from', check if the resulting name is a valid IDNA2008
     * name, and only once we ensure it is, output that name in the current
     * locale's character encoding.
     * We could just use idn2_to_unicode_8zIz() + idn2_to_ascii_lz(), but
     * then we would not be able to universally tell invalid names and
     * character encoding errors apart (if the current locale uses ASCII
     * for character encoding, the former function would fail even for a
     * valid IDNA2008 name, as long as it contained any non-ASCII
     * character). Thus, we need to take a longer route.
     */

    /*
     * We need to:
     * 1) check whether 'from' is a valid IDNA2008 name,
     * 2) if it is, output it in the current locale's character encoding.
     * Unlike idn2_to_ascii_*, idn2_to_unicode_*() functions are unable
     * to perform IDNA2008 validity checks. Thus, we need to decode any
     * Punycode in 'from', check if the resulting name is a valid IDNA2008
     * name, and only once we ensure it is, output that name in the current
     * locale's character encoding.
     * We could just use idn2_to_unicode_8zIz() + idn2_to_ascii_lz(), but
     * then we would not be able to universally tell invalid names and
     * character encoding errors apart (if the current locale uses ASCII
     * for character encoding, the former function would fail even for a
     * valid IDNA2008 name, as long as it contained any non-ASCII
     * character). Thus, we need to take a longer route.
     */

    /*
     * We need to:
     * 1) check whether 'from' is a valid IDNA2008 name,
     * 2) if it is, output it in the current locale's character encoding.
     * Unlike idn2_to_ascii_*, idn2_to_unicode_*() functions are unable
     * to perform IDNA2008 validity checks. Thus, we need to decode any
     * Punycode in 'from', check if the resulting name is a valid IDNA2008
     * name, and only once we ensure it is, output that name in the current
     * locale's character encoding.
     * We could just use idn2_to_unicode_8zIz() + idn2_to_ascii_lz(), but
     * then we would not be able to universally tell invalid names and
     * character encoding errors apart (if the current locale uses ASCII
     * for character encoding, the former function would fail even for a
     * valid IDNA2008 name, as long as it contained any non-ASCII
     * character). Thus, we need to take a longer route.
     */
res = idn2_to_unicode_8z8z(from, &utf8_src, 0);
if (res != IDN2_OK) {
    fatal("Bad ACE string '%s' (%s), use +noidnout",
          from, idn2_strerror(res));
}

/*
* Then, check whether decoded 'from' is a valid IDNA2008 name.
*/
res = idn2_to_ascii_8z(utf8_src, NULL, IDN2_NONTRANSITIONAL);
if (res != IDN2_OK) {
    fatal("'%s' is not a legal IDNA2008 name (%s), use +noidnout",
          from, idn2_strerror(res));
}

/*
* Finally, try converting the decoded 'from' into the current locale's
* character encoding.
*/
res = idn2_to_unicode_8z1z(utf8_src, &tmp_str, 0);
if (res != IDN2_OK) {
    fatal("Cannot represent '%s' in the current locale (%s), "
          "use +noidnout or a different locale",
          from, idn2_strerror(res));
}

/*
* Free the interim conversion result.
*/
idn2_free(utf8_src);

/* check the length */
if (strlen(tmp_str) >= tolen) {
    debug("encoded ASC string is too long");
    idn2_free(tmp_str);
    return (ISC_R_FAILURE);
}

(void) strlcpy(to, tmp_str, tolen);
idn2_free(tmp_str);
return (ISC_R_SUCCESS);

#endif /* WITH_IDN_OUT_SUPPORT */
#endif /* WITH_LIBIDN2 */
#endif /* WITH_IDN_SUPPORT */

#ifdef DIG_SIGCHASE
void
print_type(dns_rdatatype_t type)
{
    isc_buffer_t * b = NULL;
    isc_result_t result;
    isc_region_t r;

    result = isc_buffer_allocate(mctx, &b, 4000);
    check_result(result, "isc_buffer_allocate");

    result = dns_rdatatype_totext(type, b);
    check_result(result, "print_type");

    isc_buffer_usedregion(b, &r);
    r.base[r.length] = '\0';

    printf("%s", r.base);

    isc_buffer_free(&b);
}

void
dump_database_section(dns_message_t *msg, int section)
{
    dns_name_t *msg_name=NULL;
    dns_rdataset_t *rdataset;

    do {
        dns_message_currentname(msg, section, &msg_name);

        for (rdataset = ISC_LIST_HEAD(msg_name->list); rdataset != NULL;
             rdataset = ISC_LIST_NEXT(rdataset, link)) {
            dns_name_print(msg_name, stdout);
            printf("\n");
            print_rdataset(msg_name, rdataset);
            printf("end\n");
        }
        msg_name = NULL;
    } while (dns_message_nextname(msg, section) == ISC_R_SUCCESS);
}

void
dump_database(void) {
    dig_message_t * msg;

    for (msg = ISC_LIST_HEAD(chase_message_list);  msg != NULL;
        msg = ISC_LIST_NEXT(msg, link)) {
        if (dns_message_firstname(msg->msg, DNS_SECTION_ANSWER)
== ISC_R_SUCCESS)
dump_database_section(msg->msg, DNS_SECTION-answer);

if (dns_message_firstname(msg->msg, DNS_SECTION_AUTHORITY) == ISC_R_SUCCESS)
dump_database_section(msg->msg, DNS_SECTION_AUTHORITY);

if (dns_message_firstname(msg->msg, DNS_SECTION_ADDITIONAL) == ISC_R_SUCCESS)
dump_database_section(msg->msg, DNS_SECTION_ADDITIONAL);
}
}

dns_rdataset_t *
search_type(dns_name_t *name, dns_rdatatype_t type, dns_rdatatype_t covers) {

dns_rdataset_t *rdataset;
dns_rdata_sig_t siginfo;
dns_rdata_t sigrdata = DNS_RDATA_INIT;
isc_result_t result;
for (rdataset = ISC_LIST_HEAD(name->list); rdataset != NULL;
rdataset = ISC_LIST_NEXT(rdataset, link)) {
if (type == dns_rdatatype_any) {
if (rdataset->type != dns_rdatatype_rrsig)
return (rdataset);
else if ((type == dns_rdatatype_rrsig) &&
(rdataset->type == dns_rdatatype_rrsig)) {
result = dns_rdataset_first(rdataset);
check_result(result, "empty rdataset");
dns_rdataset_current(rdataset, &sigrdata);
result = dns_rdata_tostruct(&sigrdata, &siginfo, NULL);
check_result(result, "sigrdata tostruct siginfo");

if (((siginfo.covered == covers) ||
(covers == dns_rdatatype_any)) {

dns_rdata_reset(&sigrdata);
dns_rdata_freestruct(&siginfo);
return (rdataset);
}
else if (rdataset->type == type)
return (rdataset);
}
return (NULL);
}
dns_rdataset_t *
chase_scanname_section(dns_message_t *msg, dns_name_t *name,
        dns_rdatatype_t type, dns_rdatatype_t covers,
        int section)
{
    dns_rdataset_t *rdataset;
    dns_name_t *msg_name = NULL;

    if (msg->counts[section] == 0)
        return (NULL);

    do {
        dns_message_currentname(msg, section, &msg_name);
        if (dns_name_compare(msg_name, name) == 0) {
            rdataset = search_type(msg_name, type, covers);
            if (rdataset != NULL)
                return (rdataset);
        }
        msg_name = NULL;
    } while (dns_message_nextname(msg, section) == ISC_R_SUCCESS);

    return (NULL);
}

dns_rdataset_t *
chase_scanname(dns_name_t *name, dns_rdatatype_t type, dns_rdatatype_t covers)
{
    dns_rdataset_t *rdataset = NULL;
    dig_message_t * msg;

    for (msg = ISC_LIST_HEAD(chase_message_list2);  msg != NULL;
            msg = ISC_LIST_NEXT(msg, link)) {
        if (dns_message_firstname(msg->msg, DNS_SECTION_ANSWER)
            == ISC_R_SUCCESS)
            {
                rdataset = chase_scanname_section(msg->msg, name,
                        type, covers,
                        DNS_SECTION_ANSWER);
                if (rdataset != NULL)
                    return (rdataset);
            }
        if (dns_message_firstname(msg->msg, DNS_SECTION_AUTHORITY)
            == ISC_R_SUCCESS)
            {
                rdataset =
                        chase_scanname_section(msg->msg, name,
                        type, covers,
DNS_SECTION_AUTHORITY);
if (rdataset != NULL)
return (rdataset);
}
if (dns_message_firstname(msg->msg, DNS_SECTION_ADDITIONAL)
    == ISC_R_SUCCESS)
{
    rdataset =
    chase_scannamename_section(msg->msg, name, type,
        covers,
        DNS_SECTION_ADDITIONAL);
if (rdataset != NULL)
return (rdataset);
}

return (NULL);


dns_rdataset_t *
sigchase_scannamename(dns_rdatatype_t type, dns_rdatatype_t covers,
    bool * lookedup, dns_name_t *rdata_name)
{
    dig_lookup_t *lookup;
    isc_buffer_t *b = NULL;
    isc_region_t r;
    isc_result_t result;
    dns_rdataset_t * temp;
    dns_rdatatype_t querytype;

    temp = chase_scannamename(rdata_name, type, covers);
    if (temp != NULL)
return (temp);

    if (*lookedup == true)
return (NULL);

    lookup = clone_lookup(current_lookup, true);
    lookup->trace_root = false;
    lookup->new_search = true;

    result = isc_buffer_allocate(mctx, &b, BUFSIZE);
    check_result(result, "isc_buffer_allocate");
    result = dns_name_totext(rdata_name, false, b);
    check_result(result, "dns_name_totext");
    isc_buffer_usedregion(b, &r);
    r.base[r.length] = '\0';
    strlcpy(lookup->textname, (char*)r.base, sizeof(lookup->textname));
isc_buffer_free(&b);

if (type == dns_rdatatype_rrsig)
querytype = covers;
else
querytype = type;

if (querytype == 0 || querytype == 255) {
printf("Error in the queried type: %d\n", querytype);
return (NULL);
}

lookup->rdtype = querytype;
lookup->rdtypeset = true;
lookup->qrdtype = querytype;
*lookedup = true;

ISC_LIST_APPEND(lookup_list, lookup, link);
printf("\n\nLaunch a query to find a RRset of type ");
print_type(type);
printf(" for zone: %s\n", lookup->textname);
return (NULL);
}

isc_result_t
insert_trustedkey(void *arg, dns_name_t *name, dns_rdataset_t *rdataset)
{
isc_result_t result;
dst_key_t *dstkey;

UNUSED(arg);

if (rdataset == NULL || rdataset->type != dns_rdatatype_dnskey)
return (ISC_R_SUCCESS);

for (result = dns_rdataset_first(rdataset);
result == ISC_R_SUCCESS;
result = dns_rdataset_next(rdataset)) {

dns_rdata_t rdata = DNS_RDATA_INIT;
isc_buffer_t b;

dns_rdataset_current(rdataset, &rdata);
isc_buffer_init(&b, rdata.data, rdata.length);
isc_buffer_add(&b, rdata.length);
if (tk_list.nb_tk >= MAX_TRUSTED_KEY)
return (ISC_R_SUCCESS);
dstkey = NULL;
result = dst_key_fromdns(name, rdata.rdclass, &b, mctx, &dstkey);
if (result != ISC_R_SUCCESS)
    continue;
    tk_list.key[tk_list.nb_tk++] = dstkey;
}
    return (ISC_R_SUCCESS);

void
    clean_trustedkey()
    {
        int i = 0;

        for (i = 0; i < MAX_TRUSTED_KEY; i++) {
            if (tk_list.key[i] != NULL) {
                dst_key_free(&tk_list.key[i]);
                tk_list.key[i] = NULL;
            } else
                break;
        }
    tk_list.nb_tk = 0;
    return;

    char alphnum[] =
        "ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789";

    isc_result_t
    removetmpkey(const char *file)
    {
        char *tempnamekey = NULL;
        int tempnamekeylen;
        isc_result_t result;

        tempnamekeylen = strlen(file)+10;
        tempnamekey = isc_mem_allocate(mctx, tempnamekeylen);
        if (tempnamekey == NULL)
            return (ISC_R_NOMEMORY);
        memset(tempnamekey, 0, tempnamekeylen);
        strcat(tempnamekey, file);
        strcat(tempnamekey, ".key");
        isc_file_remove(tempnamekey);

        result = isc_file_remove(tempnamekey);
        isc_mem_free(mctx, tempnamekey);
        return (result);
isc_result_t
get_trusted_key(void) {
    isc_result_t result;
    const char *filename = NULL;
    dns_rdatacallbacks_t callbacks;

    result = isc_file_exists(trustedkey);
    if (result != true) {
        result = isc_file_exists("/etc/trusted-key.key");
        if (result != true) {
            result = isc_file_exists("./trusted-key.key");
            if (result != true)
                return (ISC_R_FAILURE);
            else
                filename = "/trusted-key.key";
        } else
            filename = "/etc/trusted-key.key";
    } else
        filename = trustedkey;

    if (filename == NULL) {
        printf("No trusted key\n");
        return (ISC_R_FAILURE);
    }

    dns_rdatacallbacks_init_stdio(&callbacks);
    callbacks.add = insert_trustedkey;
    return (dns_master_loadfile(filename, dns_rootname, dns_rootname,
                                 current_lookup->rdclass, DNS_MASTER_NOTTL,
                                 &callbacks, mctx));
}

static void
nameFromString(const char *str, dns_name_t *p_ret) {
    size_t len = strlen(str);
    isc_result_t result;
    isc_buffer_t buffer;
    dns_fixedname_t fixedname;

    REQUIRE(p_ret != NULL);
    REQUIRE(str != NULL);

    isc_buffer_constinit(&buffer, str, len);
    isc_buffer_add(&buffer, len);
dns_fixedname_init(&fixedname);
result = dns_name_fromtext(dns_fixedname_name(&fixedname), &buffer,
    dns_rootname, DNS_NAME_DOWNCASE, NULL);
check_result(result, "nameFromText");

if (dns_name_dynamic(p_ret))
    free_name(p_ret);

result = dns_name_dup(dns_fixedname_name(&fixedname), mctx, p_ret);
check_result(result, "nameFromText");
}

#if DIG_SIGCHASE_TD
isc_result_t
prepare_lookup(dns_name_t *name)
{
    isc_result_t result;
    dig_lookup_t *lookup = NULL;
    dig_server_t *s;
    void *ptr;

    lookup = clone_lookup(current_lookup, true);
    lookup->trace_root = false;
    lookup->new_search = true;
    lookup->trace_root_sigchase = false;

    strlcpy(lookup->textname, lookup->textnamesigchase, MXNAME);

    lookup->rdtype = lookup->rdtype_sigchase;
    lookup->rdtypeset = true;
    lookup->qrdtype = lookup->qrdtype_sigchase;

    s = ISC_LIST_HEAD(lookup->my_server_list);
    while (s != NULL) {
        debug("freeing server %p belonging to %p", 
            s, lookup);
        ptr = s;
        s = ISC_LIST_NEXT(s, link);
        ISC_LIST_DEQUEUE(lookup->my_server_list, 
            (dig_server_t *)ptr, link);
        isc_mem_free(mctx, ptr);
    }

    for (result = dns_rdataset_first(chase_nsrdataset);
        result == ISC_R_SUCCESS;
        result = dns_rdataset_next(chase_nsrdataset)) {

char namestr[DNS_NAME_FORMATSIZE];
dns_rdata_t ns;
dns_rdata_t rdata = DNS_RDATA_INIT;
dig_server_t * srv = NULL;
#define __FOLLOW_GLUE__
#endif __FOLLOW_GLUE__
isc_buffer_t *b = NULL;
isc_region_t r;
dns_rdataset_t *rdataset = NULL;
bool t = true;
#endif

memset(namesstr, 0, DNS_NAME_FORMATSIZE);

dns_rdataset_current(chase_nsrdataset, &rdata);

result = dns_rdata_tostruct(&rdata, &ns, NULL);
check_result(result, "dns_rdata_tostruct");

#ifdef __FOLLOW_GLUE__

result = advanced_rrsearch(&rdataset, &ns.name,
    dns_rdatatype_aaaa,
    dns_rdatatype_any, &t);
if (result == ISC_R_SUCCESS) {
    for (result = dns_rdataset_first(rdataset);
    result == ISC_R_SUCCESS;
    result = dns_rdataset_next(rdataset)) {
    dns_rdata_t aaaa = DNS_RDATA_INIT;
    dns_rdataset_current(rdataset, &aaaa);

    result = isc_buffer_allocate(mctx, &b, 80);
    check_result(result, "isc_buffer_allocate");

    dns_rdata_totext(&aaaa, &ns.name, b);
    isc_buffer_usedregion(b, &r);
    r.base[r.length] = '\0';
    strlcpy(namesstr, (char*)r.base,
    DNS_NAME_FORMATSIZE);
    isc_buffer_free(&b);
    dns_rdata_reset(&aaaa);

    srv = make_server(namesstr, namesstr);

    ISC_LIST_APPEND(lookup->my_server_list,
    srv, link);
}


rdataset = NULL;
result = advanced_rresearch(&rdataset, &ns.name, dns_rdatatype_a,
    dns_rdatatype_any, &t);
if (result == ISC_R_SUCCESS) {
    for (result = dns_rdataset_first(rdataset);
        result == ISC_R_SUCCESS;
        result = dns_rdataset_next(rdataset)) {
        dns_rdata_t a = DNS_RDATA_INIT;
        dns_rdataset_current(rdataset, &a);
        result = isc_buffer.allocate(mctx, &b, 80);
        check_result(result, "isc_buffer.allocate");
        dns_rdata_totext(&a, &ns.name, b);
        isc_buffer.usedregion(b, &r);
        r.base[r.length] = '\0';
        strlcpy(namestr, (char*)r.base,
            DNS_NAME_FORMATSIZE);
        isc_buffer.free(&b);
        dns_rdata_freestruct(&ns);
        dns_rdata.reset(&rdata);
        printf("ns name: %s\n", namestr);
    }
}
else
    dns_name_format(&ns.name, namestr, sizeof(namestr));
    printf("ns name: ");
    dns_name_print(&ns.name, stdout);
    printf("\n");
    srv = make_server(namestr, namestr);
    ISC_LIST_APPEND(lookup->my_server_list, srv, link);
#endif

dns_rdata_freestruct(&ns);
	ns.name = NULL;
result = advanced_rresearch(&rdataset, &ns.name, dns_rdatatype_a,
    dns_rdatatype_any, &t);
if (result == ISC_R_SUCCESS) {
    for (result = dns_rdataset_first(rdataset);
        result == ISC_R_SUCCESS;
        result = dns_rdataset_next(rdataset)) {
        dns_rdata_t a = DNS_RDATA_INIT;
        dns_rdataset_current(rdataset, &a);
        result = isc_buffer.allocate(mctx, &b, 80);
        check_result(result, "isc_buffer.allocate");
        dns_rdata_totext(&a, &ns.name, b);
        isc_buffer.usedregion(b, &r);
        r.base[r.length] = '\0';
        strlcpy(namestr, (char*)r.base,
            DNS_NAME_FORMATSIZE);
        isc_buffer.free(&b);
        dns_rdata_freestruct(&ns);
        dns_rdata.reset(&rdata);
        printf("ns name: %s\n", namestr);
    }
}

isc_buffer_free(&b);
check_result(result, "isc_buffer.allocate");
printf("Launch a query to find a RRset of type ");
print_type(lookup->rdtype);
printf(" for zone: %%s", lookup->textname);
printf(" with nameservers:");
printf("\n");
print_rdataset(name, chase_nsrdataset);
return (ISC_R_SUCCESS);
}

isc_result_t
child_of_zone(dns_name_t * name, dns_name_t * zone_name,
   dns_name_t * child_name)
{
   dns_namereln_t name_reln;
   int orderp;
   unsigned int nlabelsp;

   name_reln = dns_name_fullcompare(name, zone_name, &orderp, &nlabelsp);
   if (name_reln != dns_namereln_subdomain ||
      dns_name_countlabels(name) < dns_name_countlabels(zone_name) + 1) {
      printf("\n;; ERROR : ");
dns_name_print(name, stdout);
      printf(" is not a subdomain of: ");
dns_name_print(zone_name, stdout);
      printf(" FAILED\n\n");
      return (ISC_R_FAILURE);
   }

dns_name_getlabelsequence(name,
   dns_name_countlabels(name) -
   dns_name_countlabels(zone_name) -1,
   dns_name_countlabels(zone_name) +1,
   child_name);
return (ISC_R_SUCCESS);
}

isc_result_t
grandfather_pb_test(dns_name_t *zone_name, dns_rdataset_t  *sigrdataset) {
   dns_rdata_sig_t siginfo;
dns_rdataset_t mysigrdataset;
isc_result_t result;

   dns_rdataset_init(&mysigrdataset);
dns_rdataset_clone(sigrdataset, &mysigrdataset);

result = dns_rdataset_first(&mysigrdataset);
check_result(result, "empty RRSIG dataset");
do {
    dns_rdata_t sigrdata = DNS_RDATA_INIT;
    dns_rdataset_current(&mysigrdataset, &sigrdata);
    result = dns_rdata_tostruct(&sigrdata, &siginfo, NULL);
    check_result(result, "sigrdata tostruct siginfo");
    if (dns_name_compare(&siginfo.signer, zone_name) == 0) {
        result = ISC_R_SUCCESS;
        goto cleanup;
    }
} while (dns_rdataset_next(&mysigrdataset) == ISC_R_SUCCESS);
result = ISC_R_FAILURE;
cleanup:
    dns_rdataset_disassociate(&mysigrdataset);
    return (result);
}

isc_result_t initialization(dns_name_t *name) {
    isc_result_t result;
    bool t = true;
    chase_nsrdataset = NULL;
    result = advanced_rrsearch(&chase_nsrdataset, name, dns_rdatatype_ns,
        dns_rdatatype_any, &t);
    if (result != ISC_R_SUCCESS) {
        printf(";; NS RRset is missing to continue validation:"
            " FAILED\n\n");
        return (ISC_R_FAILURE);
    }
    INSIST(chase_nsrdataset != NULL);
    prepare_lookup(name);
    dup_name(name, &chase_current_name);
    return (ISC_R_SUCCESS);
}
#endif

void print_rdataset(dns_name_t *name, dns_rdataset_t *rdataset)
isc_buffer_t *b = NULL;
isc_result_t result;
isc_region_t r;

result = isc_buffer_allocate(mctx, &b, 9000);
check_result(result, "isc_buffer_allocate");

dighost_printrdataset(name, rdataset, b);
isc_buffer_usedregion(b, &r);
r.base[r.length] = '\0';

printf("%s\n", r.base);
isc_buffer_free(&b);
}

void
dup_name(dns_name_t *source, dns_name_t *target) {
isc_result_t result;

if (dns_name_dynamic(target))
free_name(target);
result = dns_name_dup(source, mctx, target);
check_result(result, "dns_name_dup");
}

void
free_name(dns_name_t *name) {
dns_name_free(name, mctx);
dns_name_init(name, NULL);
}

/*
 *
* take a DNSKEY RRset and the RRSIG RRset corresponding in parameter
* return ISC_R_SUCCESS if the DNSKEY RRset contains a trusted_key
* and the RRset is valid
* return ISC_R_NOTFOUND if not contains trusted key
* or if the RRset isn't valid
* return ISC_R_FAILURE if problem
*
*/
isc_result_t
contains_trusted_key(dns_name_t *name, dns_rdataset_t *rdataset,


dns_rdataset_t *sigrdataset)
{

dns_rdataset_t myrdataset;
dst_key_t *dnsseckey = NULL;
int i;
isc_result_t result;

if (name == NULL || rdataset == NULL)
    return (ISC_R_FAILURE);

dns_rdataset_init(&myrdataset);
dns_rdataset_clone(rdataset, &myrdataset);

result = dns_rdataset_first(&myrdataset);
check_result(result, "empty rdataset");

do {
    dns_rdata_t rdata = DNS_RDATA_INIT;

    dns_rdataset_current(&myrdataset, &rdata);
    INSIST(rdata.type == dns_rdatatype_dnskey);

    result = dns_dnssec_keyfromrdata(name, &rdata,
        mctx, &dnsseckey);
    check_result(result, "dns_dnssec_keyfromrdata");

    for (i = 0; i < tk_list.nb_tk; i++) {
        if (dst_key_compare(tk_list.key[i], dnsseckey)
            == true) {
            dns_rdata_reset(&rdata);

            printf(";; Ok, find a Trusted Key in the "
                "DNSKEY RRset: %d\n",
                dst_key_id(dnsseckey));
            result = sigchase_verify_sig_key(name, rdataset,
                dnsseckey,
                sigrdataset);
            if (result == ISC_R_SUCCESS)
                goto cleanup;
        }
    }
    dst_key_free(&dnsseckey);
} while (dns_rdataset_next(&myrdataset) == ISC_R_SUCCESS);

result = ISC_R_NOTFOUND;

cleanup:
if (dnsseckey != NULL)
dst_key_free(&dnsseckey);
dns_rdataset_disassociate(&myrdataset);

return (result);
}

isc_result_t
sigchase_verify_sig(dns_name_t *name, dns_rdataset_t *rdataset,
    dns_rdataset_t *keyrdataset,
    dns_rdataset_t *sigrdataset)
{
    dns_rdataset_t mykeyrdataset;
dst_key_t *dnsseckey = NULL;
isc_result_t result;

dns_rdataset_init(&mykeyrdataset);
dns_rdataset_clone(keyrdataset, &mykeyrdataset);
result = dns_rdataset_first(&mykeyrdataset);
check_result(result, "empty DNSKEY dataset");

do {
    dns_rdata_t keyrdata = DNS_RDATA_INIT;

dns_rdataset_current(&mykeyrdataset, &keyrdata);
INSIST(keyrdata.type == dns_rdatatype_dnskey);

result = dns_dnssec_keyfromrdata(name, &keyrdata,
    mctx, &dnsseckey);
check_result(result, "dns_dnssec_keyfromrdata");

result = sigchase_verify_sig_key(name, rdataset, dnsseckey,
    sigrdataset);
if (result == ISC_R_SUCCESS)
goto cleanup;
dst_key_free(&dnsseckey);
} while (dns_rdataset_next(&mykeyrdataset) == ISC_R_SUCCESS);

result = ISC_R_NOTFOUND;

cleanup:
if (dnsseckey != NULL)
dst_key_free(&dnsseckey);
dns_rdataset_disassociate(&mykeyrdataset);

return (result);
}
isc_result_t
sigchase_verify_sig_key(dns_name_t *name, dns_rdataset_t *rdataset,
dst_key_t *dnsseckey, dns_rdataset_t *sigrdataset)
{
dns_rdata_sig_t siginfo;
dns_rdataset_t myrdataset;
dns_rdataset_t mysigrdataset;
isc_result_t result;

dns_rdataset_init(&myrdataset);
dns_rdataset_clone(rdataset, &myrdataset);
dns_rdataset_init(&mysigrdataset);
dns_rdataset_clone(sigrdataset, &mysigrdataset);

result = dns_rdataset_first(&mysigrdataset);
check_result(result, "empty RRSIG dataset");

do {
  dns_rdata_t sigrdata = DNS_RDATA_INIT;

dns_rdataset_current(&mysigrdataset, &sigrdata);

  result = dns_rdata_tostruct(&sigrdata, &siginfo, NULL);
  check_result(result, "sigrdata tostruct siginfo");

  /*
   * Test if the id of the DNSKEY is
   * the id of the DNSKEY signer's
   */
  if (siginfo.keyid == dst_key_id(dnsseckey)) {

    result = dns_rdataset_first(&myrdataset);
    check_result(result, "empty DS dataset");

    result = dns_dnssec_verify(name, &myrdataset, dnsseckey,
      false, mctx, &sigrdata);

    printf(":: VERIFYING ");
    print_type(rdataset->type);
    printf(" RRset for ");
    dns_name_print(name, stdout);
    printf(" with DNSKEY:%d: %s\n", dst_key_id(dnsseckey),
      isc_result_totext(result));

    if (result == ISC_R_SUCCESS)
      goto cleanup;
  }
} while (dns_rdataset_next(&mysigrdataset) == ISC_R_SUCCESS);
result = ISC_R_NOTFOUND;

cleanup:
dns_rdataset_disassociate(&myrdataset);
dns_rdataset_disassociate(&mysigrdataset);

return (result);
}

isc_result_t sigchase_verify_ds(dns_name_t *name, dns_rdataset_t *keyrdataset,  
dns_rdataset_t *dsrdataset)
{
    dns_rdata_ds_t dsinfo;
    dns_rdataset_t mydsrdataset;
    dns_rdataset_t mykeyrdataset;
    dst_key_t *dnsseckey = NULL;
    isc_result_t result;
    unsigned char dsbuf[DNS_DS_BUFFERSIZE];

    dns_rdataset_init(&mydsrdataset);
    dns_rdataset_clone(dsrdataset, &mydsrdataset);
    dns_rdataset_init(&mykeyrdataset);
    dns_rdataset_clone(keyrdataset, &mykeyrdataset);

    result = dns_rdataset_first(&mydsrdataset);
    check_result(result, "empty DSset dataset");
    do {
        dns_rdata_t dsrdata = DNS_RDATA_INIT;

        dns_rdataset_current(&mydsrdataset, &dsrdata);

        result = dns_rdata_tostruct(&dsrdata, &dsinfo, NULL);
        check_result(result, "dns_rdata_tostruct for DS");

        result = dns_rdataset_first(&mykeyrdataset);
        check_result(result, "empty KEY dataset");

        do {
            dns_rdata_t keyrdata = DNS_RDATA_INIT;

            dns_rdataset_current(&mykeyrdataset, &keyrdata);
            INSIST(keyrdata.type == dns_rdatatype_dnskey);

            result = dns_dnssec_keyfromrdata(name, &keyrdata, mctx, &dnsseckey);

            break;
        }
    }
check_result(result, "dns_dnssec_keyfromrdata");

*/
* Test if the id of the DNSKEY is the
* id of DNSKEY referenced by the DS
*/
if (dsinfo.key_tag == dst_key_id(dnsseckey)) {
dns_rdata_t newdsrdata = DNS_RDATA_INIT;

result = dns_ds_buildrdata(name, &keyrdata,
   dsinfo.digest_type,
   dsbuf, &newdsrdata);

dns_rdata_freestruct(&dsinfo);

if (result != ISC_R_SUCCESS) {
    printf("Oops: impossible to build"
           " new DS rdata\n");
goto cleanup;
}

if (dns_rdata_compare(&dsrdata,
   &newdsrdata) == 0) {
    printf(";; OK a DS valids a DNSKEY"
           " in the RRS\n");
    printf(";; Now verify that this"
           " DNSKEY validates the "
           "DNSKEY RRS\n");

    result = sigchase_verify_sig_key(name,
       keyrdataset,
       dnsseckey,
       chase_sigkeyrdataset);
    if (result == ISC_R_SUCCESS)
        goto cleanup;
    else {
        printf(";; This DS is NOT the DS for"
               " the chasing KEY: FAILED\n");
    }
    dst_key_free(&dnsseckey);
} while (dns_rdataset_next(&mykeyrdataset) == ISC_R_SUCCESS);
} while (dns_rdataset_next(&mydsrdataset) == ISC_R_SUCCESS);

result = ISC_R_NOTFOUND;

cleanup:
if (dnsseckey != NULL)
dst_key_free(&dnsseckey);
dns_rdataset_disassociate(&mydsrdataset);
dns_rdataset_disassociate(&mykeyrdataset);

return (result);
}

/*
 * take a pointer on a rdataset in parameter and try to resolv it.
 * the searched rrset is a rrset on 'name' with type 'type'
 * (and if the type is a rrsig the signature cover 'covers').
 * the lookedup is to known if you have already done the query on the net.
 * ISC_R_SUCCESS: if we found the rrset
 * ISC_R_NOTFOUND: we do not found the rrset in cache
 * and we do a query on the net
 * ISC_R_FAILURE: rrset not found
 */
isc_result_t
advanced_rrsearch(dns_rdataset_t **rdataset, dns_name_t *name,
dns_rdatatype_t type, dns_rdatatype_t covers,
bool *lookedup)
{
bool tmplookedup;

INSIST(rdataset != NULL);

if (*rdataset != NULL)
return (ISC_R_SUCCESS);
tmplookedup = *lookedup;
if ((*rdataset = sigchase_scanname(type, covers,
    lookedup, name)) == NULL) {
    if (tmplookedup)
        return (ISC_R_FAILURE);
    return (ISC_R_NOTFOUND);
}
    *lookedup = false;
    return (ISC_R_SUCCESS);
}

#if DIG_SIGCHASE_TD
void
sigchase_td(dns_message_t *msg)
{
    isc_result_t result;

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dns_name_t *name = NULL;
bool have_answer = false;
bool t = true;

if (msg->rcode != dns_rcode_noerror &&
    msg->rcode != dns_rcode_nxdomain) {
    char buf[20];
    isc_buffer_t b:

    isc_buffer_init(&b, buf, sizeof(buf));
    result = dns_rcode_totext(msg->rcode, &b);
    check_result(result, "dns_rcode_totext failed");
    printf("error response code %.%s\n",
           (int)isc_buffer_usedlength(&b), buf);
    error_message = msg;
    return;
}

if ((result = dns_message_firstname(msg, DNS_SECTION_ANSWER))
    == ISC_R_SUCCESS) {
    dns_message_currentname(msg, DNS_SECTION_ANSWER, &name); 
    if (current_lookup->trace_root_sigchase) {
        initialization(name);
        return;
    } else {
        if (!current_lookup->trace_root_sigchase) {
            result = dns_message_firstname(msg,
            DNS_SECTION_AUTHORITY);
            if (result != ISC_R_SUCCESS) {
                printf("no answer or authority section\n");
                error_message = msg;
                return;
            }
            dns_message_currentname(msg, DNS_SECTION_AUTHORITY,
            &name);
            chase_nsrdataset = chase_scanname_section(msg, name, 
            dns_rdatatype_ns, 
            dns_rdatatype_any, 
            DNS_SECTION_AUTHORITY);
            if (chase_nsrdataset != NULL) {
                have_delegation_ns = true;
                printf("no response but there is a delegation" 
                       " in authority section:");
                dns_name_print(name, stdout);
            }
        } else {
            initialization(name);
            return;
        }
    }
    have_answer = true;
} else { 
    if (!current_lookup->trace_root_sigchase) {
        result = dns_message_firstname(msg, 
        DNS_SECTION_AUTHORITY);
        if (result != ISC_R_SUCCESS) {
            printf("no answer or authority section\n");
            error_message = msg;
            return;
        }
        dns_message_currentname(msg, DNS_SECTION_AUTHORITY,
        &name);
        chase_nsrdataset = chase_scanname_section(msg, name, 
        dns_rdatatype_ns, 
        dns_rdatatype_any, 
        DNS_SECTION_AUTHORITY);
        if (chase_nsrdataset != NULL) {
            have_delegation_ns = true;
            printf("no response but there is a delegation" 
                   " in authority section:");
            dns_name_print(name, stdout);
        }
    } else {
        initialization(name);
        return;
    }
}
printf("\n");
} else {
    printf("no response and no delegation in ")
    "authority section but a reference"
    " to: ");
    dns_name_print(name, stdout);
    printf("\n");
    error_message = msg;
}
} else {
    printf(";; NO ANSWERS: %s\n",
        isc_result_totext(result));
    free_name(&chase_name);
    clean_trustedkey();
    return;
}

if (have_answer) {
    chase_rdataset
        = chase_scanname_section(msg, &chase_name,
        current_lookup
        ->rdtype_sigchase,
        dns_rdatatype_any,
        DNS_SECTION_ANSWER);
    if (chase_rdataset != NULL)
        have_response = true;
}

result = advanced_rrsearch(&chase_keyrdataset,
    &chase_current_name,
    dns_rdatatype_dnskey,
    dns_rdatatype_any,
    &chase_keylookedup);
if (result == ISC_R_FAILURE) {
    printf("\n;; DNSKEY is missing to continue validation:
    " FAILED\n\n"));
goto cleanandgo;
}
if (result == ISC_R_NOTFOUND)
    return;
INSIST(chase_keyrdataset != NULL);
printf("\n;; DNSKEYset:\n");
print_rdataset(&chase_current_name , chase_keyrdataset);

result = advanced_rrsearch(&chase_sigkeyrdataset,
&chase_current_name,
dns_rdatatype_rrsig,
dns_rdatatype_dnskey,
&chase_sigkeylookedup);
if (result == ISC_R_FAILURE) {
printf("\n;; RRSIG of DNSKEY is missing to continue validation:
 " FAILED\n\n");
goto cleanandgo;
}
if (result == ISC_R_NOTFOUND)
return;
INSIST(chase_sigkeyrdataset != NULL);
printf("\n;; RRSIG of the DNSKEYset:\n");
print_rdataset(&chase_current_name, chase_sigkeyrdataset);

if (!chase_dslookedup &amp; !chase_nslookedup) {
if (!delegation_follow) {
result = contains_trusted_key(&chase_current_name,
   chase_keyrdataset,
   chase_sigkeyrdataset);
} else {
INSIST(chase_dsrdataset != NULL);
INSIST(chase_sigsrdataset != NULL);
result = sigchase_verify_ds(&chase_current_name,
   chase_keyrdataset,
   chase_dsrdataset);
}

if (result != ISC_R_SUCCESS) {
printf("\n;; chain of trust can't be validated:
 " FAILED\n\n");
goto cleanandgo;
} else {
chase_dsrdataset = NULL;
chase_sigsrdataset = NULL;
}
}

if (have_response || (!have_delegation_ns &amp; !have_response)) {
/* test if it's a grand father case */

if (have_response) {
result = advanced_rrsearch(&chase_sigrdataset,
 &chase_name,
 dns_rdatatype_rrsig,
 current_lookup
 ->rdtype_sigchase,
&t);
if (result == ISC_R_FAILURE) {
printf("\n;; RRset is missing to continue" " validation SHOULD NOT APPEND:" " FAILED\n\n");
goto cleanandgo;
}
else {
result = advanced_rrsearch(&chase_sigrdataset, &chase_authority_name, dns_rdatatype_rrsig, dns_rdatatype_any, &t);
if (result == ISC_R_FAILURE) {
printf("\n;; RRSIG is missing to continue" " validation SHOULD NOT APPEND:" " FAILED\n\n");
goto cleanandgo;
}
result = grandfather_pb_test(&chase_current_name, chase_sigrdataset);
if (result != ISC_R_SUCCESS) {
dns_name_t tmp_name;
printf("\n;; We are in a Grand Father Problem:" " See 2.2.1 in RFC 3658\n");
chase_rdataset = NULL;
chase_sigrdataset = NULL;
have_response = false;
have_delegation_ns = false;
dns_name_init(&tmp_name, NULL);
result = child_of_zone(&chase_name, &chase_current_name, &tmp_name);
if (result != ISC_R_SUCCESS)
goto cleanandgo;
if (dns_name_dynamic(&chase_authority_name))
free_name(&chase_authority_name);
dup_name(&tmp_name, &chase_authority_name);
printf(";; and we try to continue chain of trust" " validation of the zone: ");
dns_name_print(&chase_authority_name, stdout);
have_delegation_ns = true;
} else {
if (have_response)
goto finalstep;
else
chase_sigrdataset = NULL;
}
}

if (have_delegation_ns) {
chase_nsrdataset = NULL;
result = advanced_rsearch(&chase_nsrdataset,
&chase_authority_name,
dns_rdatatype_ns,
dns_rdatatype_any,
&chase_nslookedup);
if (result == ISC_R_FAILURE) {
printf(";;NSset is missing to continue validation:" " FAILED\n\n");
goto cleanandgo;
}
if (result == ISC_R_NOTFOUND) {
return;
}
INSIST(chase_nsrdataset != NULL);

result = advanced_rsearch(&chase_dsrdataset,
&chase_authority_name,
dns_rdatatype_ds,
dns_rdatatype_any,
&chase_dslookedup);
if (result == ISC_R_FAILURE) {
printf(";; DSset is missing to continue validation:" " FAILED\n\n");
goto cleanandgo;
}
if (result == ISC_R_NOTFOUND) {
return;
}
INSIST(chase_dsrdataset != NULL);
print_rdataset(&chase_authority_name , chase_dsrdataset);

result = advanced_rsearch(&chase_sigdsrdataset,
&chase_authority_name,
dns_rdatatype_rrsig,
dns_rdatatype_ds,
&t);
if (result != ISC_R_SUCCESS) {
printf(";; DSset is missing to continue validation:" " FAILED\n\n");
goto cleanandgo;
}
printf("RRSIGset of DS set\n");
print_rdataset(&chase_authority_name, chase_sigdsrdataset);
INSIST(chase_sigdsrdataset != NULL);
result = sigchase_verify_sig(&chase_authority_name,
    chase_dsrdataset,
    chase_keyrdataset,
    chase_sigdsrdataset);
if (result != ISC_R_SUCCESS) {
    printf("Impossible to verify the DS set: FAILED\n");
goto cleanandgo;
}
chase_keyrdataset = NULL;
chase_sigkeyrdataset = NULL;

prepare_lookup(&chase_authority_name);

have_response = false;
have_delegation_ns = false;
delegation_follow = true;
error_message = NULL;
dup_name(&chase_authority_name, &chase_current_name);
free_name(&chase_authority_name);
return;

if (error_message != NULL) {
    dns_rdataset_t *rdataset;
    dns_rdataset_t *sigrdataset;
    dns_name_t rdata_name;
    isc_result_t ret = ISC_R_FAILURE;

dns_name_init(&rdata_name, NULL);
result = prove_nx(error_message, &chase_name,
    current_lookup->rdclass_sigchase,
    current_lookup->rdtype_sigchase, &rdata_name,
    &rdataset, &sigrdataset);
if (rdataset == NULL || sigrdataset == NULL ||
    dns_name_countlabels(&rdata_name) == 0) {
    printf("Impossible to verify the non-existence, "
        " the NSEC RRset can't be validated: FAILED\n");
goto cleanandgo;
}
ret = sigchase_verify_sig(&rdata_name, rdataset, chase_keyrdataset, sigrdataset);
if (ret != ISC_R_SUCCESS) {
  free_name(&rdata_name);
  printf("\n;; Impossible to verify the NSEC RR to prove"
       " the non-existence : FAILED\n\n");
  goto cleanandgo;
}
free_name(&rdata_name);
if (result != ISC_R_SUCCESS) {
  printf("\n;; Impossible to verify the non-existence:
       " FAILED\n\n");
  goto cleanandgo;
} else {
  printf("\n;; OK the query doesn't have response but
       " we have validate this fact : SUCCESS\n\n");
  goto cleanandgo;
}
}

cleanandgo:
printf("\n;; cleanandgo \n");
if (dns_name_dynamic(&chase_current_name))
  free_name(&chase_current_name);
if (dns_name_dynamic(&chase_authority_name))
  free_name(&chase_authority_name);
clean_trustedkey();
return;

finalstep :
result = advanced_rrsearch(&chase_rdataset, &chase_name, current_lookup->rdtype_sigchase, dns_rdatatypedataset, &t);
if (result == ISC_R_FAILURE) {
  printf("\n;; RRsig of RRset is missing to continue validation" " SHOULD NOT APPEND: FAILED\n\n");
  goto cleanandgo;
}
result = sigchase_verifySig(&chase_name, chase_rdataset, chase_keyrdataset, chase_sigrdataset);
if (result != ISC_R_SUCCESS) {
  printf("\n;; Impossible to verify the RRset : FAILED\n\n");
  printf("RRset: \n");
  print_rdataset(&chase_name, chase_rdataset);
}
printf("DNSKEYset:\n");
print_rdataset(&chase_name, chase_keyrdataset);
printf("RRSIG of RRset:\n");
print_rdataset(&chase_name, chase_signrdataset);
printf("\n");
/*
goto cleanandgo;
} else {
printf("\n; The Answer:\n");
print_rdataset(&chase_name, chase_rdataset);
printf("\n; FINISH : we have validate the DNSSEC chain"
    " of trust: SUCCESS\n\n");
goto cleanandgo;
}

#endif

#if DIG_SIGCHASE_BU

isc_result_t
getneededrr(dns_message_t *msg)
{
    isc_result_t result;
dns_name_t *name = NULL;
dns_rdata_t sigdata = DNS_RDATA_INIT;
dns_rdata_sig_t siginfo;
bool t = true;

    if ((result = dns_message_firstname(msg, DNS_SECTION_ANSWER))
        != ISC_R_SUCCESS) {
        printf(";; NO ANSWERS: %s\n", isc_result_tostring(result));

        if (chase_name.ndata == NULL)
            return (ISC_R_ADDRNOTAVAIL);
    } else {
        dns_message_currentname(msg, DNS_SECTION_ANSWER, &name);
    }

    /* What do we chase? */

    if (chase_rdataset == NULL) {
        result = advanced_rrsearch(&chase_rdataset, name,
            dns_rdata_type_any,
            dns_rdata_type_any, &t);
        if (result != ISC_R_SUCCESS) {
            printf("\n; No Answers: Validation FAILED\n\n");

            /* If we don't have the key, we cannot validate the RRSIG */
            return (ISC_R_ADDRNOTAVAIL);
        }

        if (result != ISC_R_SUCCESS) {
            printf("\n; No Answers: Validation FAILED\n\n");

            /* If we don't have the key, we cannot validate the RRSIG */
            return (ISC_R_ADDRNOTAVAIL);
        }

        /* We have the key, so we can validate the RRSIG */

        /* If we don't have the key, we cannot validate the RRSIG */
        return (ISC_R_ADDRNOTAVAIL);
    }

    /* We have the key, so we can validate the RRSIG */

    /* If we don't have the key, we cannot validate the RRSIG */
    return (ISC_R_ADDRNOTAVAIL);
#endif

*/
return (ISC_R_NOTFOUND);
}
dup_name(name, &chase_name);
printf(";; RRset to chase:\n");
print_rdataset(&chase_name, chase_rdataset);
}
INSIST(chase_rdataset != NULL);

if (chase_sigrdataset == NULL) {
result = advanced_rrsearch(&chase_sigrdataset, name,
    dns_rdatatype_rrsig,
    chase_rdataset->type,
    &chase_siglookedup);
if (result == ISC_R_FAILURE) {
    printf("\n;; RRSIG is missing for continue validation:
    FAILED\n\n");
    if (dns_name_dynamic(&chase_name))
        free_name(&chase_name);
    return (ISC_R_NOTFOUND);
}
if (result == ISC_R_NOTFOUND) {
    return (ISC_R_NOTFOUND);
}
printf("\n;; RRSIG of the RRset to chase:\n");
print_rdataset(&chase_name, chase_sigrdataset);
}
INSIST(chase_sigrdataset != NULL);

/* first find the DNSKEY name */
result = dns_rdataset_first(chase_sigrdataset);
check_result(result, "empty RRSIG dataset");
dns_rdataset_current(chase_sigrdataset, &sigrdata);
result = dns_rdata_tostruct(&sigrdata, &siginfo, NULL);
check_result(result, "sigrdata tostruct siginfo");
dup_name(&siginfo.signer, &chase_signame);
dns_rdata_freestruct(&siginfo);
dns_rdata_reset(&sigrdata);

/* Do we have a key? */
if (chase_keyrdataset == NULL) {
result = advanced_rrsearch(&chase_keyrdataset,
    &chase_signame,
    dns_rdatatype_dnskey,
    dns_rdatatype_any,
    &chase_keylookedup);
if (result == ISC_R_FAILURE) {
printf("\n; DNSKEY is missing to continue validation:");
    " FAILED\n\n");
free_name(&chase_signame);
if (dns_name_dynamic(&chase_name))
    free_name(&chase_name);
return (ISC_R_NOTFOUND);
}
if (result == ISC_R_NOTFOUND) {
    free_name(&chase_signame);
    return (ISC_R_NOTFOUND);
}
printf("\n; DNSKEYset that signs the RRset to chase:\n");
print_rdataset(&chase_signame, chase_keyrdataset);
} INSIST(chase_keyrdataset != NULL);

if (chase_sigkeyrdataset == NULL) {
    result = advanced_rrsearch(&chase_sigkeyrdataset,
        &chase_signame,
        dns_rdatatype_rrsig,
        dns_rdatatype_dnskey,
        &chase_sigkeylookedup);
    if (result == ISC_R_FAILURE) {
        printf("\n; RRSIG for DNSKEY is missing to continue validation: FAILED\n\n");
      free_name(&chase_signame);
    if (dns_name_dynamic(&chase_name))
        free_name(&chase_name);
    return (ISC_R_NOTFOUND);
    }
    if (result == ISC_R_NOTFOUND) {
        free_name(&chase_signame);
        return (ISC_R_NOTFOUND);
    }
    printf("\n; RRSIG of the DNSKEYset that signs the "
        "RRset to chase:\n");
    print_rdataset(&chase_signame, chase_sigkeyrdataset);
} INSIST(chase_sigkeyrdataset != NULL);

if (chase_dsrdataset == NULL) {
    result = advanced_rmsearch(&chase_dsrdataset, &chase_signame,
        dns_rdatatype_ds, dns_rdatatype_any,
        &chase_dslookedup);
    if (result == ISC_R_FAILURE) {
        printf("\n; WARNING There is no DS for the zone: ");
    dns_name_print(&chase_signame, stdout);
void sigchase_bu(dns_message_t *msg)
{
    isc_result_t result;
    int ret;

    if (tk_list.nb_tk == 0) {
        result = get_trusted_key();
        if (result != ISC_R_SUCCESS) {
            printf("\n");
            if (result == ISC_R_NOTFOUND) {
                free_name(&chase_signame);
                return (ISC_R_NOTFOUND);
            }
            if (chase_dsrdataset != NULL) {
                printf("\n;; DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_dsrdataset);
                }
            }
            result = advanced_rrsearch(&chase_sigdsrdataset,
                                          &chase_signame,
                                          dns_rdatatype_rrsig,
                                          dns_rdatatype_ds, &t);
            if (result == ISC_R_FAILURE) {
                printf("\n;; WARNING : NO RRSIG DS : RRSIG DS\n";
                       " should come with DS\n");
            /*
            * We continue even the DS couldn't be validated,
            * because the DNSKEY could be a Trusted Key.
            */
                chase_dsrdataset = NULL;
            } else {
                printf("\n;; RRSIG of the DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_sigdsrdataset);
                }
            return (1);
            }

void sigchase_bu(dns_message_t *msg)
{
    isc_result_t result;
    int ret;

    if (tk_list.nb_tk == 0) {
        result = get_trusted_key();
        if (result != ISC_R_SUCCESS) {
            printf("\n");
            if (result == ISC_R_NOTFOUND) {
                free_name(&chase_signame);
                return (ISC_R_NOTFOUND);
            }
            if (chase_dsrdataset != NULL) {
                printf("\n;; DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_dsrdataset);
                }
            }
            result = advanced_rrsearch(&chase_sigdsrdataset,
                                          &chase_signame,
                                          dns_rdatatype_rrsig,
                                          dns_rdatatype_ds, &t);
            if (result == ISC_R_FAILURE) {
                printf("\n;; WARNING : NO RRSIG DS : RRSIG DS\n";
                       " should come with DS\n");
            /*
            * We continue even the DS couldn't be validated,
            * because the DNSKEY could be a Trusted Key.
            */
                chase_dsrdataset = NULL;
            } else {
                printf("\n;; RRSIG of the DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_sigdsrdataset);
                }
            return (1);
            }

void sigchase_bu(dns_message_t *msg)
{
    isc_result_t result;
    int ret;

    if (tk_list.nb_tk == 0) {
        result = get_trusted_key();
        if (result != ISC_R_SUCCESS) {
            printf("\n");
            if (result == ISC_R_NOTFOUND) {
                free_name(&chase_signame);
                return (ISC_R_NOTFOUND);
            }
            if (chase_dsrdataset != NULL) {
                printf("\n;; DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_dsrdataset);
                }
            }
            result = advanced_rrsearch(&chase_sigdsrdataset,
                                          &chase_signame,
                                          dns_rdatatype_rrsig,
                                          dns_rdatatype_ds, &t);
            if (result == ISC_R_FAILURE) {
                printf("\n;; WARNING : NO RRSIG DS : RRSIG DS\n";
                       " should come with DS\n");
            /*
            * We continue even the DS couldn't be validated,
            * because the DNSKEY could be a Trusted Key.
            */
                chase_dsrdataset = NULL;
            } else {
                printf("\n;; RRSIG of the DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_sigdsrdataset);
                }
            return (1);
            }

void sigchase_bu(dns_message_t *msg)
{
    isc_result_t result;
    int ret;

    if (tk_list.nb_tk == 0) {
        result = get_trusted_key();
        if (result != ISC_R_SUCCESS) {
            printf("\n");
            if (result == ISC_R_NOTFOUND) {
                free_name(&chase_signame);
                return (ISC_R_NOTFOUND);
            }
            if (chase_dsrdataset != NULL) {
                printf("\n;; DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_dsrdataset);
                }
            }
            result = advanced_rrsearch(&chase_sigdsrdataset,
                                          &chase_signame,
                                          dns_rdatatype_rrsig,
                                          dns_rdatatype_ds, &t);
            if (result == ISC_R_FAILURE) {
                printf("\n;; WARNING : NO RRSIG DS : RRSIG DS\n";
                       " should come with DS\n");
            /*
            * We continue even the DS couldn't be validated,
            * because the DNSKEY could be a Trusted Key.
            */
                chase_dsrdataset = NULL;
            } else {
                printf("\n;; RRSIG of the DSset of the DNSKEYset\n");
                print_rdataset(&chase_signame, chase_sigdsrdataset);
                }
            return (1);
            }
printf("No trusted keys present\n");
return;
}

ret = getneededrr(msg);
if (ret == ISC_R_NOTFOUND)
    return;

if (ret == ISC_R_ADDRNOTAVAIL) {
    /* We have no response */
    dns_rdataset_t *rdataset;
    dns_rdataset_t *sigrdataset;
    dns_name_t rdata_name;
    dns_name_t query_name;

    dns_name_init(&query_name, NULL);
    dns_name_init(&rdata_name, NULL);
    nameFromString(current_lookup->textname, &query_name);

    result = prove_nx(msg, &query_name, current_lookup->rdclass,
                      current_lookup->rdtype, &rdata_name,
                      &rdataset, &sigrdataset);
    free_name(&query_name);
    if (rdataset == NULL || sigrdataset == NULL ||
        dns_name_countlabels(&rdata_name) == 0) {
        printf(";; Impossible to verify the Non-existence,
"            " the NSEC RRset can't be validated: 
"            "FAILED\n\n");
        clean_trustedkey();
        return;
    }

    if (result != ISC_R_SUCCESS) {
        printf("\nNo Answers and impossible to prove the"            " unsecurity : Validation FAILED\n\n");
        clean_trustedkey();
        return;
    }

    printf(";; An NSEC prove the non-existence of a answers,"            " Now we want validate this NSEC\n");

    dup_name(&rdata_name, &chase_name);
    free_name(&rdata_name);
    chase_rdataset = rdataset;
    chase_sigrdataset = sigrdataset;
chase_keyrdataset = NULL;
chase_sigkeyrdataset = NULL;
chase_dsrdataset = NULL;
chase_sigrdataset = NULL;
chase_sigdsrdataset = NULL;
chase_siglookedup = false;
chase_keylookedup = false;
chase_dslookedup = false;
chase_sigdslookedup = false;
sigchase(msg);
clean_trustedkey();
return;
}

printf("\n\n\n;; WE HAVE MATERIAL, WE NOW DO VALIDATION\n");

result = sigchase_verify_sig(&chase_name, chase_rdataset,
    chase_keyrdataset,
    chase_sigrdataset);
if (result != ISC_R_SUCCESS) {
    free_name(&chase_name);
    free_name(&chase_sigrname);
    printf(";; No DNSKEY is valid to check the RRSIG" 
        " of the RRset: FAILED\n");
clean_trustedkey();
    return;
}
printf(";;;; OK We found DNSKEY (or more) to validate the RRset\n");

result = contains_trusted_key(&chase_sigrname, chase_keyrdataset,
    chase_sigkeyrdataset);
if (result == ISC_R_SUCCESS) {
    free_name(&chase_name);
    free_name(&chase_sigrname);
    printf(";;;; Ok this DNSKEY is a Trusted Key," 
        " DNSSEC validation is ok: SUCCESS\n");
clean_trustedkey();
    return;
}
printf(";;;;; Now, we are going to validate this DNSKEY by the DS\n");

if (chase_dsrdataset == NULL) {
    free_name(&chase_name);
    free_name(&chase_sigrname);
    printf(";;;;; the DNSKEY isn't trusted-key and there isn't" 
        " DS to validate the DNSKEY: FAILED\n");
clean_trustedkey();
}
return;
}

result = sigchase_verify_ds(&chase_signame, chase_keyrdataset,
    chase_dsrdataset);
if (result != ISC_R_SUCCESS) {
    free_name(&chase_signame);
    free_name(&chase_name);
    printf(";; ERROR no DS validates a DNSKEY in the"
            " DNSKEY RRset: FAILED\n");
clean_trustedkey();
return;
} else
    printf(";; OK this DNSKEY (validated by the DS) validates"
            " the RRset of the DNSKEYs, thus the DNSKEY validates"
            " the RRset\n");
INSIST(chase_sigsrdataset != NULL);

dup_name(&chase_signame, &chase_name);
free_name(&chase_signame);
chase_rdataset = chase_dsrdataset;
chase_sigrdataset = chase_sigsrdataset;
chase_keyrdataset = NULL;
chase_sigkeyrdataset = NULL;
chase_dsrdataset = NULL;
chase_sigsrdataset = NULL;
chase_siglookedup = chase_keylookedup = false;
chase_dslookedup = chase_sigslookedup = false;

printf(";; Now, we want to validate the DS :  recursive call\n");
sigchase(msg);
return;
}
#endif

void
sigchase(dns_message_t *msg) {
#if DIG_SIGCHASE_TD
if (current_lookup->do_topdown) {
    sigchase_td(msg);
    return;
}
#endif
#if DIG_SIGCHASE_BU
    sigchase_bu(msg);
    return;
#endif
}
/*
*  return 1  if name1  <  name2
*  0  if name1  == name2
*  -1 if name1  >  name2
*  and -2 if problem
*/

int
inf_name(dns_name_t *name1, dns_name_t *name2)
{

dns_label_t  label1;
dns_label_t  label2;
unsigned int nblabel1;
unsigned int nblabel2;
int min_lum_label;
int i;
int ret = -2;

nblabel1 = dns_name_countlabels(name1);
nblabel2 = dns_name_countlabels(name2);

if (nblabel1 >= nblabel2)
min_lum_label = nblabel2;
else
min_lum_label = nblabel1;

for (i=1 ; i < min_lum_label; i++) {

dns_name_getlabel(name1, nblabel1 -1  - i, &label1);
dns_name_getlabel(name2, nblabel2 -1  - i, &label2);
if ((ret = isc_region_compare(&label1, &label2)) != 0) {
if (ret < 0)
return (-1);
else if (ret > 0)
return (1);
}
}

if (nblabel1 == nblabel2)
return (0);

if (nblabel1 < nblabel2)
return (-1);
else
return (1);
}
isc_result_t
prove_nx_domain(dns_message_t *msg,
    dns_name_t *name,
    dns_name_t *rdata_name,
    dns_rdataset_t **rdataset,
    dns_rdataset_t **sigrdataset)
{
    isc_result_t ret = ISC_R_FAILURE;
    isc_result_t result = ISC_R_NOTFOUND;
    dns_rdataset_t *nsecset = NULL;
    dns_rdataset_t *signsecset = NULL;
    dns_rdata_t nsec = DNS_RDATA_INIT;
    dns_name_t *nsecname;
    dns_rdata_nsec_t nsecstruct;

    if ((result = dns_message_firstname(msg, DNS_SECTION_AUTHORITY))
        != ISC_R_SUCCESS) {
        printf(";; nothing in authority section : impossible to";
            " validate the non-existence : FAILED\n");
        return (ISC_R_FAILURE);
    }

    do {
        nsecname = NULL;
        dns_message_currentname(msg, DNS_SECTION_AUTHORITY, &nsecname);
        nsecset = search_type(nsecname, dns_rdatatype_nsec,
                dns_rdatatype_any);
        if (nsecset == NULL)
            continue;

        printf("There is a NSEC for this zone in the";
            " AUTHORITY section: nsec");
        print_rdataset(nsecname, nsecset);

        for (result = dns_rdataset_first(nsecset);
                result == ISC_R_SUCCESS;
                result = dns_rdataset_next(nsecset)) {
            dns_rdataset_current(nsecset, &nsec);

            signsecset
                = chase_scanname_section(msg, nsecname,
                        dns_rdatatype_rrsig,
                        dns_rdatatype_nsec,
                        DNS_SECTION_AUTHORITY);

            /*
            */
            isc_result_t
if (signsecset == NULL) {
printf(";; no RRSIG NSEC in authority section:
  " impossible to validate the 
  "non-existence: FAILED\n");
return (ISC_R_FAILURE);
}

ret = dns_rdata_tostruct(&nsec, &nsecstruct, NULL);
check_result(ret,"dns_rdata_tostruct");

if ((inf_name(nsecname, &nsecstruct.next) == 1 &&
    inf_name(name, &nsecstruct.next) == 1) ||
  (inf_name(name, nsecname) == 1 &&
   inf_name(&nsecstruct.next, name) == 1)) {
dns_rdata_freestruct(&nsecstruct);
*rdataset = nsecset;
*sigrdataset = signsecset;
dup_name(nsecname, rdata_name);

return (ISC_R_SUCCESS);
}

dns_rdata_freestruct(&nsecstruct);
dns_rdata_reset(&nsec);
}
} while (dns_message_nextname(msg, DNS_SECTION_AUTHORITY)
  == ISC_R_SUCCESS);

*rdataset = NULL;
*sigrdataset = NULL;
rdata_name = NULL;
return (ISC_R_FAILURE);
}

/**
 *
 *
 *
 */
isc_result_t
prove_nx_type(dns_message_t *msg, dns_name_t *name, dns_rdataset_t *nsecset,
    dns_rdataclass_t rdclass, dns_rdatatype_t type,
    dns_name_t *rdata_name, dns_rdataset_t **rdataset,
    dns_rdataset_t **sigrdataset)
{
    isc_result_t ret;
dns_rdataset_t *signsecset;
dns_rdata_t nsec = DNS_RDATA_INIT;

UNUSED(rdclass);

ret = dns_rdataset_first(nsecset);
check_result(ret,"dns_rdataset_first");
dns_rdataset_current(nsecset, &nsec);

ret = dns_nsec_typepresent(&nsec, type);
if (ret == ISC_R_SUCCESS)
printf("OK the NSEC said that the type doesn't exist \n");

signsecset = chase_scanname_section(msg, name,
   dns_rdatatype_rrsig,
   dns_rdatatype_nsec,
   DNS_SECTION_AUTHORITY);
if (signsecset == NULL) {
printf("There isn't RRSIG NSEC for the zone \n");
return (ISC_R_FAILURE);
}
dup_name(name, rdata_name);
*rdataset = nsecset;
*sigrdataset = signsecset;

return (ret);
}

/**
 *
 *
 */
isc_result_t prove_nx(dns_message_t *msg, dns_name_t *name, dns_rdataclass_t rdclass,
   dns_rdatatype_t type, dns_name_t *rdata_name,
   dns_rdataset_t **rdataset, dns_rdataset_t **sigrdataset)
{
isc_result_t ret;
dns_rdataset_t *nsecset = NULL;

printf("We want to prove the non-existence of a type of rdata %d"
   " or of the zone: \n", type);

if ((ret = dns_message_firstname(msg, DNS_SECTION_AUTHORITY))
!= ISC_R_SUCCESS) {

printf(";; nothing in authority section : impossible to" 
    " validate the non-existence : FAILED\n");
return (ISC_R_FAILURE);
}

nsecset = chase_scannamename_section(msg, name, dns_rdatatypensec, 
    dns_rdatatypen_any, 
    DNS_SECTION_AUTHORITY);
if (nsecset != NULL) {
    printf("We have a NSEC for this zone : OK\n");
    ret = prove_nx_type(msg, name, nsecset, rdclass, 
        type, rdata_name, rdataset, 
        sigrdataset);
    if (ret != ISC_R_SUCCESS) {
        printf("prove_nx: ERROR type exist\n");
        return (ret);
    } else {
        printf("prove_nx: OK type does not exist\n");
        return (ISC_R_SUCCESS);
    }
} else {
    printf("there is no NSEC for this zone: validating 
    "that the zone doesn't exist\n");
    ret = prove_nx_domain(msg, name, rdata_name, 
        rdataset, sigrdataset);
    return (ret);
}
/* Never get here */
}
#endif

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(This file is under construction.)

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 file, as requested by the FSF.

++++++++++++++++

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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1.13 boost 1.66.0

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1.18 ca-certificates 20170717

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1.19 certifi 2018.1.18

1.19.1 Available under license:
This package contains a modified version of ca-bundle.crt:

ca-bundle.crt -- Bundle of CA Root Certificates

Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#
This is a bundle of X.509 certificates of public Certificate Authorities (CA). These were automatically extracted from Mozilla's root certificates file (certdata.txt). This file can be found in the mozilla source tree:
It contains the certificates in PEM format and therefore can be directly used with curl / libcurl / php_curl, or with an Apache+mod_ssl webservice for SSL client authentication.
Just configure this file as the SSLCACertificateFile.#

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@(#) SRCSfile: certdata.txt,v $Revision: 1.80 $ $Date: 2011/11/03 15:11:58 $
Metadata-Version: 1.1
Name: certifi
`Certifi` is a carefully curated collection of Root Certificates for validating the trustworthiness of SSL certificates while verifying the identity of TLS hosts. It has been extracted from the `Requests` project.

Installation

```
`certifi` is available on PyPI. Simply install it with `pip`:

$ pip install certifi
```

Usage

To reference the installed certificate authority (CA) bundle, you can use the built-in function:

```
>>> import certifi

>>> certifi.where()
'/usr/local/lib/python2.7/site-packages/certifi/cacert.pem'
```

Enjoy!

1024-bit Root Certificates

Browsers and certificate authorities have concluded that 1024-bit keys are unacceptably weak for certificates, particularly root certificates. For this reason, Mozilla has removed any weak (i.e. 1024-bit key) certificate from its bundle, replacing it with an equivalent strong (i.e. 2048-bit or greater key) certificate from the same CA. Because Mozilla removed these certificates from its bundle, `certifi` removed them as well.

In previous versions, `certifi` provided the `certifi.old_where()` function to intentionally re-add the 1024-bit roots back into your bundle. This was not recommended in production and therefore was removed. To assist in migrating old code, the function `certifi.old_where()` continues to exist as an alias of `certifi.where()`. Please update your code to use `certifi.where()`
instead. ``certifi.old_where()`` will be removed in 2018.

.. _`Requests`: http://docs.python-requests.org/en/latest/

Platform: UNKNOWN
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Classifier: Programming Language :: Python :: 3.4
Classifier: Programming Language :: Python :: 3.5
Classifier: Programming Language :: Python :: 3.6
This package contains a modified version of ca-bundle.crt:

ca-bundle.crt -- Bundle of CA Root Certificates

Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#
This is a bundle of X.509 certificates of public Certificate Authorities
(CA). These were automatically extracted from Mozilla's root certificates
file (certdata.txt). This file can be found in the mozilla source tree:
It contains the certificates in PEM format and therefore
can be directly used with curl / libcurl / php_curl, or with
an Apache+mod_ssl webserver for SSL client authentication.
Just configure this file as the SSLCACertificateFile.#

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@(#) SRCFile: certdata.txt,v $Revision: 1.80 $ $Date: 2011/11/03 15:11:58 $

1.20 cgreen 1.0.0
:2c146fa3b5e33ecd5f4e513360f576f02323405
b
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1.21 chardet 3.0.4

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1.22 cloud-init 0.7.6
1.22.1 Available under license:

Name: cloud-init
Maintainer: Scott Moser <scott.moser@canonical.com>
Source: https://launchpad.net/cloud-init

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1.23 coreutils 8.29

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1.26 dhcp 4.4.1 :r0

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<xsl:stylesheet version="1.0"
 xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
 xmlns:xi="http://www.w3.org/2001/XInclude"
 xmlns:db="http://docbook.org/ns/docbook">

<xsl:template name="isc.copyright.format">
  <xsl:param name="text"/>
  <xsl:value-of select="$isc.copyright.leader"/>
  <xsl:value-of select="normalize-space(substring-before($text, '&#10;'))"/>
  <xsl:text>&#10;</xsl:text>
  <xsl:variable name="rest" select="substring-after($text, '&#10;')"/>
  <xsl:if test="translate($rest, '&#9;&#32;', '')">
    <xsl:call-template name="isc.copyright.format">
      <xsl:with-param name="text" select="$rest"/>
    </xsl:call-template>
  </xsl:if>
</xsl:template>

<xsl:variable name="isc.copyright.text">
  <xsl:text>
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</xsl:text>
</xsl:variable>

<xsl:variable name="isc.copyright">
  <xsl:call-template name="isc.copyright.format">
    <xsl:with-param name="text">
      <xsl:for-each select="book/info/copyright | refentry/docinfo/copyright">
        <xsl:text>Copyright (C) </xsl:text>
        <xsl:call-template name="copyright.years">
          <xsl:with-param name="years" select="year"/>
        </xsl:call-template>
        <xsl:text> </xsl:text>
        <xsl:value-of select="holder"/>
        <xsl:value-of select="$isc.copyright.breakline"/>
      </xsl:for-each>
    </xsl:with-param>
  </xsl:call-template>
</xsl:variable>
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* configure.ac, Makefile.am: The original versions were derived from the ones in the XML Catalog Manager project, version 2.2.

  Author: Julio Merino <jmmv@users.sourceforge.net>

* atf-c/u.c: The format_paragraph and format_text functions were derived form the ones in the Monotone project, revision 3a0982da308228d796df35f98d787c5c7f2bb5b6.

  Author: Julio Merino <jmmv@NetBSD.org>

* atf-c++/detail/io.hpp, atf-c++/detail/io.cpp, atf-c++/detail/io_test.cpp: These files were derived from the file_handle, systembuf, pipe and pistream classes and tests found in the Boost.Process library.

  Author: Julio Merino <jmmv84@gmail.com>

* admin/check-style.sh, admin/check-style-common.awk, admin/check-style-cpp.awk, admin/check-style-shell.awk: These files, except the first one, were first implemented in the Buildtool project. They were later adapted to be part of Boost.Process and, during that process, the shell script was created.

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/* FAT32, VFAT, Atari format support, and various fixes additions May 1998
* by Roman Hodek <Roman.Hodek@informatik.uni-erlangen.de> */

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Theodore Ts'o
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This package was added to the e2fsprogs debian source package by
Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

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Upstream Author: Theodore Ts'o <tytso@mit.edu>

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This package was put together by Yann Dirson <dirson@debian.org>, from sources obtained from a mirror of:
tsx-11.mit.edu:/pub/linux/packages/ext2fs/
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This package was put together by Yann Dirson <dirson@debian.org>,
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Index: tdbsa/tdb.c
===================================================================
--- tdbsa.orig/tdb.c
+++ tdbsa/tdb.c
@@ -4,11 +4,11 @@
Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)
*/
/*
- Unix SMB/CIFS implementation.
+ trivial database library - standalone version

- trivial database library - private includes
-
- Copyright (C) Andrew Tridgell 2005
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** NOTE! The following LGPL license applies to the tdb library. This does NOT imply that all of Samba is released
#
# This is a Makefile stub which handles the creation of BSD shared
# libraries.
#
# In order to use this stub, the following makefile variables must be defined.
#
# BSDLIB_VERSION = 1.0
# BSDLIB_IMAGE = libce
# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#
all:: image

real-subdirs:: Makefile
@echo "MKDIR pic"
@mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image:$(BSD_LIB)

$(BSD_LIB): $(OBJS)
(cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
$(MV) pic/$(BSD_LIB) .
$(RM) -f $(BSD_LIB)
(cd ..; $(LN) $(LINK_BUILD_FLAGS) \`echo $(my_dir) | sed -e 's;lib/;;'"/$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
@echo "INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
@$(INSTALL_PROGRAM) $(BSD_LIB) \ $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
@-$(LDCONFIG)

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
$(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
$(RM) -rf pic
$(RM) -f $(BSD_LIB)
$(RM) -f ..$(BSD_LIB)

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Gadi Oxman, August 1995

---------------------------------------------------------------------------

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1.32 ecdsa 0.13

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1.33 efitools

1.7.0+git0649468475d20d8ca5634433c4912467cef3ce93

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efitools - useful tools for manipulating UEFI secure boot platforms

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1.35 elfutils 0.173

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.src/pcf/pcf.h
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1.43 gcc 8.2.0

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This is an attempt to acknowledge early contributions to the garbage collector. Later contributions should instead be mentioned in README.changes.

HISTORY -

Early versions of this collector were developed as a part of research projects supported in part by the National Science Foundation and the Defense Advanced Research Projects Agency.

The garbage collector originated as part of the run-time system for the Russell programming language implementation. The first version of the garbage collector was written primarily by Al Demers. It was then refined and mostly rewritten, primarily by Hans-J. Boehm, at Cornell U., the University of Washington, Rice University (where it was first used for C and assembly code), Xerox PARC, SGI, and HP Labs. However, significant
contributions have also been made by many others.

More recent contributors are mentioned in the modification history in README.changes. My apologies for any omissions.

The SPARC specific code was originally contributed by Mark Weiser. The Encore Multimax modifications were supplied by Kevin Kenny (kenny@m.cs.uiuc.edu). The adaptation to the IBM PC/RT is largely due to Vernon Lee, on machines made available to Rice by IBM. Much of the HP specific code and a number of good suggestions for improving the generic code are due to Walter Underwood. Robert Brazile (brazile@diamond.bbn.com) originally supplied the ULTRIX code. Al Dosser (dosser@src.dec.com) and Regis Cridlig (Regis.Cridlig@cl.cam.ac.uk) subsequently provided updates and information on variation between ULTRIX systems. Parag Patel (parag@netcom.com) supplied the A/UX code. Jesper Peterson(jep@mitame.mitia.oz.au), Michel Schinz, and Martin Tauchmann (martintauchmann@bigfoot.com) supplied the Amiga port. Thomas Funke (thf@zelator.in-berlin.de(?)) and Brian D.Carlstrom (bdc@clark.lcs.mit.edu) supplied the NeXT ports. Douglas Steel (doug@wg.icl.co.uk) provided ICL DRS6000 code. Bill Janssen (janssen@parc.xerox.com) supplied the SunOS dynamic loader specific code. Manuel Serrano (serrano@cornas.inria.fr) supplied linux and Sony News specific code. Al Dosser provided Alpha/OSF/1 code. He and Dave Detlefs(detlefs@src.dec.com) also provided several generic bug fixes. Alistair G. Crooks(agt@uts.amdahl.com) supplied the NetBSD and 386BSD ports. Jeffrey Hsu (hsu@soda.berkeley.edu) provided the FreeBSD port. Brent Benson (brent@jade.ssd.csd.harris.com) ported the collector to a Motorola 88K processor running CX/UX (Harris NightHawk). Ari Huttunen (Ari.Huttunen@hut.fi) generalized the OS/2 port to nonIBM development environments (a nontrivial task). Patrick Beard (beard@cs.ucdavis.edu) provided the initial MacOS port. David Chase, then at Olivetti Research, suggested several improvements. Scott Schwartz (schwartz@groucho.cse.psu.edu) supplied some of the code to save and print call stacks for leak detection on a SPARC. Jesse Hull and John Ellis supplied the C++ interface code. Zhong Shao performed much of the experimentation that led to the current typed allocation facility. (His dynamic type inference code hasn’t made it into the released version of the collector, yet.)

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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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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.

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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
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.

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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.

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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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<table>
<thead>
<tr>
<th>Program</th>
<th>Directory</th>
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<tr>
<td>mach_override</td>
<td>lib/interception/mach_override</td>
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David Megginson, sax@megginson.com
1998-05-11

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*m4/ax_func_which_gethostbyname_r.m4

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#
# The script also doesn't change testsuite files, except those in
# libstdc++-v3. This is because libstdc++-v3 has a conformance testsuite,
# while most tests in other directories are just things that failed at some
# point in the past.
#
# Pass --this-year to the script if you want it to add the current year
# to all applicable notices. Pass --quilt if you are using quilt and
# want files to be added to the quilt before being changed.
#
# By default the script will update all directories for which the
# output has been vetted. You can instead pass the names of individual
# directories, including those that haven't been approved. So:
#
#    update-copyright.py --this-year
#
# is the command that would be used at the beginning of a year to update
# all copyright notices (and possibly at other times to check whether
# new files have been added with old years). On the other hand:
#
#    update-copyright.py --this-year libitm
#
# would run the script on just libitm/.
#
# Note that things like --version output strings must be updated before
# this script is run. There's already a separate procedure for that.

import os
import re
import sys
import time
import subprocess

class Errors:
    def __init__(self):
        self.num_errors = 0

def report(self, filename, string):
    if filename:
        string = filename + ': ' + string
    sys.stderr.write(string + '
')
    self.num_errors += 1

def ok(self):
    return self.num_errors == 0

class GenericFilter:
    def __init__(self):
        self.skip_files = set()
        self.skip_dirs = set()
        self.skip_extensions = set()
        self.fossilised_files = set()
        self.own_files = set()

        self.skip_files |= set( [  

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# Skip licence files.
'COPYING',
'COPYING.LIB',
'COPYING3',
'COPYING3.LIB',
'LICENSE',
'fdl.texi',
'gpl_v3.texi',
'fdl-1.3.xml',
'gpl-3.0.xml',

# Skip auto- and libtool-related files
'aclocal.m4',
'compile',
'config.guess',
'config.sub',
'depcomp',
'install-sh',
'libtool.m4',
'ltmain.sh',
'ltoptions.m4',
'ltversion.m4',
'lt~obsolete.m4',
'missing',
'mkdep',
'mkinstalldirs',
'move-if-change',
'shlibpath.m4',
'symlink-tree',
'ylwrap',

# Skip FSF mission statement, etc.
'gnu.texi',
'funding.texi',
'appendix_free.xml',

# Skip imported texinfo files.
'texinfo.tex',

def get_line_filter (self, dir, filename):
    if filename.startswith ('ChangeLog'):
        # Ignore references to copyright in changelog entries.
        return re.compile ('\t')
    return None
def skip_file(self, dir, filename):
    if filename in self.skip_files:
        return True

    (base, extension) = os.path.splitext(os.path.join(dir, filename))
    if extension in self.skip_extensions:
        return True

    if extension == '.in':
        # Skip .in files produced by automake.
        if os.path.exists(base + '.am'):
            return True

        # Skip files produced by autogen
        if (os.path.exists(base + '.def')
            and os.path.exists(base + '.tpl')):
            return True

        # Skip configure files produced by autoconf
        if filename == 'configure':
            if os.path.exists(base + '.ac'):
                return True
            if os.path.exists(base + '.in'):
                return True

    return False

def skip_dir(self, dir, subdir):
    return subdir in self.skip_dirs

def is_fossilised_file(self, dir, filename):
    if filename in self.fossilised_files:
        return True

    # Only touch current ChangeLogs.
    if filename != 'ChangeLog' and filename.find('ChangeLog') >= 0:
        return True

    return False

def by_package_author(self, dir, filename):
    return filename in self.own_files

class Copyright:
    def __init__(self, errors):
        self.errors = errors

        # Characters in a range of years. Include '.' for typos.
        ranges = '[0-9]+\s+and\s+[0-9]'
# Non-whitespace characters in a copyright holder's name.
name = '[\w.,-]'

# Matches one year.
self.year_re = re.compile ('\[0-9]+')

# Matches part of a year or copyright holder.
self.continuation_re = re.compile (ranges + '|' + name)

# Matches a full copyright notice:
self.copyright_re = re.compile (  # 1: 'Copyright (C)', etc.
    '((C|c)opyright'  # 2: the years. Include the whitespace in the year, so that  
    '\[[Cc]opyrights+\[[Cc]\]'  # we can remove any excess.  
    '\[[Cc]opyright%s'  
    '\[[Cc]opyright+=copy;'  
    '\[[Cc]opyrights+@copyright\{ \}'  
    'copyright = u"'  
    '@set%s+copyright\[w-]+')

# 3: 'by ', if used
'\(by\s*\)?'  # (by\s++)?’

# 4: the copyright holder. Don't allow multiple consecutive  
# spaces, so that right-margin gloss doesn't get caught  
# (e.g. gnat_ugn.texi).  
'('\ + name + '(\:\s?' + name + '+')*')?

# A regexp for notices that might have slipped by. Just matching  
# 'copyright' is too noisy, and 'copyright.*[0-9]' falls foul of  
# HTML header markers, so check for 'copyright' and two digits.  
self.other_copyright_re = re.compile ('copyright.*[0-9][0-9]', re.IGNORECASE)

self.comment_re = re.compile('#+|\[*\]+|;+|%+|//+|\@c |dnl ')  
self.holders = { '@copying': '@copying' }  
self.holder_prefixes = set()

# True to 'quilt add' files before changing them.
self.use_quilt = False

# If set, force all notices to include this year.
self.max_year = None
# Goes after the year(s). Could be ', '
self.separator = ' ' 

def add_package_author(self, holder, canon_form = None):
    if not canon_form:
        canon_form = holder
    self.holders[holder] = canon_form
    index = holder.find (' ')
    while index >= 0:
        self.holder_prefixes.add (holder[:index])
        index = holder.find (' ', index + 1)

def add_external_author(self, holder):
    self.holders[holder] = None

class BadYear():
    def __init__(self, year):
        self.year = year
    
    def __str__(self):
        return 'unrecognised year: ' + self.year

def parse_year(self, string):
    year = int (string)
    if len (string) == 2:
        if year > 70:
            return year + 1900
        elif len (string) == 4:
            return year
        raise self.BadYear (string)

def year_range(self, years):
    year_list = [self.parse_year (year)
                 for year in self.year_re.findall (years)]
    assert len (year_list) > 0
    return (min (year_list), max (year_list))

def set_use_quilt(self, use_quilt):
    self.use_quilt = use_quilt

def include_year(self, year):
    assert not self.max_year
    self.max_year = year

def canonicalise_years(self, dir, filename, filter, years):
    # Leave texinfo variables alone.
    if years.startswith ('@value'):
return years

(min_year, max_year) = self.year_range(years)

# Update the upper bound, if enabled.
if self.max_year and not filter.is_fossilised_file(dir, filename):
    max_year = max(max_year, self.max_year)

# Use a range.
if min_year == max_year:
    return '%d' % min_year
else:
    return '%d-%d' % (min_year, max_year)

def strip_continuation(self, line):
    line = line.lstrip()
    match = self.comment_re.match(line)
    if match:
        line = line[match.end():].lstrip()
    return line

def is_complete(self, match):
    holder = match.group(4)
    return (holder
        and (holder not in self.holder_prefixes
            or holder in self.holders))

def update_copyright(self, dir, filename, filter, file, line, match):
    orig_line = line
    next_line = None
    pathname = os.path.join(dir, filename)

    intro = match.group(1)
    if intro.startswith('@set'):
        # Texinfo year variables should always be on one line
        after_years = line[match.end(2):].strip()
        if after_years != '':
            self.errors.report(pathname,
                'trailing characters in @set: ' + after_years)
            return (False, orig_line, next_line)
    else:
        # If it looks like the copyright is incomplete, add the next line.
        while not self.is_complete(match):
            try:
                next_line = file.next()
            except StopIteration:
                break
            else:
                intro = match.group(1)
                if intro.startswith('@set'):
                    after_years = line[match.end(2):].strip()
                    if after_years != '':
                        self.errors.report(pathname,
                            'trailing characters in @set: ' + after_years)
                        return (False, orig_line, next_line)
# If the next line doesn't look like a proper continuation,
# assume that what we've got is complete.
continuation = self.strip_continuation (next_line)
if not self.continuation_re.match (continuation):
    break

# Merge the lines for matching purposes.
orig_line += next_line
line = line.rstrip() + ' ' + continuation
next_line = None

# Rematch with the longer line, at the original position.
match = self.copyright_re.match (line, match.start())
assert match

holder = match.group (4)

# Use the filter to test cases where markup is getting in the way.
if filter.by_package_author (dir, filename):
    assert holder not in self.holders

elif not holder:
    self.errors.report (pathname, 'missing copyright holder')
    return (False, orig_line, next_line)

elif holder not in self.holders:
    self.errors.report (pathname, 'unrecognised copyright holder: ' + holder)
    return (False, orig_line, next_line)

else:
    # See whether the copyright is associated with the package
    # author.
    canon_form = self.holders[holder]
    if not canon_form:
        return (False, orig_line, next_line)

    # Make sure the author is given in a consistent way.
    line = (line[:match.start (4)]
            + canon_form
            + line[match.end (4):])

    # Remove any 'by'
    line = line[:match.start (3)] + line[match.end (3):]

    # Update the copyright years.
    years = match.group (2).strip()
try:
    canon_form = self.canonicalise_years (dir, filename, filter, years)
except self.BadYear as e:
    self.errors.report (pathname, str (e))
return (False, orig_line, next_line)

line = (line[:match.start (2)]
    + ('' if intro.startswith ('copyright = ') else ' ')
    + canon_form + self.separator
    + line[match.end (2):])

# Use the standard (C) form.
if intro.endswith ('(right)'):
    intro += ' (C)'
else:
    intro = intro[:-3] + '(C)'
line = line[:match.start (1)] + intro + line[match.end (1):]

# Strip trailing whitespace
line = line.rstrip() + '\n'

return (line != orig_line, line, next_line)

def process_file (self, dir, filename, filter):
    pathname = os.path.join (dir, filename)
    if filename.endswith ('.tmp'):
        # Looks like something we tried to create before.
        try:
            os.remove (pathname)
        except OSError:
            pass
        return
    lines = []
    changed = False
    line_filter = filter.get_line_filter (dir, filename)
    mode = None
    with open (pathname, 'r') as file:
        prev = None
        mode = os.fstat (file.fileno()).st_mode
        for line in file:
            if not (line_filter and line_filter.match (line)):
                match = self.copyright_re.search (line)
                if match:
                    res = self.update_copyright (dir, filename, filter,
file, line, match)
    (this_changed, line, next_line) = res
    changed = changed or this_changed

    # Check for copyright lines that might have slipped by.
    elif self.other_copyright_re.search(line):
        self.errors.report(pathname,
                          'unrecognised copyright: %s
                          % line.strip())
        lines.append(line)
        line = next_line

    # If something changed, write the new file out.
if changed and self.errors.ok():
    tmp_pathname = pathname + '.tmp'
    with open(tmp_pathname, 'w') as file:
        for line in lines:
            file.write(line)
            os.fchmod(file.fileno(), mode)
    if self.use_quilt:
        subprocess.call(['quilt', 'add', pathname])
    os.rename(tmp_pathname, pathname)

def process_tree(self, tree, filter):
    for (dir, subdirs, filenames) in os.walk(tree):
        # Don't recurse through directories that should be skipped.
        for i in xrange(len(subdirs) - 1, -1, -1):
            if filter.skip_dir(dir, subdirs[i]):
                del subdirs[i]

        # Handle the files in this directory.
        for filename in filenames:
            if filter.skip_file(dir, filename):
                sys.stdout.write('Skipping %s
                % os.path.join(dir, filename))
            else:
                self.process_file(dir, filename, filter)

class CmdLine:
def __init__(self, copyright = Copyright):
    self.errors = Errors()
    self.copyright = copyright(self.errors)
    self.dirs = []
    self.default_dirs = []
    self.chosen_dirs = []
    self.option_handlers = dict()
    self.option_help = []
def add_option (self, name, help, handler):
    self.option_help.append ((name, help))
    self.option_handlers[name] = handler

def add_dir (self, dir, filter = GenericFilter ()):  
    self.dirs.append ((dir, filter))

def o_help (self, option = None):
    sys.stdout.write ('Usage: %s [options] dir1 dir2...\n
    ' % sys.argv[0])
    format = '%-15s %s
    '  
    for (what, help) in self.option_help:
        sys.stdout.write (format % (what, help))
    sys.stdout.write ('\nDirectories:
    ')
    format = '%-25s
    i = 0
    for (dir, filter) in self.dirs:
        i += 1
        if i % 3 == 0 or i == len (self.dirs):
            sys.stdout.write (dir + '\n')
        else:
            sys.stdout.write (format % dir)
    sys.exit (0)

def o_quilt (self, option):
    self.copyright.set_use_quilt (True)

def o_this_year (self, option):
    self.copyright.include_year (time.localtime().tm_year)

def main (self):
    for arg in sys.argv[1:]:
        if arg[1:] != '\':
            self.chosen_dirs.append (arg)
        elif arg in self.option_handlers:
            self.option_handlers[arg] (arg)
        else:
            self.errors.report (None, 'unrecognised option: ' + arg)
    if self.errors.ok (): 
        if len (self.chosen_dirs) == 0:
            self.chosen_dirs = self.default_dirs
if len(self.chosen_dirs) == 0:
    self.o_help()
else:
    for chosen_dir in self.chosen_dirs:
        canon_dir = os.path.join(chosen_dir, '')
        count = 0
        for (dir, filter) in self.dirs:
            if (dir + os.sep).startswith(canon_dir):
                count += 1
                self.copyright.process_tree(dir, filter)
        if count == 0:
            self.errors.report(None, 'unrecognised directory: '
                               + chosen_dir)
    sys.exit(0 if self.errors.ok() else 1)

#---------------------------------------------------------------

class TopLevelFilter(GenericFilter):
    def skip_dir(self, dir, subdir):
        return True

class ConfigFilter(GenericFilter):
    def __init__(self):
        GenericFilter.__init__(self)
    def skip_file(self, dir, filename):
        if filename.endswith('.m4'):
            pathname = os.path.join(dir, filename)
            with open(pathname) as file:
                # Skip files imported from gettext.
                if file.readline().find('gettext-') > 0:
                    return True
                return GenericFilter.skip_file(self, dir, filename)

class GCCFilter(GenericFilter):
    def __init__(self):
        GenericFilter.__init__(self)
        self.skip_files |= set([  
            # Not part of GCC
            'math-68881.h',  
            ])  
    
        self.skip_dirs |= set([  
            # Better not create a merge nightmare for the GNAT folks.
            'ada',  
            ])  

    # Handled separately.
'testsuite',
})

self.skip_extensions |= set([
    # Maintained by the translation project.
    '.po',

    # Automatically-generated.
    '.pot',
])

self.fossilised_files |= set([
    # Old news won't be updated.
    'ONEWS',
])

class TestsuiteFilter (GenericFilter):
    def __init__ (self):
        super().__init__(self)

        self.skip_extensions |= set([
            # Don't change the tests, which could be woend by anyone.
            '.c',
            '.C',
            '.cc',
            '.h',
            '.hs',
            '.f',
            '.f90',
            '.go',
            '.inc',
            '.java',
        ])

def skip_file (self, dir, filename):
    # g++.niklas/README contains historical copyright information
    # and isn't updated.
    if filename == 'README' and os.path.basename (dir) == 'g++.niklas':
        return True
    # Similarly params/README.
    if filename == 'README' and os.path.basename (dir) == 'params':
        return True
    if filename == 'pdt_5.f03' and os.path.basename (dir) == 'gfortran.dg':
        return True
    return super().skip_file (self, dir, filename)

class LibCppFilter (GenericFilter):
    def __init__ (self):
GenericFilter.__init__(self)

self.skip_extensions |= set([
    # Maintained by the translation project.
    '.po',

    # Automatically-generated.
    '.pot',
])

class LibGCCFilter(GenericFilter):
    def __init__(self):
        GenericFilter.__init__(self)

        self.skip_dirs |= set([
            # Imported from GLIBC.
            'soft-fp',
        ])

class LibStdCxxFilter(GenericFilter):
    def __init__(self):
        GenericFilter.__init__(self)

        self.skip_files |= set([
            # Contains no copyright of its own, but quotes the GPL.
            'intro.xml',
        ])

        self.skip_dirs |= set([
            # Contains automatically-generated sources.
            'html',

            # The testsuite data files shouldn't be changed.
            'data',

            # Contains imported images
            'images',
        ])

        self.own_files |= set([
            # Contains markup around the copyright owner.
            'spine.xml',
        ])

        def get_line_filter(self, dir, filename):
            if filename == 'boost_concept_check.h':
                return re.compile('// \(C\) Copyright Jeremy Siek')
            return GenericFilter.get_line_filter(self, dir, filename)
class GCCCopyright(Copyright):
    def __init__(self, errors):
        Copyright.__init__(self, errors)

        canon_fsf = 'Free Software Foundation, Inc.'
        self.add_package_author('Free Software Foundation', canon_fsf)
        self.add_package_author('Free Software Foundation.', canon_fsf)
        self.add_package_author('Free Software Foundation Inc.', canon_fsf)
        self.add_package_author('Free Software Foundation, Inc', canon_fsf)
        self.add_package_author('The Free Software Foundation', canon_fsf)
        self.add_package_author('The Free Software Foundation, Inc.', canon_fsf)
        self.add_package_author('Software Foundation, Inc.', canon_fsf)

        self.add_external_author('ARM')
        self.add_external_author('AdaCore')
        self.add_external_author('Ami Tavory and Vladimir Dreizin, IBM-HRL.')
        self.add_external_author('Cavium Networks.')
        self.add_external_author('Faraday Technology Corp.')
        self.add_external_author('Florida State University')
        self.add_external_author('Greg Colvin and Beman Dawes.')
        self.add_external_author('Hewlett-Packard Company')
        self.add_external_author('Intel Corporation')
        self.add_external_author('Information Technology Industry Council.')
        self.add_external_author('James Theiler, Brian Gough')
        self.add_external_author('Makoto Matsumoto and Takuji Nishimura,')
        self.add_external_author('National Research Council of Canada.')
        self.add_external_author('NVIDIA Corporation')
        self.add_external_author('Peter Dimov and Multi Media Ltd.')
        self.add_external_author('Peter Dimov')
        self.add_external_author('Pipeline Associates, Inc.')
        self.add_external_author('Regents of the University of California.')
        self.add_external_author('Silicon Graphics Computer Systems, Inc.')
        self.add_external_author('Silicon Graphics')
        self.add_external_author('Stephen L. Moshier')
        self.add_external_author('Sun Microsystems, Inc. All rights reserved.')
        self.add_external_author('The Go Authors. All rights reserved.')
        self.add_external_author('The Go Authors. All rights reserved.')
        self.add_external_author('The Go Authors.')
        self.add_external_author('The Regents of the University of California')
        self.add_external_author('Unicode, Inc.')
        self.add_external_author('University of Toronto.')

class GCCCmdLine(CmdLine):
    def __init__(self):
        CmdLine.__init__(self, GCCCopyright)
self.add_dir('.', TopLevelFilter())
# boehm-gc is imported from upstream.
self.add_dir('config', ConfigFilter())
# contrib isn't really part of GCC.
self.add_dir('fixincludes')
self.add_dir('gcc', GCCFilter())
self.add_dir(os.path.join('gcc', 'testsuite'), TestsuiteFilter())
self.add_dir('gnattools')
self.add_dir('gotools')
self.add_dir('include')
# intl is imported from upstream.
self.add_dir('libada')
self.add_dir('libatomic')
self.add_dir('libbacktrace')
self.add_dir('libcc1')
self.add_dir('libc++', LibCppFilter())
self.add_dir('libdecnumber')
# libffi is imported from upstream.
self.add_dir('libgcc', LibGCCFilter())
self.add_dir('libgfortran')
# libgo is imported from upstream.
self.add_dir('libgomp')
self.add_dir('libhsail-rt')
self.add_dir('libiberty')
self.add_dir('libitm')
self.add_dir('libobjc')
# liboffloadmic is imported from upstream.
self.add_dir('libquadmath')
# libsanitizer is imported from upstream.
self.add_dir('libssp')
self.add_dir('libstdc++-v3', LibStdCxxFilter())
self.add_dir('libvtsv')
self.add_dir('lto-plugin')
# maintainer-scripts maintainer-scripts
# zlib is imported from upstream.

self.default_dirs = [
    'gcc',
    'include',
    'libada',
    'libatomic',
    'libbacktrace',
    'libcc1',
    'libc++',
    'libdecnumber',
    'libgcc',
    'libgfortran',
    'libgomp',
]
GCCCmdLine().main()

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<table>
<thead>
<tr>
<th>Program</th>
<th>Directory</th>
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</thead>
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<td>mach_override</td>
<td>lib/interception/mach_override</td>
</tr>
<tr>
<td>ignore</td>
<td></td>
</tr>
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<td>@c Set file name and title for man page.</td>
<td>@setfilename gpl</td>
</tr>
<tr>
<td>@settitle GNU General Public License</td>
<td>@c man begin SEEALSO</td>
</tr>
<tr>
<td></td>
<td>gfdl(7), fsf-funding(7).</td>
</tr>
<tr>
<td></td>
<td>@c man end</td>
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<td></td>
<td>@c man begin COPYRIGHT</td>
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</tbody>
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@enumerate 0
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received the object code with such an offer, in accord with subsection
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equivalent copying facilities, provided you maintain clear directions
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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.

@example
@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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@example
@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.

The hypothetical commands @samp{show w} and @samp{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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Escape single quotes in literal strings from groff's Unicode transform.

" If the F register is >0, we'll generate index entries on stderr for
" titles (.TH), headers (.SH), subsections (.SS), items (.Ip), and index
" entries marked with X<> in POD. Of course, you'll have to process the
" output yourself in some meaningful fashion.

" Avoid warning from groff about undefined register 'F'.

Accent mark definitions (@(#)ms.acc 1.5 88/02/08 SMI; from UCB 4.2).

Fear. Run. Save yourself. No user-serviceable parts.

Accent mark definitions for nroff and troff

Simple accents for nroff and troff


" corrections for vroff
.if v .ds ~ \k:h'-(\n(wu*9/10-^*#H)'\n|u' |n:u'
.if v .ds ^ \k:h'-(\n(wu*10/11-^*#H)'\n|u' |n:u'
 . V' for low resolution devices (crt and lpr)
.if \n(H>23 .if \n(V>19 \
|\n . ds : e
 . ds 8 ss
 . ds o a
 . ds d- dlh-1\(ga
 . ds D- Dh-1\(hy
 . ds th \o'bp'
 . ds Th \o'LP'
 . ds ae ae
 . ds Ae AE
\l]
.rm #[ #] #H #V #F C
\l" ==============================================================
\l"
.IX Title "GPL 7"
.TH GPL 7 "2018-07-26" "gcc-8.2.0" "GNU"
\l" For nroff, turn off justification. Always turn off hyphenation; it makes
\l" way too many mistakes in technical documents.
.if n .ad 1
.nh
.SH "NAME"
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linked subprograms that the work is specifically designed to require,
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.IP "e." 4
.IX Item "e."
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/* Use the Sequent Symmetry assembler syntax. */

/* Define the syntax of pseudo-ops, labels and comments. */

/* Prefix for internally generated assembler labels. If we aren't using
underscores, we are using prefix "."s to identify labels that should
be ignored, as in `i386/gas.h' --karl@cs.umb.edu */

#define LPREFIX "L"

/* Assembler pseudos to introduce constants of various size. */

#define ASM_BYTE "\t.byte\t"
#define ASM_SHORT "\t.word\t"
#define ASM_LONG "\t.long\t"
#define ASM_QUAD "\t.quad\t" /* Should not be used for 32bit compilation. */

/* This was suggested, but it shouldn't be right for DBX output. -- RMS */
#define ASM_OUTPUT_SOURCE_FILENAME(FILE, NAME) */

/* Define the syntax of labels and symbol definitions/declarations. */

/* This is how to output an assembler line
that says to advance the location counter by SIZE bytes. */

#define ASM_OUTPUT_SKIP(FILE,SIZE)  
fprintf (FILE, "\t.space " HOST_WIDE_INT_PRINT_UNSIGNED"\n", (SIZE))

/* Define the syntax of labels and symbol definitions/declarations. */

/* This says how to output an assembler line
to define a global common symbol. */

#define ASM_OUTPUT_COMMON(FILE, NAME, SIZE, ROUNDED) 
( fputs (".comm ", (FILE)),
 assemble_name ((FILE), (NAME)),
 fprintf ((FILE), ",%u\n", (int)(ROUNDED)))

/* This says how to output an assembler line
to define a local common symbol. */

#define ASM_OUTPUT_LOCAL(FILE, NAME, SIZE, ROUNDED) 
( fputs (".lcomm ", (FILE)),
 assemble_name ((FILE), (NAME)),

fprintf ((FILE), ",%u\n", (int)(ROUNDED)))

#ifdef HAVE_GAS_LCOMM_WITH_ALIGNMENT
#define ASM_OUTPUT_ALIGNED_ALIGNMENT (FILE, NAME, SIZE, ALIGNMENT) \ 
( fputs (".lcomm ", (FILE)),
 assemble_name ((FILE), (NAME)),
 fprintf ((FILE), ",%u,%u\n", (int)(SIZE), (int)(ALIGNMENT) / BITS_PER_UNIT))
#endif

/* This is how to output an assembler line 
that says to advance the location counter 
to a multiple of 2**LOG bytes. */

#define ASM_OUTPUT_ALIGN(FILE,LOG)\ 
if ((LOG)!=(0) fprintf ((FILE), ".align %d\n", (LOG))

/* This is how to store into the string BUF 
the symbol_ref name of an internal numbered label where 
PREFIX is the class of label and NUM is the number within the class. 
This is suitable for output with `assemble_name'. */

#define ASM_GENERATE_INTERNAL_LABEL(BUF,PREFIX,NUMBER)\ 
sprintf ((BUF), "*%s%ld", (PREFIX), (long)(NUMBER))

/* The prefix to add to user-visible assembler symbols. */
#define USER_LABEL_PREFIX "_"

/* Sequent has some changes in the format of DBX symbols. */
#define DBX_NO_XREFS 1

/* Don't split DBX symbols into continuations. */
#define DBX_CONTIN_LENGTH 0

---------------------------------------------------------------------

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Julian Seward, jseward@bzip.org
bzip2/libbzip2 version 1.0.6 of 6 September 2010

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1.44 gdb 8.0.1

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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.

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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
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
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Note that it is possible for a library to be covered by the ordinary
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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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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.

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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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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
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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
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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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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
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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   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
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Gnomovision version 69, Copyright (C) year name of author
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#! /usr/bin/env python

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#
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Copyright.py

This script updates the list of years in the copyright notices in
most files maintained by the GDB project.

Usage: cd src/gdb && python copyright.py

Always review the output of this script before committing it!
A useful command to review the output is:
  % filterdiff -x *.c -x *.cc -x *.h -x *.exp updates.diff
This removes the bulk of the changes which are most likely to be correct.

import datetime
import os
import os.path
import subprocess

def get_update_list():
    """Return the list of files to update.

    Assumes that the current working directory when called is the root
    of the GDB source tree (NOT the gdb/ subdirectory!). The names of
    the files are relative to that root directory.
    """
    result = []
    for gdb_dir in ('gdb', 'sim', 'include/gdb'):
        for root, dirs, files in os.walk(gdb_dir, topdown=True):
            for dirname in dirs:
                reldirname = "%s/%s" % (root, dirname)
                if (dirname in EXCLUDE_ALL_LIST
                    or reldirname in EXCLUDE_LIST
                    or reldirname in NOT_FSF_LIST
                    or reldirname in BY_HAND):
                    # Prune this directory from our search list.
                    dirs.remove(dirname)
                for filename in files:
relpath = "%s/%s" % (root, filename)
if (filename in EXCLUDE_ALL_LIST
    or relpath in EXCLUDE_LIST
    or relpath in NOT_FSF_LIST
    or relpath in BY_HAND):
    # Ignore this file.
    pass
else:
    result.append(relpath)
return result

def update_files(update_list):
    """Update the copyright header of the files in the given list.

    We use gnulib's update-copyright script for that.
    """
    # We want to use year intervals in the copyright notices, and
    # all years should be collapsed to one single year interval,
    # even if there are "holes" in the list of years found in the
    # original copyright notice (OK'ed by the FSF, case [gnu.org #719834]).
    os.environ['UPDATE_COPYRIGHT_USE_INTERVALS'] = '2'

    # Perform the update, and save the output in a string.
    update_cmd = ['bash', 'gdb/gnulib/import/extra/update-copyright']
    update_cmd += update_list
    p = subprocess.Popen(update_cmd, stdout=subprocess.PIPE,
                         stderr=subprocess.PIPE)
    update_out = p.communicate()[0]

    # Process the output. Typically, a lot of files do not have
    # a copyright notice :(. The update-copyright script prints
    # a well defined warning when it did not find the copyright notice.
    # For each of those, do a sanity check and see if they may in fact
    # have one. For the files that are found not to have one, we filter
    # the line out from the output, since there is nothing more to do,
    # short of looking at each file and seeing which notice is appropriate.
    # Too much work! (~4,000 files listed as of 2012-01-03).
    update_out = update_out.splitlines()
    warning_string = ': warning: copyright statement not found'
    warning_len = len(warning_string)

    for line in update_out:
        if line.endswith("\n"):
            line = line[:-1]
        if line.endswith(warning_string):
            filename = line[:-warning_len]
if may_have_copyright_notice(filename):
    print line
else:
    # Unrecognized file format. ?!
    print "*** " + line

def may_have_copyright_notice(filename):
    """Check that the given file does not seem to have a copyright notice.

The filename is relative to the root directory.
This function assumes that the current working directory is that root
directory.

The algorithm is fairly crude, meaning that it might return
some false positives. I do not think it will return any false
negatives... We might improve this function to handle more
complex cases later...
"""
    # For now, it may have a copyright notice if we find the word
    # "Copyright" at the (reasonable) start of the given file, say
    # 50 lines...
    MAX_LINES = 50

    fd = open(filename)
    
    lineno = 1
    for line in fd:
        if 'Copyright' in line:
            return True
        lineno += 1
        if lineno > 50:
            return False

    return False

def main ():
    """The main subprogram."""
    if not os.path.isfile("gnulib/import/extra/update-copyright"):  
        print "Error: This script must be called from the gdb directory." 

    root_dir = os.path.dirname(os.getcwd())
    os.chdir(root_dir)
    
    update_list = get_update_list()
    update_files (update_list)

    # Remind the user that some files need to be updated by HAND...
    if BY_HAND:
print
print "\033[31mREMINDER: The following files must be updated by hand." \
"\033[0m"
for filename in BY_HAND + MULTIPLE_COPYRIGHT_HEADERS:
    print " ", filename

############################################################################
#
# Some constants, placed at the end because they take up a lot of room.
# The actual value of these constants is not significant to the understanding
# of the script.
#
############################################################################

# Files which should not be modified, either because they are
generated, non-FSF, or otherwise special (e.g. license text,
or test cases which must be sensitive to line numbering).
#
# Filenames are relative to the root directory.
EXCLUDE_LIST = (
    'gdb/nat/glibc_thread_db.h',
    'gdb/CONTRIBUTE',
    'gdb/gnulib/import'
)

# Files which should not be modified, either because they are
generated, non-FSF, or otherwise special (e.g. license text,
or test cases which must be sensitive to line numbering).
#
# Matches any file or directory name anywhere.  Use with caution.
# This is mostly for files that can be found in multiple directories.
# Eg: We want all files named COPYING to be left untouched.
EXCLUDE_ALL_LIST = ( "COPYING", "COPYING.LIB", "CVS", "configure", "copying.c",
    "fdl.texi", "gpl.texi", "aclocal.m4",
)

# The list of files to update by hand.
BY_HAND = (
    # These files are sensitive to line numbering.
    "gdb/testsuite/gdb.base/step-line.inp",
    "gdb/testsuite/gdb.base/step-line.c",
)

# Files containing multiple copyright headers.  This script is only
# fixing the first one it finds, so we need to finish the update
# by hand.
MULTIPLE_COPYRIGHT_HEADERS = (  
  "gdb/doc/gdb.texinfo",  
  "gdb/doc/refcard.tex",  
  "gdb/gdbarch.sh",  
)

# The list of file which have a copyright, but not head by the FSF.  
# Filenames are relative to the root directory.
NOT_FSF_LIST = (  
  "gdb/exc_request.defs",  
  "gdb/gdbtk",  
  "gdb/testsuite/gdb.gdbtk/",  
  "sim/arm/armmenu.h", "sim/arm/armos.c", "sim/arm/gdbhost.c",  
  "sim/arm/dbg_hif.h", "sim/arm/dbg_conf.h", "sim/arm/communicate.h",  
  "sim/arm/armos.h", "sim/arm/armcopro.c", "sim/arm/armmenu.c",  
  "sim/arm/kid.c", "sim/arm/thumbemu.c", "sim/arm/armdefs.h",  
  "sim/arm/armopts.h", "sim/arm/dbg_cp.h", "sim/arm/dbg_rdi.h",  
  "sim/arm/parent.c", "sim/arm/armsupp.c", "sim/arm/armrdi.c",  
  "sim/arm/bag.c", "sim/arm/armvirt.c", "sim/arm/main.c", "sim/arm/bag.h",  
  "sim/arm/communicate.c", "sim/arm/gdbhost.h", "sim/arm/armfpe.h",  
  "sim/arm/arminit.c",  
  "sim/common/cgen-fpu.c", "sim/common/cgen-fpu.h",  
  "sim/common/cgen-accfp.c",  
  "sim/mips/m16run.c", "sim/mips/sim-main.c",  
  "sim/moxie/moxie-gdb.dts",  
  "sim/ppc/filter.h", "sim/ppc/gen-support.h", "sim/ppc/ld-insn.h",  
  "sim/ppc/hw_sem.c", "sim/ppc/hw_disk.c", "sim/ppc/decode_branch.h",  
  "sim/ppc/sim-endian.h", "sim/ppc/table.c", "sim/ppc/hw_core.c",  
  "sim/ppc/gen-support.c", "sim/ppc/gen-semantics.h", "sim/ppc/cpu.h",  
  "sim/ppc/sim_callbacks.h", "sim/ppc/RUN", "sim/ppc/Makefile.in",  
  "sim/ppc/emul_chirp.c", "sim/ppc/hw_nvram.c", "sim/ppc/dc-test.01",  
  "sim/ppc/hw_phb.c", "sim/ppc/hw_eeprom.c", "sim/ppc/bits.h",  
  "sim/ppc/hw_vm.c", "sim/ppc/cap.h", "sim/ppc/os_emul.h",  
  "sim/ppc/options.h", "sim/ppc/gen-idecode.c", "sim/ppc/filter.c",  
  "sim/ppc/corefile-n.h", "sim/ppc/std-config.h", "sim/ppc/ld-decode.h",  
  "sim/ppc/filter_filename.h", "sim/ppc/hw_shm.c",  
  "sim/ppc/pk_disklabel.c", "sim/ppc/dc-simple", "sim/ppc/misc.h",  
  "sim/ppc/device_table.h", "sim/ppc/ld-insn.c", "sim/ppc/inline.c",  
  "sim/ppc/emul_bugapi.h", "sim/ppc/hw_cpu.h", "sim/ppc/debug.h",  
  "sim/ppc/hw_ide.c", "sim/ppc/debug.c", "sim/ppc/gen-itable.h",  
  "sim/ppc/interrupts.c", "sim/ppc/hw_gdb.c", "sim/ppc/emul_unix.c",  
  "sim/ppc/sim_calls.c", "sim/ppc/dc-complex", "sim/ppc/ld-cache.c",  
  "sim/ppc/registers.h", "sim/ppc/dc-test.02", "sim/ppc/options.c",  
  "sim/ppc/igen.h", "sim/ppc/registers.c", "sim/ppc/device.h",  
  "sim/ppc/emul_chirp.h", "sim/ppc/hw_register.c", "sim/ppc/hw_init.c",  
  "sim/ppc/sim-endian-n.h", "sim/ppc/filter_filename.c",  
  "sim/ppc/bits.c", "sim/ppc/decode_fields.h", "sim/ppc/hw_memory.c",  
)
"sim/ppc/misc.c", "sim/ppc/double.c", "sim/ppc/psim.h",
"sim/ppc/hw_trace.c", "sim/ppc/emul_netbsd.h", "sim/ppc/psim.c",
"sim/ppc/ppc-instructions", "sim/ppc/tree.h", "sim/ppc/README",
"sim/ppc/gen-icache.h", "sim/ppc/gen-model.h", "sim/ppc/ld-cache.h",
"sim/ppc/mon.c", "sim/ppc/corefile.h", "sim/ppc/vm.c",
"sim/ppc/INSTALL", "sim/ppc/gen-model.c", "sim/ppc/hw_cpu.c",
"sim/ppc/corefile.c", "sim/ppc/hw_opic.c", "sim/ppc/gen-icache.c",
"sim/ppc/events.h", "sim/ppc/os_emul.c", "sim/ppc/emul_generic.c",
"sim/ppc/main.c", "sim/ppc/hw_com.c", "sim/ppc/gen-semantics.c",
"sim/ppc/emul_bugapi.c", "sim/ppc/device.c", "sim/ppc/emul_generic.h",
"sim/ppc/tree.c", "sim/ppc/mon.h", "sim/ppc/interrupts.h",
"sim/ppc/cap.c", "sim/ppc/cpu.c", "sim/ppc/hw_phb.h",
"sim/ppc/device_table.c", "sim/ppc/lf.c", "sim/ppc/lf.c",
"sim/ppc/dc-stupid", "sim/ppc/hw_pal.c", "sim/ppc/ppc-spr-table",
"sim/ppc/emul_unix.h", "sim/ppc/words.h", "sim/ppc/basics.h",
"sim/ppc/hw_htab.c", "sim/ppc/lf.h", "sim/ppc/ld-decode.c",
"sim/ppc/sim-endian.c", "sim/ppc/gen-table.c",
"sim/ppc/idecode_expression.h", "sim/ppc/table.h", "sim/ppc/dgen.c",
"sim/ppc/events.c", "sim/ppc/gen-idecode.h", "sim/ppc/emul_netbsd.c",
"sim/ppc/igen.c", "sim/ppc/vm_n.h", "sim/ppc/vm.h",
"sim/ppc/hw_iobus.c", "sim/ppc/inline.h",
"sim/testsuite/sim/bfin/s21.s", "sim/testsuite/sim/mips/mips32-dsp2.s",
)

if __name__ == "__main__":
    main()
BEGIN{
    FS="\n";
    print "/* ===> Do not modify this file!! " \n"-*- buffer-read-only: t -*- vi" \n":set ro:"
    print " It is created automatically by copying.awk.");
    print " Modify copying.awk instead. <= *=}"
    print ""
    print "#include "defs.h"
""
    print "#include "command.h"
""
    print "#include "gdbcmd.h"
""
    print ""
    print "static void show_copying_command (char *, int);"
    print ""
    print "static void show_warranty_command (char *, int);"
    print ""
    print "void _initialize_copying (void);"
    print ""
    print "static void";
    print "show_copying_command (char *ignore, int from_tty);"
    print "{";
}
NR == 1.\n
if ($0 - //)
{
    printf " printf_filtered ("\n\n\n";
}
else if ($0 !- //)
{
    printf " printf_filtered (\""
    for (i = 1; i < NF; i++)
printf "%%s\\\n\", $i;
    printf "%%s\\n\n\", $NF;
}

END{  
    print ");
    print "static void"
    printf commands (char *ignore, int from_tty)");
    print ");
}

END{  
    print ");
    print "void"
    print ".initialize_copying (void)"
    print ");
    print " add_cmd ("copying\", no_set_class, show_copying_command,";
    print " _(("Conditions for redistributing copies of GDB.");
    print " &showlist);";
    print " add_cmd ("warranty\", no_set_class, show_warranty_command,";
    print " _(("Various kinds of warranty you do not have.");
    print " &showlist);";
    print " ";
    print " /* For old-timers, allow \"info copying\", etc. */";
    print " add_info ("copying\", show_copying_command,";
    print " _(("Conditions for redistributing copies of GDB.");
    print " add_info ("warranty\", show_warranty_command,";
    print " _(("Various kinds of warranty you do not have.");
    print " ";
}
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ispell-local-pdict: "ispell-dict"
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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.

e) 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.

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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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 extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.


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* and Ajay Tirumalla <tirumala@ncsa.uiuc.edu>
* -------------------------------------------------------------------
* input and output numbers, converting with kilo, mega, giga
* ------------------------------------------------------------------- */

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* configure.ac, Makefile.am: The original versions were derived from the ones in the XML Catalog Manager project, version 2.2.

   Author: Julio Merino <jmmv@users.sourceforge.net>

* atf-c/ui.c: The format_paragraph and format_text functions were derived from the ones in the Monotone project, revision 3a0982da308228d796df35f98d787c5c8f2bb5b6.

   Author: Julio Merino <jmmv@NetBSD.org>

* atf-c++/detail/io.hpp, atf-c++/detail/io.cpp, atf-c++/detail/io_test.cpp: These files were derived from the file_handle, systembuf, pipe and pistream classes and tests found in the Boost.Process library.

   Author: Julio Merino <jmmv84@gmail.com>

* admin/check-style.sh, admin/check-style-common.awk, admin/check-style-cpp.awk, admin/check-style-shell.awk: These files, except the first one, were first implemented in the Buildtool project. They were later adapted to be part of Boost.Process and, during that process, the shell script was created.

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1.67 jansson 2.9

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1.68 jemalloc 5.1.0

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1.69 json-c 0.13

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1.70 kbd 2.0.4 :1.0

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```
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# 0 leshort 0x0436 psf screen font data
>2 byte 0 256 characters, no index
>2 byte 1 512 characters, no index
>2byte2256 characters, Unicode index
>byte3512 characters, Unicode index
>byte4256 characters, Unicode level 2 index
>byte5512 characters, Unicode level 2 index
>3byte8x%d

# PC Screen (console) Fonts - psf2 header

# 0 lelong0x864ab572psf2 screen font data
>12lelong&11 with Unicode index
>16lelongx8b, %d glyphs
>28lelongx8b, %dx
>24lelongx8b%d
The file kbdrate.c
is Copyright (C) 1992 Rickard E. Faith.

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showkey.c keymaps.5 loadkeys.1 dumpkeys.1 showkey.1
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The files setfont.c setfont.8 mapscrn.c mapscrn.8
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The files psfaddtable.1 psfgettable.1 psfstriptable.1
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getfd.c getkeycodes.c getunimap.c kbd_mode.c loadunimap.c
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setleds.c setmetamode.c setvesablank.c showconsolefont.c
spawn_console.c spawn_login.c
chvt.1 deallocvt.1 kbd_mode.1 setleds.1 setmetamode.1
getkeycodes.8 loadunimap.8 resizecons.8 setkeycodes.8
kbd.FAQ.*
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1.74 libcap2 2.25

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1.80 libffi 3.2.1

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#
# ***** END LICENSE BLOCK *****
#
# GCC-compatible wrapper for cl.exe and ml.exe. Arguments are given in GCC
# format and translated into something sensible for cl or ml.
#
args_orig=$@
args="-nologo -W3"
static_crt=
double_crt=
c1="cl"
ml="ml"
safeseh="-safeseh"
output=

while [ $# -gt 0 ]
do
case $1
in
  -fexceptions)
    # Don't enable exceptions for now.
    #args="Sargs -EHac"
shift 1
;;
-m32)
shift 1
;;
-m64)
ml="ml64" # "$MSVC/x86_amd64/ml64"
safeseh=
shift 1
;;
-clang-cl)
cl="clang-cl"
safeseh=
shift 1
;;
-O0)
args="$args -Od"
shift 1
;;
-O*)
# Runtime error checks (enabled by setting -RTC1 in the -DFFI_DEBUG
# case below) are not compatible with optimization flags and will
# cause the build to fail. Therefore, drop the optimization flag if
# -DFFI_DEBUG is also set.
case $args_orig in
*,-DFFI_DEBUG*)
  args="$args"
;;
*)
# The ax_cc_maxopt.m4 macro from the upstream autoconf-archive
# project doesn't support MSVC and therefore ends up trying to
# use -O3. Use the equivalent "max optimization" flag for MSVC
# instead of erroring out.
case $1 in
-O3)
  args="$args -O2"
;;
*})
  args="$args $1"
;;
esac
opt="true"
;;
esac
shift 1
;;
-g)
# Enable debug symbol generation.
args="$args -Zi"
shift 1
;;
-DFFI_DEBUG)
  # Enable runtime error checks.
  args="$args -RTC1"
defines="$defines $1"
shift 1
;;
-DUSE_STATIC_RTL)
  # Link against static CRT.
  static_crt=1
  shift 1
;;
-DUSE_DEBUG_RTL)
  # Link against debug CRT.
  debug_crt=1
  shift 1
;;
-c)
  args="$args -c"
  args="$(echo $args | sed 's%/Fe%/Fo%g')"
  single="-c"
  shift 1
;;
-D*=*)
  name="$(echo $1|sed 's/-D\([^=]*\)=.*/\1/g')"
  value="$(echo $1|sed 's/-D\([^=]*\)=/.*/g')"
  args="$args -D$\{name\}='$value'"
  defines="$defines -D$\{name\}='$value'"
  shift 1
;;
-D*=
  args="$args $1"
  defines="$defines $1"
  shift 1
;;
-I)
  args="$args -I$2"
  includes="$includes -I$2"
  shift 2
;;
-I*)
  args="$args $1"
  includes="$includes $1"
  shift 1
;;
-W|-Wextra)
# TODO map extra warnings
shift 1
::
-Wall)
# -Wall on MSVC is overzealous, and we already build with -W3. Nothing
# to do here.
shift 1
::
-pedantic)
# libffi tests -pedantic with -Wall, so drop it also.
shift 1
::
-Werror)
args="$args -WX"
shift 1
::
-W*)
# TODO map specific warnings
shift 1
::
-S)
args="$args -FAs"
shift 1
::
-o)
outdir="$(dirname $2)"
base="$(basename $2|sed 's/[\^\&]*//g')"
if [ -n "$single" ]; then
  output="-Fo$2"
else
  output="-Fe$2"
fi
if [ -n "$assembly" ]; then
  args="$args $output"
else
  args="$args $output -Fd$outdir/$base -Fp$outdir/$base -Fa$outdir/$base"
fi
shift 2
::
.*.S)
src=$1
assembly="true"
shift 1
::
.*.c)
args="$args $1"
shift 1
::
*)  
# Assume it's an MSVC argument, and pass it through.
args="$args $1"
shift 1
;
; esac
done

# If -Zi is specified, certain optimizations are implicitly disabled
# by MSVC. Add back those optimizations if this is an optimized build.
# NOTE: These arguments must come after all others.
if [ -n "$opt" ]; then
    args="$args -link -OPT:REF -OPT:ICF -INCREMENTAL:NO"
fi

if [ -n "$static_crt" ]; then
    md=-MT
else
    md=-MD
fi

if [ -n "$debug_crt" ]; then
    md="${md}d"
fi

if [ -n "$assembly" ]; then
    if [ -z "$outdir" ]; then
        outdir="."
    fi
    ppsrc="$outdir/$(basename $src|sed 's/.S$/asm/g')"
    echo "$cl -nologo -EP $includes $defines $src > $ppsrc"
    "$cl" -nologo -EP $includes $defines $src > $ppsrc || exit $?
    output="$(echo $output | sed 's%/F[dpa\][^ \]*%/g')"
    args="-nologo $safeseh $single $output $ppsrc"

    echo "$ml $args"
eval "\"$ml\" $args"
result=$?

    # required to fix ml64 broken output?
    #mv *.obj $outdir
else
    args="$md $args"
echo "$cl $args"
    # Return an error code of 1 if an invalid command line parameter is passed
    # instead of just ignoring it.
eval "\"$ll\" $args 2>&1 1>&3 | \n    awk '{print $0} '/D9002/ {error=1} END{exit error}' >2>&3 3>&1"
\message{Loading texinfo [version \texinfoversion]:}

% If in a .fmt file, print the version number
% and turn on active characters that we couldn't do earlier because
% they might have appeared in the input file name.
\everyjob{\message{[Texinfo version \texinfoversion]}}
\catcode`+=\active \catcode`_\active
\chardef\other=12

% We never want plain's \outer definition of \+ in Texinfo.
% For @tex, we can use \tabalign.
\let\+ = \relax

% Save some plain tex macros whose names we will redefine.
\let\ptexb=\b
\let\ptexbullet=\bullet
\let\ptexc=\c
\let\ptexcomma=\, 
\let\ptexdot=\.
\let\ptexdots=\dots
\let\ptexend=\end
\let\ptexequiv=\equiv
\let\ptexexclam=! 
\let\ptexfootnote=\footnote
\let\ptexgtr=>
\let\ptexhat=^ 
\let\ptexi=\i 
\let\ptexindent=\indent
\let\ptexinsert=\insert
\let\ptexbrace=\{

% manual foo.texi, however, you can get away with this:
% tex foo.texi
% texindex foo.??
% tex foo.texi
% tex foo.texi
% dvips foo.dvi -o # or whatever; this makes foo.ps.
% The extra TeX runs get the cross-reference information correct.
% Sometimes one run after texindex suffices, and sometimes you need more
% than two; texi2dvi does it as many times as necessary.
%
% It is possible to adapt texinfo.tex for other languages, to some
% extent.  You can get the existing language-specific files from the
% full Texinfo distribution.
%
% The GNU Texinfo home page is http://www.gnu.org/software/texinfo.
\% Since the category of space is not known, we have to be careful.
\def\spacecat = 10
\def\spaceisspace {\catcode`\s =\spacecat}

\% sometimes characters are active, so we need control sequences.
\chardef\ampChar   = `&
\chardef\colonChar = `:
\chardef\commaChar = `,\chardef\dashChar  = `-\chardef\dotChar   = `.
\chardef\exclamChar= `!
\chardef\hashChar  = `#
\chardef\lquoteChar= ``
\chardef\questChar = `?
\chardef\rquoteChar= `'
\chardef\semiChar  = `;\chardef\slashChar = `\/
\chardef\underChar = `_%

\% Ignore a token.
\%
\def\gobble#1{ }

\% The following is used inside several \edef's.
\def\makecsname#1{\expandafter\noexpand\csname#1\endcsname}

\% Hyphenation fixes.
\hyphenation{
Flor-i-da Ghost-script Ghost-view Mac-OS Post-Script
ap-pen-dix bit-map bit-maps}
data-base data-bases eshell fall-ing half-way long-est man-u-script
man-u-scripts mini-buf-fer mini-buf-fers over-view par-a-digm
par-a-digs rath-er rec-tan-gu-lar ro-bot-ics se-ver-e-ly set-up spa-ces
spell-ing spell-ings
stand-alone strong-est time-stamp time-stamps which-ever white-space
wide-spread wrap-around
}

% Margin to add to right of even pages, to left of odd pages.
definitions\bindingoffset
\newdimen\normaloffset
\newdimen\pagewidth \newdimen\pageheight

% For a final copy, take out the rectangles
% that mark overfull boxes (in case you have decided
% that the text looks ok even though it passes the margin).
% def\finalout{overfullrule=0pt }

% Sometimes it is convenient to have everything in the transcript file
% and nothing on the terminal. We don’t just call \tracingall here,
% since that produces some useless output on the terminal. We also make
% some effort to order the tracing commands to reduce output in the log
% file; cf. trace.sty in LaTeX.
% def\gloggingall{\begingroup \globaldefs = 1 \loggingall \endgroup}%
def\gloggingall{%
\tracingstats2
\tracingpages1
\tracinglostchars2 % 2 gives us more in etex
\tracingparagraphs1
\tracingoutput1
\tracingmacros2
\tracingrestores1
\showboxbreadth\maxdimen \showboxdepth\maxdimen
\ifeTeXversion\thisisundefined\else % etex gives us more logging
\tracingscantokens1
\tracingifs1
\tracinggroups1
\tracingnesting2
\tracingassigns1
\fi
\tracingcommands3 % 3 gives us more in etex
\errorcontextlines16
%

% @errormsg{MSG}. Do the index-like expansions on MSG, but if things
% aren’t perfect, it’s not the end of the world, being an error message,
\def\errormsg{\begingroup \indexnofonts \doerrormsg}
\def\doerrormsg#1{\errmessage{#1}}

% add check for \lastpenalty to plain's definitions. If the last thing
% we did was a \nobreak, we don't want to insert more space.
\def\smallbreak{\ifnum\lastpenalty<10000\par\ifdim\lastskip<\smallskipamount
\removelastskip\penalty-50\smallskip\fi\fi}
\def\medbreak{\ifnum\lastpenalty<10000\par\ifdim\lastskip<\medskipamount
\removelastskip\penalty-100\medskip\fi\fi}
\def\bigbreak{\ifnum\lastpenalty<10000\par\ifdim\lastskip<\bigskipamount
\removelastskip\penalty-200\bigskip\fi\fi}

% Do @cropmarks to get crop marks.
% newif\ifcropmarks
\let\cropmarks = \cropmarkstrue
%
% Dimensions to add cropmarks at corners.
% Added by P. A. MacKay, 12 Nov. 1986
%
\newdimen\outerhsize \newdimen\outervsize % set by the paper size routines
\newdimen\cornerlong \cornerlong=1pc
\newdimen\cornerthick \cornerthick=.3pt
\newdimen\topandbottommargin \topandbottommargin=.75in

% Output a mark which sets \thischapter, \thissection and \thiscolor.
% We dump everything together because we only have one kind of mark.
% This works because we only use \botmark / \topmark, not \firstmark.
%
% A mark contains a subexpression of the \ifcase ... \fi construct.
% \get*marks macros below extract the needed part using \ifcase.
%
% Another complication is to let the user choose whether \thischapter
% \(\text{(thissection)}\) refers to the chapter (section) in effect at the top
% of a page, or that at the bottom of a page. The solution is
% described on page 260 of The TeXbook. It involves outputting two
% marks for the sectioning macros, one before the section break, and
% one after. I won't pretend I can describe this better than DEK...
\def\domark{\toks0=\expandafter{\lastchapterdefs} \%
\toks2=\expandafter{\lastsectiondefs} \%
\toks4=\expandafter{\prevchapterdefs} \%
\toks6=\expandafter{\prevsectiondefs} \%
\toks8=\expandafter{\lastcolordefs} \%
\mark{\smallbreak}}
\toks0 \toks2
\noexpand\or \toks4 \toks6
\noexpand\else \toks8
}\%
}
%
% \topmark doesn't work for the very first chapter (after the title
% page or the contents), so we use \firstmark there -- this gets us
% the mark with the chapter defs, unless the user sneaks in, e.g.,
% \@setcolor (or \@url, or \@link, etc.) between \@contents and the very
% first \@chapter.
\def\gettopheadingmarks{%
\ifcase0\topmark\fi
\ifx\thischapter\empty \ifcase0\firstmark\fi \fi
}%
\def\getbottomheadingmarks{\ifcase1\botmark\fi}
\def\getcolormarks{\ifcase2\topmark\fi}

% Avoid "undefined control sequence" errors.
\def\lastchapterdefs{}
\def\lastsectiondefs{}
\def\prevchapterdefs{}
\def\prevsectiondefs{}
\def\lastcolordefs{}

% Main output routine.
\chardef\PAGE = 255
\output = {\onepageout{\pagecontents\PAGE}}

\newbox\headlinebox
\newbox\footlinebox

% \onepageout takes a vbox as an argument. Note that \pagecontents
% does insertions, but you have to call it yourself.
\def\onepageout#1{%
\ifcropmarks \hoffset=0pt \else \hoffset=\normaloffset \fi
%\ifodd\pageno \advance\hoffset by \bindingoffset
%\else \advance\hoffset by -\bindingoffset\fi
%\ifodd\pageno \advance\hoffset by \bindingoffset
%\else \advance\hoffset by -\bindingoffset\fi
%
% Do this outside of the \shipout so \@code etc. will be expanded in
% the headline as they should be, not taken literally (outputting "code).
%\ifodd\pageno \getoddheadingmarks \else \getevenheadingmarks \fi
%\setbox\headlinebox = \vbox {\let\hsize=\pagewidth \makeheadline}\%
%\ifodd\pageno \getoddfootingmarks \else \getevenfootingmarks \fi
%\setbox\footlinebox = \vbox {\let\hsize=\pagewidth \makefootline}\%
%
% Have to do this stuff outside the \shipout because we want it to
% take effect in \write's, yet the group defined by the \vbox ends
% before the \shipout runs.
%
\indexdummies         % don't expand commands in the output.
\normalturnoffactive  % \ in index entries must not stay \, e.g., if
% the page break happens to be in the middle of an example.
% We don't want .vr (or whatever) entries like this:
% \entry{{\tt \indexbackslash acronym}}{32}{\code {\acronym}}
% "\acronym" won't work when it's read back in;
% it needs to be
% \entry{\code {{\tt \backslashcurfont acronym}}}
\shipout\vbox{ %
% Do this early so pdf references go to the beginning of the page.
\ifpdfmakepagedest \pdfdest name{\the\pageno} xyz\fi
%
\ifcropmarks \vbox to \outervsize\bgroup
\hsize = \outerhsize
\hskip-stopandbottommargin
\vtop to0pt{%
\line{\ewtop\hfil\ewtop} %
\nointerlineskip
\line{%
\vbox{\moveleft\cornerthick\nstop}
\hfill
\vbox{\moveright\cornerthick\nstop}%
}%
\vss}%
\skip-topandbottommargin
\line\bgroup
\hfil % center the page within the outer (page) hsize.
\ifodd\pageno\hskip\bindingoffset\fi
\vbox\bgroup
\fi
%
\unvbox\headlinebox
\pagebody{#1}%
\ifdim\ht\footlinebox > 0pt
% Only leave this space if the footline is nonempty.
% (We lessened \vsize for it in \oddfootingyy..)
% The \baselineskip=24pt in plain's \makefootline has no effect.
\vskip 24pt
\unvbox\footlinebox
\fi
%
\ifcropmarks
\egroup % end of \vbox\bgroup
\hfil\egroup % end of (centering) \line\bgroup
\skip-topandbottommargin plus1fill minus1fill
\def\argtorun{#2}\
\begingroup\obeylines\spaceisspace #1% \parseargline\empty% Insert the \empty token, see \finishparsearg below.\}
\{
\obeylines % \gdef\parseargline#1^^M{% \endgroup % End of the group started in \parsearg. \argremovecomment #1\comment\ArgTerm% }% 
\}
% First remove any @comment, then any @c comment. \def\argremovecomment#1\comment#2\ArgTerm{\argremovec #1\c\ArgTerm}
\def\argremovec#1\c#2\ArgTerm{\argcheckspaces#1\^^M\ArgTerm}
% Each occurrence of `'\^^M` or `<space>\^^M` is replaced by a single space. % % \argremovevec might leave us with trailing space, e.g., % @end itemize @c foo % This space token undergoes the same procedure and is eventually removed % by \finishparsearg. % \def\argcheckspaces#1\^^M{\argcheckspacesX#1\^^M \^^M} \def\argcheckspacesX#1 \^^M#2\^^M#3\ArgTerm{% \def\temp[#3]% \ifx\temp\empty % Do not use \next, perhaps the caller of \parsearg uses it; reuse \temp: \let\temp\finishparsearg \else \let\temp\argcheckspaces \fi % Put the space token in: \temp#1 #3\ArgTerm 
}\def\argcheckspacesY#1\^^M#2\^^M#3\ArgTerm{%}
% If a _delimited_ argument is enclosed in braces, they get stripped; so % to get _exactly_ the rest of the line, we had to prevent such situation. % We prepended an \empty token at the very beginning and we expand it now, % just before passing the control to \argtorun. % (Similarly, we have to think about #3 of \argcheckspacesY above: it is % either the null string, or it ends with `\^^M`—thus there is no danger % that a pair of braces would be stripped. %
% But first, we have to remove the trailing space token.
%
def\finishparsearg#1 \ArgTerm{\expandafter\argtorun\expandafter[#1]}

% \parseargdef\foo[...]
% is roughly equivalent to
% \def\foo{\parsearg\Xfoo}
% \def\Xfoo#1[...]
%
% Actually, I use \csname\string\foo\endcsname, i.e. \foo, as it is my
% favourite TeX trick. --kasal, 16nov03

def\parseargdef#1{%
  \expandafter \doparseargdef \csname\string#1\endcsname #1%
}

def\doparseargdef#1#2{%
  \def#2{\parsearg#1}%
  \def#1##1%
}

% Several utility definitions with active space:
{
  \obeyspaces
  \gdef\obeyedspace{ }
%
  % Make each space character in the input produce a normal interword
  % space in the output. Don't allow a line break at this space, as this
  % is used only in environments like @example, where each line of input
  % should produce a line of output anyway.
  %
  \gdef\sepspaces{\obeyspaces\let =\tie}
%
  % If an index command is used in an @example environment, any spaces
  % therein should become regular spaces in the raw index file, not the
  % expansion of \tie (\leavevmode \penalty @M \ ).
  \gdef\unsepspaces{\let =\space}
}

\def\flushcr{\ifx\par\lisppar \def\next##1{}\else \let\next=\relax \fi \next}

% Define the framework for environments in texinfo.tex. It's used like this:
%
% \envdef\foo[...]
% \def\Efoo[...]
%
% It's the responsibility of \envdef to insert \begingroup before the
% actual body; @end closes the group after calling \Efoo. \envdef also
% defines \thisenv, so the current environment is known; @end checks
% whether the environment name matches. The \checkenv macro can also be
% used to check whether the current environment is the one expected.
%
% Non-false conditionals (@ifex, @ifset) don't fit into this, so they
% are not treated as environments; they don't open a group. (The
% implementation of @end takes care not to call \endgroup in this
% special case.)

% At run-time, environments start with this:
\def\startenvironment#1{\begingroup\def\thisenv{#1}}
% initialize
\let\thisenv\empty

% ... but they get defined via ``\envdef\foo{...}'':
\long\def\envdef#1#2{\def#1{\startenvironment#1#2}}
\def\envparseargdef#1#2{\parseargdef#1{\startenvironment#1#2}}

% Check whether we're in the right environment:
\def\checkenv#1{\def\temp{#1}\ifx\thisenv\temp\else\badenverr\fi}

% Environment mismatch, #1 expected:
\def\badenverr{\errhelp = \EMsimple\errmessage{This command can appear only \inenvironment\temp,
not \inenvironment\thisenv}}
\def\inenvironment#1{\ifx#1\empty outside of any environment\else in environment \expandafter\string#1\fi}

% @end foo executes the definition of \Efoo.
% But first, it executes a specialized version of \checkenv
% \parseargdef\end{%
% \if 1\csname iscond.#1\endcsname  
% \else 

% The general wording of \badenverr may not be ideal.
\begin{checkenv csname#1\endcsname
\csname E#1\endcsname
\endgroup
\fi
}
\newhelp\EMsimple{Press RETURN to continue.}

% Be sure we're in horizontal mode when doing a tie, since we make space
% equivalent to this in @example-like environments. Otherwise, a space
% at the beginning of a line will start with \penalty -- and
% since \penalty is valid in vertical mode, we'd end up putting the
% penalty on the vertical list instead of in the new paragraph.
\catcode`@ = 11
% Avoid using \@M directly, because that causes trouble
% if the definition is written into an index file.
\let\tiepenalty = \@M
\gdef\tie{\leavevmode\penalty\tiepenalty\ }

% @: forces normal size whitespace following.
\def\@{\spacefactor=1000 }

% @* forces a line break.
\def\*{\unskip\hfil\break\hbox{}\ignorespaces}

% @/ allows a line break.
\let/=/allowbreak

% @. is an end-of-sentence period.
\def\.\spacefactor=endofsentencespacefactor\space

% @! is an end-of-sentence bang.
\def!{\spacefactor=endofsentencespacefactor\space}

% @? is an end-of-sentence query.
\def?{\spacefactor=endofsentencespacefactor\space}

% @frenchspacing on|off says whether to put extra space after punctuation.
% %
\def\onword{on}
\def\offword{off}
% \parseargdef\frenchspacing{%
\def\temp{#1}%
\ifx\temp\onword plainfrenchspacing

Open Source Used In SD-WAN 19.3.0
% \baselineskip glue before it, and (when the next line of text is done)
% \lineskip glue after it. Thus, space below is not quite equal to space
% above. But it's pretty close.
\def\Egroup{%
  % To get correct interline space between the last line of the group
  % and the first line afterwards, we have to propagate \prevdepth.
  \endgraf  % Not \par, as it may have been set to \dispar.
  \global\prevdepth = \prevdepth
  \group  % End the \vtop.

  \dimen0 is the vertical size of the group's box.
  \dimen0 = \ht\groupbox \advance\dimen0 by \dp\groupbox
  \dimen2 is how much space is left on the page (more or less).

  \ifdim \dimen0 > \dimen2
    \ifdim \pagetotal < \vfilllimit\pageheight
      \page
    \fi
  \fi
  \box\groupbox

  \prevdepth = \prevdepth
  \checkinserts
}
%
% TeX puts in an \escapechar (i.e., `@') at the beginning of the help
% message, so this ends up printing `@group can only ...
%
\newhelp\groupinvalidhelp{%
  group can only be used in environments such as \example,\^J%
  where each line of input produces a line of output.}
%
% \@need space-in-mils
% forces a page break if there is not space-in-mils remaining.

\newdimen\mil \mil=0.001in

\parseargdef\need{%
  % Ensure vertical mode, so we don't make a big box in the middle of a
  % paragraph.
  \par
%
  % If the @need value is less than one line space, it's useless.
  \dimen0 = \mil
  \dimen2 = \ht\strutbox
  \advance\dimen2 by \dp\strutbox
  \ifdim\dimen0 > \dimen2
    %
\leftline{\hskip\leftskip{\rm#1}}} \\

% @inmargin{WHICH}{TEXT} puts TEXT in the WHICH margin next to the current paragraph. For more general purposes, use the inmargin insertion class. WHICH is 'l' or 'r'. Not documented, written for gawk manual. %
\newskip\inmarginspacing \inmarginspacing=1cm
\def\strutdepth{\dp\strutbox}%
\def\doinmargin#1#2{\vadjust{%
\nobreak\kern-\strutdepth\vtop to \strutdepth{%\baselineskip=\strutdepth\vss
% if you have multiple lines of stuff to put here, you'll need to % make the vbox yourself of the appropriate size.
\ifx#1l%
\llap{\ignorespaces #2\hskip\inmarginspacing}%
\else
\rlap{\hskip\hsize \hskip\inmarginspacing \ignorespaces #2}%
\fi
\null}
}%
\def\inleftmargin{\doinmargin l}
\def\inrightmargin{\doinmargin r}
%
% @inmargin{TEXT [, RIGHT-TEXT]} % (if RIGHT-TEXT is given, use TEXT for left page, RIGHT-TEXT for right; % else use TEXT for both). %
\def\inmargin#1{\parseinmargin #1,,\finish}{% not perfect, but better than nothing.
\setbox0 = \hbox{\ignorespaces #2}%
\ifdim\wd0 > 0pt
\lefttext{#1} % have both texts
\righttext{#2}%
\else
\lefttext{#1} % have only one text
\righttext{#1}%
\fi
%
\ifodd\pageno
\temp{\inrightmargin righttext}{% odd page -> outside is right margin
\else
\temp{\inleftmargin lefttext}%
\fi
\temp
}

% @| inserts a changebar to the left of the current line. It should
% surround any changed text. This approach does *not* work if the
% change spans more than two lines of output. To handle that, we would
% have adopt a much more difficult approach (putting marks into the main
% vertical list for the beginning and end of each change). This command
% is not documented, not supported, and doesn't work.
%
\def\|{%
  \vadjust can only be used in horizontal mode.
  \leavevmode
  \%
  % Append this vertical mode material after the current line in the output.
  \vadjust{%
    \%
    We want to insert a rule with the height and depth of the current
    \%
    leading; that is exactly what \strutbox is supposed to record.
    \vskip\baselineskip
    \%
    \vadjust-items are inserted at the left edge of the type. So
    \%
    the \llap here moves out into the left-hand margin.
    \llap{%
      \%
      \%
      For a thicker or thinner bar, change the `1pt'.
      \vrule height\baselineskip width1pt
      \%
      \%
      This is the space between the bar and the text.
      \hskip 12pt
    }%
  }%
}%
%
%
% @include FILE -- \input text of FILE.
%
\def\include{|\parseargusing\filenamecatcodes\includezzz|
\def\includezzz#1{|%
\pushthisfilestack
\def\thisfile{#1}|
{|%
\makevalueexpandable % we want to expand any @value in FILE.
\turnofactive % and allow special characters in the expansion
\indexnofonts % Allow `@ @' and other weird things in file names.
\wlog{texinfo.tex: doing @include of #1^^J}|
\edef\temp{|\noexpand\input #1 }%
%}
%
% This trickery is to read FILE outside of a group, in case it makes
% definitions, etc.
\advance\hsize by -\leftskip
\advance\hsize by -\rightskip
\line[#1]%
\break
}
}\newcount\centerpenalty
\def\centerV#1{%
% The idea here is the same as in \startdefun, \cartouche, etc.: if
% @center is the first thing after a section heading, we need to wipe
% out the negative parskip inserted by \sectionheading, but still
% prevent a page break here.
\centerpenalty = \lastpenalty
\ifnum\centerpenalty>10000 \vskip\parskip \fi
\ifnum\centerpenalty>9999 \penalty\centerpenalty \fi
\line{\kern\leftskip #1\kern\rightskip}%
}
%
% @sp n   outputs n lines of vertical space
%
\parseargdef\sp{\vskip #1\baselineskip}
%
% @comment ...line which is ignored...
% @c is the same as @comment
% @ignore ... @end ignore  is another way to write a comment
%
\def\comment{\begingroup \catcode\^^M=\other%
\catcode\@=\other \catcode\{=\other \catcode\}=\other%
\commentxxx}
{\catcode\^^M=\other \gdef\commentxxx#1^^M{\endgroup}}
%
\let\c=\comment
%
% @paragraphindent NCHARS
% We'll use ems for NCHARS, close enough.
% NCHARS can also be the word `asis' or `none'.
% We cannot feasibly implement @paragraphindent asis, though.
%
\def\asisword{asis} % no translation, these are keywords
\def\noneword{none}
%
\parseargdef\paragraphindent{%
\def\temp[#1]{%
\if\temp\asisword
\else
\if\temp\noneword
\defaultparindent = 0pt
\else

\defaultparindent = #1em
\fi
\fi
\parindent = \defaultparindent
}

% @exampleindent NCHARS
% We'll use ems for NCHARS like @paragraphindent.
% It seems @exampleindent asis isn't necessary, but
% I preserve it to make it similar to @paragraphindent.
\parseargdef@exampleindent{%
\def\temp[#1]{%\ifx\temp\asisword
\else\ifx\temp\noneword
\lispnarrowing = 0pt
\else\lispnarrowing = #1em
\fi\fi
\fi}
}

% @firstparagraphindent WORD
% If WORD is `none', then suppress indentation of the first paragraph
% after a section heading. If WORD is `insert', then do indent at such
% paragraphs.
%
% The paragraph indentation is suppressed or not by calling
% \suppresstfirstparagraphindent, which the sectioning commands do.
% We switch the definition of this back and forth according to WORD.
% By default, we suppress indentation.
%
% \edef\suppresstfirstparagraphindent{\dosuppresstfirstparagraphindent}
% \edef\insertword{insert}
%
% \parseargdef\firstparagraphindent{%
% \def\temp[#1]{%\ifx\temp\noneword
% \let\suppresstfirstparagraphindent = \dosuppresstfirstparagraphindent
% \else\ifx\temp\insertword
% \let\suppresstfirstparagraphindent = \relax
% \else\errhelp = \EMsimple
% \errmessage{Unknown @firstparagraphindent option `\temp'}\fi\fi
% \fi\fi
%
% Here is how we actually suppress indentation. Redefine \everypar to
\% \kern backwards by \parindent, and then reset itself to empty.
\%
\% We also make \indent itself not actually do anything until the next
\% paragraph.
\%
\gdef\dosuppressfirstparagraphindent{\%
  \gdef\indent{\%
    \restorefirstparagraphindent
    \indent
  }\%
  \gdef\noindent{\%
    \restorefirstparagraphindent
    \noindent
  }\%
  \global\everypar = {\%
    \kern -\parindent
    \restorefirstparagraphindent
  }\%
}\%

\gdef\restorefirstparagraphindent{\%
  \global \let \indent = \ptexindent
  \global \let \noindent = \ptexnoindent
  \global \everypar = {}\%
}\%

\%
% @refill is a no-op.
\let\refill=\relax
%
% If working on a large document in chapters, it is convenient to
% be able to disable indexing, cross-referencing, and contents, for test runs.
% This is done with @novalidate (before @setfilename).
%
\newif\iflinks \linkstrue % by default we want the aux files.
\let\novalidate = \linksfalse

% @setfilename is done at the beginning of every texinfo file.
% So open here the files we need to have open while reading the input.
% This makes it possible to make a .fmt file for texinfo.
\def\setfilename{\%
  \fixbackslash  % Turn off hack to swallow \input texinfo'.
  \iflinks
    \tryauxfile
    % Open the new aux file. TeX will close it automatically at exit.
  \immediate\openoutauxfile=\jobname.aux
  \fi % \openindices needs to do some work in any case.
  \openindices
% PDF uses PostScript string constants for the names of xref targets, 
% for display in the outlines, and in other places. Thus, we have to 
% double any backslashes. Otherwise, a name like "node" will be 
% interpreted as a newline (\n), followed by o, d, e. Not good. 
%
% See http://www.ntg.nl/pipermail/ntg-pdftex/2004-July/000654.html and 
% related messages. The final outcome is that it is up to the TeX user 
% to double the backslashes and otherwise make the string valid, so 
% that's what we do. pdftex 1.30.0 (ca.2005) introduced a primitive to 
% do this reliably, so we use it.

% #1 is a control sequence in which to do the replacements, 
% which we \xdef.
\def\txtiescapepdf#1{%
  \ifpdfescapestring\thisisundefined
    % No primitive available; should we give a warning or log? 
    % Many times it won't matter.
    \else
    % The expandable \pdfescapestring primitive escapes parentheses, 
    % backslashes, and other special chars.
    \edef#1{\pdfescapestring{#1}}%
  \fi
}

\newhelp\nopdfimagehelp{Texinfo supports .png, .jpg, .jpeg, and .pdf images 
with PDF output, and none of those formats could be found. (.eps cannot 
be supported due to the design of the PDF format; use regular TeX (DVI 
output) for that.)}

\ifpdf
%
% Color manipulation macros based on pdfcolor.tex, 
% except using rgb instead of cmyk; the latter is said to render as a 
% very dark gray on-screen and a very dark halftone in print, instead 
% of actual black.
\def\rgbDarkRed{0.50 0.09 0.12}
\def\rgbBlack{0 0 0}
%
% k sets the color for filling (usual text, etc.);
% K sets the color for stroking (thin rules, e.g., normal _'s).
\def\pdfsetcolor#1{\pdfliteral{#1 rg #1 RG}}
\% Set color, and create a mark which defines \thiscolor accordingly, 
\% so that \makeheadline knows which color to restore.
\def\setcolor#1{\%
  \xdef\lastcolordefs{\gdef\noexpand\thiscolor{#1}}\%
  \domark
  \pdfsetcolor{#1}\%
}\%
\def\maincolor{\rgbBlack}
\pdfsetcolor{\maincolor}
\edef\thiscolor{\maincolor}
\def\lastcolordefs{}\%
\def\makefootline{\%
  \baselineskip24pt
  \line{\pdfsetcolor{\maincolor}\the\footline}\%
}\%
\def\makeheadline{\%
  \vbox to 0pt{\%
    \vskip-22.5pt
    \line{\%
      \vbox to 8.5pt{}\%
      \% Extract \thiscolor definition from the marks.
      \getcolormarks
      \% Typeset the headline with \maincolor, then restore the color.
      \pdfsetcolor{\maincolor}\the\headline\pdfsetcolor{\thiscolor}\%
    }\%
    \vss
  }\%
  \nointerlineskip
}\%
\pdfcatalog{/PageMode /UseOutlines} \%
% #1 is image name, #2 width (might be empty/whitespace), #3 height (ditto).
\def\dopdfimage#1#2#3{\%
  \def\pdfimagewidth{#2}\setbox0 = \hbox{\ignorespaces #2}\%
  \def\pdfimageheight{#3}\setbox2 = \hbox{\ignorespaces #3}\%
  \%
  \pdfTeX (and the PDF format) support .pdf, .png, .jpg (among
  \% others). Let's try in that order, PDF first since if
  \% someone has a scalable image, presumably better to use that than a
  \% bitmap.
  \let\pdfimgext=\empty
  \begingroup
\xiescapepdf\pdfdestname
\safewhatsit{\pdfdest name{\pdfdestname} xyz}%
}
%
% used to mark target names; must be expandable.
def\pdfmkpgn#1[#1]
%
% by default, use a color that is dark enough to print on paper as
% nearly black, but still distinguishable for online viewing.
def\urlcolor{\rgbDarkRed}
def\linkcolor{\rgbDarkRed}
def\endlink{\setcolor{\maincolor}\pdfendlink}
%
% Adding outlines to PDF; macros for calculating structure of outlines
% come from Petr Olsak
def\expnumber#1[\expandafter\ifx\csname#1\endcsname\relax 0%
\else \csname#1\endcsname \fi]
def\advancenumber#1[\tempnum=\expnumber{#1}\relax
\advance\tempnum by 1
\expandafter\xdef\csname#1\endcsname{\the\tempnum}]
%
% #1 is the section text, which is what will be displayed in the
% outline by the pdf viewer.  #2 is the pdf expression for the number
% of subentries (or empty, for subsubsections).  #3 is the node text,
% which might be empty if this toc entry had no corresponding node.
% #4 is the page number
%
def\dopdfoutline#1#2#3#4{%
% Generate a link to the node text if that exists; else, use the
% page number.  We could generate a destination for the section
% text in the case where a section has no node, but it doesn't
% seem worth the trouble, since most documents are normally structured.
def\pdfoutlinedest[#3]%
\ifx\pdfoutlinedest\empty
\def\pdfoutlinedest[#4]%
\else
\xiescapepdf\pdfoutlinedest
\fi
%
% Also escape PDF chars in the display string.
def\pdfoutlinetext[#1]%
\xiescapepdf\pdfoutlinetext
%
\pdfoutline goto name{\pdfmkpgn{\pdfoutlinedest} }#2{\pdfoutlinetext}%
}
%
def\pdfmakeoutlines{%
\begingroup

PDF outlines are displayed using system fonts, instead of document fonts. Therefore we cannot use special characters, since the encoding is unknown. For example, the eogonek from Latin 2 (0xea) gets translated to a | character. Info from Staszek Wawrykiewicz, 19 Jan 2004 04:09:24 +0100.

TODO this right, we have to translate 8-bit characters to their "best" equivalent, based on the @documentencoding. Too much work for too little return. Just use the ASCII equivalents we use for the index sort strings.

\indexnofonts
\setupdatafile
% We can have normal brace characters in the PDF outlines, unlike Texinfo index files. So set that up.
\def\lbracecharliteral\%
\def\rbracecharliteral\%
\catcode`\=\active \otherbackslash
\input \tocreadfilename
\endgroup
}
}\catcode`[]=1 \catcode`]=2
\catcode`{=\other \catcode`}=\other
\gdef\lbracecharliteral[\[
\gdef\rbracecharliteral[\]]
%
\def\skipspaces#1{\def\PP{#1}\def\D{|}%
\ifx\PP\D\let\nextsp\relax
\else\let\nextsp\skipspaces
\addtokens{\filename}{\PP}%
\advance\filenamelength by 1
\fi
\nextsp}
\def\getfilename#1{%
\filenamelength=0
% If we don't expand the argument now, \skipspaces will get
% snagged on things like "@value{foo}".
\edef\temp[#1]{%}
\expandafter\skipspaces\temp\relax
}
\ifnum\pdftexversion < 14
\let\startlink\pdfannotlink
\else
\let\startlink\pdfstartlink
\fi
% make a live url in pdf output.
\def\endlink = \relax
\def\setcolor = \gobble
\def\pdfsetcolor = \gobble
\def\pdfmakeoutlines = \relax
\fi  % \ifx\pdfoutput
\message{fonts,}
% Change the current font style to #1, remembering it in \curfontstyle.
% For now, we do not accumulate font styles: \texttt{@b{ @i[foo]}} prints foo in
% italics, not bold italics.
% \def\setfontstyle#1{%
\def\curfontstyle{#1}% not as a control sequence, because we are \edef\d.
\csname ten#1\endcsname  % change the current font
}
% Select #1 fonts with the current style.
%
\def\selectfonts#1{\csname #1fonts\endcsname \csname\curfontstyle\endcsname}
\def\rm{\fam=0 \setfontstyle{rm}}
\def\it{\fam=\itfam \setfontstyle{it}}
\def\sl{\fam=\slfam \setfontstyle{sl}}
\def\bf{\fam=\bffam \setfontstyle{bf}} \def\bfstylename{bf}
\def\tt{\fam=\ttfam \setfontstyle{tt}}
% Unfortunately, we have to override this for titles and the like, since
% in those cases "rm" is bold. Sigh.
\def\rmisbold{\rm{\def\curfontstyle{bf}}}
% Texinfo sort of supports the sans serif font style, which plain TeX does not.
% So we set up a \sf.
\newfam\sffam
\def\sf{\fam=\sffam \setfontstyle{sf}}
\let\li = \sf  % Sometimes we call it \li, not \sf.
% We don't need math for this font style.
\def\ttlsl{\setfontstyle{ttsl}}

% Set the baselineskip to #1, and the lineskip and strut size
% correspondingly. There is no deep meaning behind these magic numbers
% used as factors; they just match (closely enough) what Knuth defined.
%
\def\lineskipfactor{.08333}
\def\strutheightpercent{.70833}
<7B> <7C> <2013>
endbfrange
42 beginbfchar
<02> <0398>
<03> <039B>
<04> <039E>
<05> <03A0>
<06> <03A3>
<07> <03D2>
<08> <03A6>
<0B> <00660066>
<0C> <00660069>
<0D> <0066006C>
<0E> <006600660069>
<0F> <00660066006C>
<10> <0131>
<11> <0237>
<12> <0060>
<13> <00B4>
<14> <02C7>
<15> <02D8>
<16> <00AF>
<17> <02DA>
<18> <00B8>
<19> <00DF>
<1A> <00E6>
<1B> <0153>
<1C> <00F8>
<1D> <00C6>
<1E> <0152>
<1F> <00D8>
<21> <0021>
<22> <201D>
<23> <0023>
<24> <00A3>
<27> <2019>
<3C> <00A1>
<3D> <003D>
<3E> <00BF>
<5C> <201C>
<5F> <02D9>
<60> <2018>
<7D> <02DD>
<7E> <007E>
<7F> <00A8>
endbfchar
endcode
CMapName currentdict /CMap defineresource pop
\def\setfont#1#2#3#4#5{\%
  \font#1=\fontprefix#2#3 scaled #4
  \csname cmap#5\endcsname#1
}\%
% This is what gets called when #5 of \setfont is empty.
\def\cmap\gobble
\%
% (end of cmaps)

% Use cm as the default font prefix.
% To specify the font prefix, you must define \fontprefix
% before you read in texinfo.tex.
\ifx\fontprefix\thisisundefined
  \def\fontprefix{cm}
\fi
%
% Support font families that don't use the same naming scheme as CM.
\def\rmshape{r}
\def\rmbshape{bx}               % where the normal face is bold
\def\bfshape{b}
\def\bxshape{bx}
\def\ttshape{tt}
\def\ttbshape{tt}
\def\tttslshape{sltt}
\def\itshape{ti}
\def\itbshape{bxti}
\def\slshape{sl}
\def\slbshape{bxsl}
\def\sfshape{ss}
\def\sfbshape{ss}
\def\scshape{csc}
\def\scbshape{csc}

% Definitions for a main text size of 11pt.  (The default in Texinfo.)
%
\def\define\text\fontsize\textnominalsize\{11pt\}
\edef\mainmagstep{\magstephalf}
\setfont\textrm\rmshape{10}{\mainmagstep}{OT1}
\setfont\texttt\ttshape{10}{\mainmagstep}{OT1TT}
\setfont\textbf\bfshape{10}{\mainmagstep}{OT1}
\setfont\textit\itshape{10}{\mainmagstep}{OT1IT}
\setfont\textsl\slshape{10}{\mainmagstep}{OT1}
\setfont\textsf\sfshape{10}{\mainmagstep}{OT1}
\setfont\textttsl\tttslshape{10}{\mainmagstep}{OT1TT}
\font\texti=cmmi10 scaled \mainmagstep
\font\textsy=cmsy10 scaled \mainmagstep

\def\textecsize{1095}

% A few fonts for @defun names and args.
\setfont\defbf\bfshape{10}{\magstep1}{OT1}
\setfont\deftt\ttshape{10}{\magstep1}{OT1TT}
\setfont\defttsl\ttslshape{10}{\magstep1}{OT1TT}
\def\df{\let\tentt=\deftt \let\tenbf = \defbf \let\tentsl=\defttsl \bf}

% Fonts for indices, footnotes, small examples (9pt).
\def\smallnominalsize{9pt}
\setfont\smallrm\rmshape{9}{1000}{OT1}
\setfont\smalltt\ttshape{9}{1000}{OT1TT}
\setfont\smallbf\bfshape{10}{900}{OT1}
\setfont\smallit\itshape{9}{1000}{OT1IT}
\setfont\smallsl\slshape{9}{1000}{OT1}
\setfont\smallsf\sfshape{9}{1000}{OT1}
\setfont\smallsc\scshape{10}{900}{OT1}
\setfont\smallttsl\ttslshape{10}{900}{OT1TT}
\font\smalli=cmmi9
\font\smallsy=cmsy9
\def\smallecsize{0900}

% Fonts for small examples (8pt).
\def\smallernominalsize{8pt}
\setfont\smallerrm\rmshape{8}{1000}{OT1}
\setfont\smallertt\ttshape{8}{1000}{OT1TT}
\setfont\smallerbf\bfshape{10}{800}{OT1}
\setfont\smallerit\itshape{8}{1000}{OT1IT}
\setfont\smallersl\slshape{8}{1000}{OT1}
\setfont\smallersf\sfshape{8}{1000}{OT1}
\setfont\smallersc\scshape{10}{800}{OT1}
\setfont\smallerttsl\ttslshape{10}{800}{OT1TT}
\font\smalleri=cmmi8
\font\smallersy=cmsy8
\def\smallerecsize{0800}

% Fonts for title page (20.4pt):
\def\titlenominalsize{20pt}
\setfont\titlerm\rmbshape{12}{\magstep3}{OT1}
\setfont\titleit\itbshape{10}{\magstep4}{OT1IT}
\setfont\titlesl\slbshape{10}{\magstep4}{OT1}
\setfont\titlett\ttbshape{12}{\magstep3}{OT1TT}
\setfont\titlettsl\ttslshape{10}{\magstep4}{OT1TT}
\setfont\titlesf\sfshape{17}{\magstep1}{OT1}
\def\titlebf=\titlerm
\setfont\titlesc\scbshape{10}{\magstep4}{OT1}
\font\titlei=cmmi12 scaled \magstep3
\font\titlesy=cmsy10 scaled \magstep4
\rm
} % end of 10pt text font size definitions, \definetextfontsizex

% We provide the user-level command
% @fonttextsize 10
% (or 11) to redefine the text font size. pt is assumed.
%
def\xword{11}
def\xword{10}
def\xwordpt{10pt}
%
\parseargdef\fonttextsize{%
  \def\textsizearg{#1}%
  %\wlog{doing @fonttextsize \textsizearg}%
  %
  % Set \globaldefs so that documents can use this inside @tex, since
  % makeinfo 4.8 does not support it, but we need it nonetheless.
%
  \begingroup \globaldefs=1
    \ifx\textsizearg\xword \definetextfontsizex
    \else \ifx\textsizearg\xword \definetextfontsizexi
    \else
      \errhelp=\EMsimple
      \errmessage[@fonttextsize only supports `10' or `11', not `\textsizearg']
    \fi
  \ifi
  \endgroup
  }
%

% In order for the font changes to affect most math symbols and letters,
% we have to define the \textfont of the standard families. Since
% texinfo doesn't allow for producing subscripts and superscripts except
% in the main text, we don't bother to reset \scriptfont and
% \scriptscriptfont (which would also require loading a lot more fonts).
%
def\resetmathfonts{%
  \textfont0=\tenrm \textfont1=\teni \textfont2=\tensy
  \textfont\itfam=\tenit \textfont\sffam=\tensl \textfont\bffam=\tenbf
  \textfont\ttfam=\tentt \textfont\sffam=\tensf
}

% The font-changing commands redefine the meanings of \tenSTYLE, instead
% of just \STYLE. We do this because \STYLE needs to also set the
% current \fam for math mode. Our \STYLE (e.g., \rm) commands hardwire
% \tenSTYLE to set the current font.
%
% Each font-changing command also sets the names \size (one size lower)
\% and \lllsize (three sizes lower). These relative commands are used in
the LaTeX logo and acronyms.
\%
\% This all needs generalizing, badly.
\%
def\textfonts{\%
def\lsize{reduced}\def\lllsize{smaller} \%
resetmathfonts \setleading{\textleading} }
def\titlefonts{ \%
def\lsize{chap}\def\lllsize{subsec} \%
resetmathfonts \setleading{27pt} }
def\chapfonts{ \%
def\lsize{sec}\def\lllsize{text} \%
resetmathfonts \setleading{19pt} }
def\secfonts{ \%
def\lsize{subsec}\def\lllsize{reduced} \%
resetmathfonts \setleading{16pt} }
def\subsecfonts{ \%
def\lsize{small}\def\lllsize{small} \%
resetmathfonts \setleading{15pt} }
def\reducedfonts{\%}
\let\tenrm=\reducedrm \let\tenit=\reducedit \let\tensl=\reducedsl \\
\let\tenbf=\reducedbf \let\tentt=\reducedtt \let\reducedcaps=\reducedsc \\
\let\tenssf=\reducedssf \let\teni=\reducedi \let\tensy=\reducedsy \\
\let\tentsl=\reducedtsl \\
\def\curfontsize{\reduced}%
\def\lsize{\reduced} \def\lllsize{\reduced} \\
\resetmathfonts \setleading{10.5pt}}
\def\smallfonts{%
\let\tenrm=\smallrm \let\tenit=\smallit \let\tensl=\smallsl \\
\let\tenbf=\smallbf \let\tentt=\smalltt \let\smallcaps=\smallsc \\
\let\tenssf=\smallssf \let\teni=\smalli \let\tensy=\smallsy \\
\let\tentsl=\smalltsl \\
\def\curfontsize{\small}%
\def\lsize{\smaller} \def\lllsize{\smaller} \\
\resetmathfonts \setleading{10.5pt}}
\def\smallerfonts{%
\let\tenrm=\smallerrm \let\tenit=\smallerit \let\tensl=\smallersl \\
\let\tenbf=\smallerbf \let\tentt=\smallertt \let\smallcaps=\smallersc \\
\let\tenssf=\smallersf \let\teni=\smalleri \let\tensy=\smallersy \\
\let\tentsl=\smallertsl \\
\def\curfontsize{\smaller}%
\def\lsize{\smaller} \def\lllsize{\smaller} \\
\resetmathfonts \setleading{9.5pt}}

% Fonts for short table of contents.
\setfontshort\rm\rmshape{12}{1000}{OT1} \\
\setfontshort\bf\bfshape{10}{\magstep1}{OT1} \% no cmb12 \\
\setfontshort\sl\slshape{12}{1000}{OT1} \\
\setfontshort\tt\ttshape{12}{1000}{OT1TT}

% Define these just so they can be easily changed for other fonts.
\def\angleleft{$\langle$} \\
\def\angleright{$\rangle$}

% Set the fonts to use with the @small... environments.
\let\smallexamplefonts = \smallfonts

% About \smallexamplefonts. If we use \smallfonts (9pt), @smallexample 
% can fit this many characters:
% 8.5x11=86 smallbook=72 a4=90 a5=69
% If we use \scriptfonts (8pt), then we can fit this many characters:
% 8.5x11=90+ smallbook=80 a4=90+ a5=77
% For me, subjectively, the few extra characters that fit aren't worth
% the additional smallness of 8pt. So I'm making the default 9pt.

% By the way, for comparison, here's what fits with @example (10pt):
% 8.5x11=71 smallbook=60 a4=75 a5=58
% --karl, 24jan03.
% Set up the default fonts, so we can use them for creating boxes.
%
\definetextfontsizexi

\message{markup,}

% Check if we are currently using a typewriter font. Since all the
% Computer Modern typewriter fonts have zero interword stretch (and
% shrink), and it is reasonable to expect all typewriter fonts to have
% this property, we can check that font parameter.
%
\def\ifmonospace\ifdim\fontdimen3\font=0pt }

% Markup style infrastructure. \defmarkupstylesetup\INITMACRO will
% define and register \INITMACRO to be called on markup style changes.
% \INITMACRO can check \currentmarkupstyle for the innermost
% style and the set of \ifmarkupSTYLE switches for all styles
% currently in effect.
\newif\ifmarkupvar
\newif\ifmarkupsamp
\newif\ifmarkupkey
%\newif\ifmarkupfile % @file == @samp.
%\newif\ifmarkuptools % @option == @samp.
\newif\ifmarkupcode
\newif\ifmarkupkbd
%\newif\ifmarkupenv % @env == @code.
%\newif\ifmarkupcommand % @command == @code.
\newif\ifmarkupexample
\newif\ifmarkupverb
\newif\ifmarkupverbatim

%\let\currentmarkupstyle\empty
\def\setupmarkupstyle#1{%
  \csname markup#1true\endcsname
  \def\currentmarkupstyle{#1}
  \markupstylesetup
}

%\let\currentmarkupstyle\empty
\def\defmarkupstylesetup#1{%
  \expandafter\def\expandafter\markupstylesetup
    \expandafter{\markupstylesetup #1}%
  \def#1%
}
% Markup style setup for left and right quotes.
defmarkupstylesetup\markupsetuplq{
\expandafter\let\expandafter \temp
\csname markupsetuplq\currentmarkupstyle\endcsname
\ifx\temp\relax \markupsetuplqdefault \else \temp \fi
}
defmarkupstylesetup\markupsetuprq{
\expandafter\let\expandafter \temp
\csname markupsetuprq\currentmarkupstyle\endcsname
\ifx\temp\relax \markupsetuprqdefault \else \temp \fi
}
{
catcode`\=\active
catcode`\=\active
gdef\markupsetuplqdefault{\let`\lq}
gdef\markupsetuprqdefault{\let\rq}
gdef\markupsetcodequoteleft{\let`\codequoteleft}
gdef\markupsetcodequoteright{\let\codequoteright}
\let\markupsetuplqcode \markupsetcodequoteleft
\let\markupsetuprqcode \markupsetcodequoteright
\let\markupsetuplqexample \markupsetcodequoteleft
\let\markupsetuprqexample \markupsetcodequoteright
\let\markupsetuplqkbd \markupsetcodequoteleft
\let\markupsetuprqkbd \markupsetcodequoteright
\let\markupsetuplqsamp \markupsetcodequoteleft
\let\markupsetuprqsamp \markupsetcodequoteright
\let\markupsetuplqverb \markupsetcodequoteleft
\let\markupsetuprqverb \markupsetcodequoteright
\let\markupsetuplqverbatim \markupsetcodequoteleft
\let\markupsetuprqverbatim \markupsetcodequoteright

% Allow an option to not use regular directed right quote/apostrophe
% (char 0x27), but instead the undirected quote from cmtt (char 0x0d).
% The undirected quote is ugly, so don't make it the default, but it
% works for pasting with more pdf viewers (at least evince), the
​
\else
errhelp = \EMsimple
errmessage{[Unknown @codequotebacktick value `\temp', must be on|off] %
fi}
}

% [Knuth] pp. 380,381,391, disable Spanish ligatures ?' and !' of \tt font.
def\noligaturesquoteleft[\relax\lq]

% Count depth in font-changes, for error checks
\newcount\fontdepth \fontdepth=0

% Font commands.

% #1 is the font command (\sl or \it), #2 is the text to slant.
% If we are in a monospaced environment, however, 1) always use \tt\sl,
% and 2) do not add an italic correction.
def\dosmartslant#1#2{%
defu\nusingtt
{\tt\sl \let\next=\relax}%
{\def\next{{#1#2}\futurelet\next\smartitaliccorrection}}%
\next
}
def\smartslanted{\dosmartslant\sl}
def\smartitalic{\dosmartslant\it}

% Output an italic correction unless \next (presumed to be the following
% character) is such as not to need one.
def\smartitaliccorrection{%
\ifax\next,%
defu\fx\next-%
defu\fx\next.%
defu\ptex\slash
\fi\fi\fi\fi
\aftersmartic
}

% Unconditional use \tt\sl, and no ic. \var is set to this for defuns.
def\ttslanted#1{{\tt\sl #1}}

% @cite is like \smartslanted except unconditionally use \sl. We never want
% \tt\sl for book titles, do we?
def\cite#1{\sl #1}\futurelet\next\smartitaliccorrection

\def\aftersmartic{}
\def\var#1{%
\let\saveaftersmartic = \aftersmartic
\def\aftersmartic{\null\let\aftersmartic=\saveaftersmartic} %
% @samp.
\def\samp#1{{\setupmarkupstyle{samp}\lq{#1}\rq}\null}

% @indicateurl is \samp, that is, with quotes.
\let\indicateurl=\samp

% @code (and similar) prints in typewriter, but with spaces the same
% size as normal in the surrounding text, without hyphenation, etc.
% This is a subroutine for that.
\def\tclose#1{% 
  % Change normal interword space to be same as for the current font.
  \spaceskip = \fontdimen2\font
  %
  % Switch to typewriter.
  \tt
  % But \ ' produces the large typewriter interword space.
  \def\ {\spaceskip = 0pt{} }
  %
  % Turn off hyphenation.
  \nohyphenation
  %
  \rawbackslash
  \plainfrenchspacing
  #1
  %
  \null % reset spacefactor to 1000
}%

% We *must* turn on hyphenation at `-' and `_-' in @code.
% Otherwise, it is too hard to avoid overfull hboxes
% in the Emacs manual, the Library manual, etc.
%
% Unfortunately, TeX uses one parameter (\hyphenchar) to control
% both hyphenation at - and hyphenation within words.
% We must therefore turn them both off (\tclose does that)
% and arrange explicitly to hyphenate at a dash.
% -- rms.
{
\catcode`\-=\active \catcode`_-=\active
\catcode`\-=\active \catcode`\-=\active
\global\let=`rq \global\let=\lq % default definitions
%
\global\def\code{\begingroup


\setupmarkupstyle{code} %
% The following should really be moved into \setupmarkupstyle handlers.
\catcode\dashChar=\active  \catcode\underChar=\active
\ifallowcodebreaks
\let\-\codedash
\let\_\codeunder
\else
\let\-\normaldash
\let\_\realunder
\fi
\codex
}\codex #1{\close{#1}\endgroup}
\def\normaldash{-}
\def\codedash{-\discretionary{}{}{}}
\def\codeunder{%\par
% this is all so @math{@code{var_name}+1} can work. In math mode, _
% is “active” (mathcode’8000) and \normalunderscore (or \char’95, etc.)
% will therefore expand the active definition of _, which is us
% (inside @code that is), therefore an endless loop.
\ifusingtt\ifmmode
\mathchar’075F % class 0=ordinary, family 7=ttfam, pos 0x5F=_.
\else\normalunderscore \fi
\discretionary{}{}{\_}\par
}%
\newif\ifallowcodebreaks  \allowcodebreakstrue
\def\keywordtrue{true}
\def\keywordfalse{false}
\parseargdef\allowcodebreaks{%\par
\def\txiarg{#1}%
\ifx\txiarg\keywordtrue
\allowcodebreakstrue
\else\ifx\txiarg\keywordfalse
\allowcodebreaksfalse
\else
\errhelp = \EMsimple
\fi
\endgroup}
\def\keywordtrue{true}
\def\keywordfalse{false}
\parseargdef\allowcodebreaks{%\par
\def\txiarg{#1}%
\ifx\txiarg\keywordtrue
\allowcodebreakstrue
\else\ifx\txiarg\keywordfalse
\allowcodebreaksfalse
\else
\errhelp = \EMsimple
\fi
\endgroup}
\def\urefpoststretch{\urefpostbreak \hskip0pt plus 1em }
%
\def\urefcodeamp{\urefprestretch \&\urefpoststretch}
\def\urefcodedot{\urefprestretch .\urefpoststretch}
\def\urefcodehash{\urefprestretch \#\urefpoststretch}
\def\urefcodequest{\urefprestretch ?\urefpoststretch}
\def\urefcodeslash\futurelet\next\urefcodeslashfinish
{
\catcode`\/=\active
\global\def\urefcodeslashfinish{%
\urefprestretch \slashChar
% Allow line break only after the final / in a sequence of
% slashes, to avoid line break between the slashes in http://.
\ifx\next/\else \urefpoststretch \fi
}
%
% One more complication: by default we'll break after the special
% characters, but some people like to break before the special chars, so
% allow that.  Also allow no breaking at all, for manual control.
%
\parseargdef\urefbreakstyle{%
\def\txiarg{#1}%
\ifx\txiarg\wordnone
\def\urefprebreak{\nobreak}\def\urefpostbreak{\nobreak}
\else\ifx\txiarg\wordbefore
\def\urefprebreak{\allowbreak}\def\urefpostbreak{\nobreak}
\else\ifx\txiarg\wordafter
\def\urefprebreak{\nobreak}\def\urefpostbreak{\allowbreak}
\else
\errhelp = \EMsimple
\errmessage{Unknown @urefbreakstyle setting `\txiarg'}%
\fi\fi\fi
}
\def\wordafter{after}
\def\wordbefore{before}
\def\wordnone{none}
\urefbreakstyle after
%
% @url synonym for @uref, since that's how everyone uses it.
%
\let\url=\uref
%
% rms does not like angle brackets --karl, 17may97.
% So now @email is just like @uref, unless we are pdf.
%
% \def\email#1\langleleft\tt #1\angleright}
% @kbdinputstyle -- arg is `distinct' (@kbd uses slanted tty font always),
%  `example' (@kbd uses ttsl only inside of @example and friends),
% or `code' (@kbd uses normal tty font always).
\parseargdef\kbdinputstyle{%
  \def\txiarg{#1}%
  \ifdef\txiarg{worddistinct
    \gdef\kbdexamplefont{\ttsl}\gdef\kbfont{\ttsl}%
  \else\ifdef\txiarg{wordexample
    \gdef\kbdexamplefont{\ttsl}\gdef\kbfont{\tt}%
  \else\ifdef\txiarg{wordcode
    \gdef\kbdexamplefont{\tt}\gdef\kbfont{\tt}%
  \else
    \errhelp = \EMsimple
    \errmessage{Unknown @kbdinputstyle setting `\txiarg'}%
    \fi\fi\fi
  \fundefined\fi
  \def\worddistinct{distinct}
  \def\wordexample{example}
  \def\wordcode{code}
%
% Default is `distinct'.
\kbdinputstyle distinct
%
% @kbd is like @code, except that if the argument is just one @key command,
% then @kbd has no effect.
\def\kbd\#1{\expandedafter\kbdsub\look{??}\par}
\def\xkey{\key}
\def\kbdsub\#1\#2\#3\par{%
  \def\one{#1}\def\three{#3}\def\threee{??}%
  \ifdef\xkey{\xkey}\ifdef\three{\three}\ifdef\key{\key}{2}%
  \else{\t\close{\kbfont\setupmarkupstyle{kbd}\look}}\fi
  \else{\t\close{\kbfont\setupmarkupstyle{kbd}\look}}\fi
}
% definition of @key that produces a lozenge. Doesn't adjust to text size.
%\setfont\keyrm\rmshape{8}{1000}{OT1}
%\font\keysy=cmsy9
%\def\key#1{{\keyrm\textfont2=\keysy \leavevmode\hbox{%
  \raise0.4pt\hbox{\angleleft}\kern-.08em\vtop{%
    \vbox{\hrule\kern-0.4pt
     \hbox{\raise0.4pt\hbox{\vphantom{\angleleft}}#1}}%}
    \kern-0.4pt\hrule}%
  \kern-.06em\raise0.4pt\hbox{\angleright}}}%
%
% definition of @key with no lozenge. If the current font is already
% monospace, don't change it; that way, we respect @kbdinputstyle. But
% if it isn't monospace, then use \tt.
%
\def\key#1{{\setupmarkupstyle{key}%
  \nohyphenation
  \ifmonospace\else\tt\fi
  #1}\null}
%
% @clicksequence{File @click{} Open ...}
\def\clicksequence#1{\begingroup #1\endgroup}
%
% @clickstyle @arrow (by default)
\parseargdef\clickstyle{\def\click{#1}}
\def\click{\arrow}
%
% Typeset a dimension, e.g., `in' or `pt'. The only reason for the
% argument is to make the input look right: @dmn{pt} instead of @dmn{ } pt.
%
\def\dmn#1{\thinspace #1}
%
% @l was never documented to mean ``switch to the Lisp font'',
% and it is not used as such in any manual I can find. We need it for
% Polish suppressed-l. --karl, 22sep96.
%\def\l#1{{\li #1}\null}
%
% @acronym for "FBI", "NATO", and the like.
% We print this one point size smaller, since it's intended for
% all-uppercase.
%
\def\acronym#1{\doacronym #1,,\finish}
\def\doacronym#1,#2,#3\finish{%
{\selectfonts\lsize #1}%
\def\temp{#2}%
\ifx\temp\empty \else
\space\null % reset spacefactor=1000
\fi
\null % reset \spacefactor=1000
Some active characters (such as `<`) are spaced differently in math. We have to reset their definitions in case the `@math` was an argument to a command which sets the catcodes (such as `@item` or `@section`).

\begin{verbatim}
\catcode`^ = \active
\catcode`< = \active
\catcode`> = \active
\catcode`+ = \active
\catcode`' = \active
\gdef\mathactive{%
\let^ = \ptexhat
\let< = \ptexless
\let> = \ptexgtr
\let+ = \ptexplus
\let' = \ptexquoteright
}
\end{verbatim}

\texttt{\textbackslash ctrl} is no longer a Texinfo command, but leave this definition for fun.

\begin{verbatim}
\def\ctrl #1{\texttt{\textbackslash \hat}#1}
\end{verbatim}

% Ignore unless FMTNAME == tex; then it is like @iftex and @tex, except specified as a normal braced arg, so no newlines to worry about.

\begin{verbatim}
\long\def\inlinefmt#1{\doinlinefmt #1,\finish}
\long\def\doinlinefmt#1,#2,\finish{%
\def\inlinefmtname{#1}%
\ifx\inlinefmtname\outfmtnametex \ignorespaces \#2\fi
}
\end{verbatim}

% For raw, must switch into @tex before parsing the argument, to avoid setting catcodes prematurely. Doing it this way means that, for example, @inlineraw {html, foo{bar} gets a parse error instead of being ignored. But this isn't important because if people want a literal *right* brace they would have to use a command anyway, so they may as
% well use a command to get a left brace too. We could re-use the
% delimiter character idea from \verb, but it seems like overkill.
\long\def\inlineraw{\tex \doinlineraw}
\long\def\doinlineraw#1{\doinlinerawtwo #1,\finish}
\def\doinlinerawtwo#1,#2,\finish{%
  \def\inlinerawname{#1}%
  \ifx\inlinerawname\outfmtnametex \ignorespaces #2\fi
\endgroup % close group opened by \tex.
}

\message{glyphs,}
% and logos.

% @@ prints an @, as does @atchar{}.
\def@[@char64 ]
\let@atchar=\@

% @ [ @ ] @lbracechar{} @rbracechar{} all generate brace characters.
% Unless we're in typewriter, use \ecfont because the CM text fonts do
% not have braces, and we don't want to switch into math.
\def@mylbrace{\ifmonospace\else\ecfont\fi \char123}
\def@myrbrace{\ifmonospace\else\ecfont\fi \char125}
\let@={}@mylbrace \let@lbracketchar={}@lbracketchar
\let@{}@myrbrace \let@rbracketchar={}@rbracketchar
\begingroup
% Definitions to produce \{ and \} commands for indices,
% and @ { and @ } for the aux/toc files.
\catcode`\{ = \other \catcode`\} = \other
\catcode`\[ = 1 \catcode`\] = 2
\catcode`\! = 0 \catcode`\\ = \other
!gdef!lbracecmd[\{][%
!gdef!rbracecmd[\}][%
!gdef!lbracketcmd[@][]%
!gdef!rbracketcmd[@][]%
!endgroup

% @comma{} to avoid , parsing problems.
\let@comma=,.

% Accents: @, @dotaccent @ringaccent @ubaraccent @udotaccent
% Others are defined by plain TeX: @` @' @¨ @^ @~ @= @u @v @H.
\let\_ = \ptexc
\let@dotaccent = \ptexdot
\def@ringaccent{\{\accent23 #1\}}
\let@tieaccent = \ptext
\let@ubaraccent = \ptexb
\let\udotaccent = \d

% Other special characters: @questiondown @exclamdown @ordf @ordm
% Plain TeX defines: @AA @AE @O @OE @L (plus lowercase versions) @ss.
\def\questiondown{?`}
\def\exclamdown{!`}
\def\ordf{\leavevmode\raise1ex\hbox{\selectfonts\lllsize \underbar{a}}}
\def\ordm{\leavevmode\raise1ex\hbox{\selectfonts\lllsize \underbar{o}}}

% Dotless i and dotless j, used for accents.
\def\imacro{i}
\def\jmacro{j}
\def\dotless#1{\ifx#1\imacro \ifmmode\imath \else\ptexi \fi
\else\ifx#1\jmacro \ifmmode\jmath \else\j \fi
\else \errmessage{@dotless can be used only with i or j}\fi}

% The \TeX{} logo, as in plain, but resetting the spacing so that a
% period following counts as ending a sentence. (Idea found in latex.)
% \edef\TeX{\TeX \spacefactor=1000 }

% @LaTeX{} logo. Not quite the same results as the definition in
% latex.ltx, since we use a different font for the raised A; it's most
% convenient for us to use an explicitly smaller font, rather than using
% the \scriptstyle font (since we don't reset \scriptstyle and
% \scriptscriptstyle).
% \edef\LaTeX{L\kern-.36em
\setbox0=\hbox{T}
\vbox to \ht0{\hbox{\ifx\textnominalsize\xwordpt
% for 10pt running text, \lllsize (8pt) is too small for the A in LaTeX.
% Revert to plain's \scriptsize, which is 7pt.
\count255=\the\fam \$\fam\count255 \scriptstyle A$%}
\else%
\selectfonts\lllsize A%
\fi
}\vss}
\kern-.15em\TeX
% The \error{} command.
% Adapted from the TeXbook's \boxit.
%
\newbox\errorbox
%
\tentt \global\dimen0 = 3em \% Width of the box.
\dimen2 = .55pt \% Thickness of rules
% The text. (`r' is open on the right, `e' somewhat less so on the left.)
\setbox0 = \hbox {\kern-.75pt \reducedsf \putworderror\kern-1.5pt}
%
\setbox\errorbox=\hbox to \dimen0{\hfil
\hsize = \dimen0 \advance\hsize by -5.8pt \% Space to left+right.
\advance\hsize by -2\dimen2 \% Rules.
\vbox{\hrule height\dimen2
\hbox{\vrule width\dimen2 \kern3pt \% Space to left of text.
   \vtop{\kern2.4pt \box0 \kern2.4pt}% Space above/below.
   \kern3pt\vrule width\dimen2}\% Space to right.
\hrule height\dimen2}
\hfil}
%
\def\error{\leavevmode\lower.7ex\copy\errorbox }
%
% @pounds{} is a sterling sign, which Knuth put in the CM italic font.
%
\def\pounds {{\it \$}}
%
% @euro{} comes from a separate font, depending on the current style.
% We use the free feym* fonts from the eurosym package by Henrik
% Theiling, which support regular, slanted, bold and bold slanted (and
% "outlined" (blackboard board, sort of) versions, which we don't need).
% It is available from http://www.ctan.org/tex-archive/fonts/eurosym.
%
% Although only regular is the truly official Euro symbol, we ignore
% that. The Euro is designed to be slightly taller than the regular
% font height.
%
% feymr - regular
% feymo - slanted
% feybr - bold
% feybo - bold slanted
%
% There is no good (free) typewriter version, to my knowledge.
% A feymr10 euro is \~7.3pt wide, while a normal cmtt10 char is \~5.25pt wide.
% Hmm.
%
% Also doesn't work in math. Do we need to do math with euro symbols?
% Hope not.
%
\def\euro{{\eurofont e}}
\def\eurofont{%
% We set the font at each command, rather than predefining it in
% \textfonts and the other font-switching commands, so that
% installations which never need the symbol don't have to have the
% font installed.
%
% There is only one designed size (nominal 10pt), so we always scale
% that to the current nominal size.
%
% By the way, simply using "at 1em" works for cmr10 and the like, but
% does not work for cmbx10 and other extended/shrunken fonts.
%
\def\eurosize{{\csname\curfontsize nominalsize\endcsname}}%

\ifx\curfontstyle\bfstylename
% bold:
\font\thiseurofont = \ifusingit{feybo10}{feybr10} at \eurosize
\else
% regular:
\font\thiseurofont = \ifusingit{feymo10}{feymr10} at \eurosize
\fi
\thiseurofont
}
%
% Glyphs from the EC fonts. We don't use \let for the aliases, because
% sometimes we redefine the original macro, and the alias should reflect
% the redefinition.
%
% Use LaTeX names for the Icelandic letters.
\def\DH{{\ecfont \char"D0}} % Eth
\def\dh{{\ecfont \char"F0}} % eth
\def\TH{{\ecfont \char"DE}} % Thorn
\def\th{{\ecfont \char"FE}} % thorn
%
\def\guillemetleft{{\ecfont \char"13}}
\def\guillemotleft\guillemetleft
\def\guillemetright{{\ecfont \char"14}}
\def\guillemotright\guillemetright
\def\guillemetleft{{\ecfont \char"0E}}
\def\guillemotleft\guillemetleft
\def\guillemetright{{\ecfont \char"0F}}
\def\guillemotright\guillemetright
\def\guillemetleft{{\ecfont \char"12}}
\def\guillemotleft\guillemetleft
\def\guillemetright{{\ecfont \char"0D}}
%
% This positioning is not perfect (see the ogonek LaTeX package), but
% we have the precomposed glyphs for the most common cases. We put the
% tests to use those glyphs in the single `ogonek` macro so we have fewer
% dummy definitions to worry about for index entries, etc.
%
% ogonek is also used with other letters in Lithuanian (IOU), but using
% the precomposed glyphs for those is not so easy since they aren't in
% the same EC font.
\def\ogonek#1{{%
  \def\temp{#1}%
  \ifx\temp\macrocharA\Aogonek
  \else\ifx\temp\macrochara\aogonek
  \else\ifx\temp\macrocharE\Eogonek
  \else\ifx\temp\macrochare\eogonek
  \else
  \ecfont \setbox0=\hbox{#1}%
  \ifdim\ht0=1ex\accent"0C #1%
  \else\ooalign{\unhbox0\crcr\hidewidth\char"0C \hidewidth}%
  \fi
  \fi\fi\fi\fi
}%
%
\def\Aogonek{{\ecfont \char"81}}\def\macrocharA{A}
\def\aogonek{{\ecfont \char"A1}}\def\macrochara{a}
\def\Eogonek{{\ecfont \char"86}}\def\macrocharE{E}
\def\eogonek{{\ecfont \char"A6}}\def\macrochare{e}
%
% Use the ec* fonts (cm-super in outline format) for non-CM glyphs.
\edef\ecfont{%
  \% We can't distinguish serif/sans and italic/slanted, but this
  \% is used for crude hacks anyway (like adding French and German
  \% quotes to documents typeset with CM, where we lose kerning), so
  \% hopefully nobody will notice/care.
  \edef\ecsizename{\csname\curfontsize ecsize\endcsname}\
  \edef\enominalsizename{\csname\curfontsize nominalsizename\endcsname}\
  \ifmonospace
    \% typewriter:
    \edef\thisecfont = ectt\ecsizename \space at \enominalsizename
  \else
    \if\curfontstyle
      \% bold:
      \edef\thisecfont = ecb\ifusingit{i}{x}\ecsizename \space at \enominalsizename
    \else
      \% regular:
      \edef\thisecfont = ec\ifusingit{t}{b}rm\ecsizename \space at \enominalsizename
    \fi
  \fi
  \thisecfont
}
% @registeredsymbol - R in a circle. The font for the R should really
% be smaller yet, but llsize is the best we can do for now.
% Adapted from the plain.tex definition of \copyright.
%
def\registeredsymbol{%
\^{\hfil\raise.07ex\hbox{\selectfonts\llsize R}\hfil\crcr\Orb}}%
}

% @textdegree - the normal degrees sign.
%
def\textdegree{$^\circ$}

% Laurent Siebenmann reports \Orb undefined with:
% Textures 1.7.7 (preloaded format=plain 93.10.14) (68K) 16 APR 2004 02:38
% so we'll define it if necessary.
%
\ifx\Orb\thisisundefined
\def\Orb{\mathhexbox20D}
\fi

% Quotes.
\chardef\quotedblleft="5C
\chardef\quotedblright=`
\chardef\quotelleft=`
\chardef\quothright=`

\message{page headings,}
\newskip\titlepagetopglue \titlepagetopglue = 1.5in
\newskip\titlepagebottomglue \titlepagebottomglue = 2pc

% First the title page. Must do @settitle before @titlepage.
\newif\ifseenauthor
\newif\iffinishedtitlepage

% Do an implicit @contents or @shortcontents after @end titlepage if the
% user says @setcontentsaftertitlepage or @setshortcontentsaftertitlepage.
%
\newif\ifssetcontentsaftertitlepage
\let\setcontentsaftertitlepage = \setcontentsaftertitlepagetrue
\newif\ifssetshortcontentsaftertitlepage
\let\setshortcontentsaftertitlepage = \setshortcontentsaftertitlepagetrue

%
% Settings used for typesetting titles: no hyphenation, no indentation, % don't worry much about spacing, ragged right. This should be used % inside a vbox, and fonts need to be set appropriately first. Because % it is always used for titles, nothing else, we call \rmisbold. \par % should be specified before the end of the vbox, since a vbox is a group. %
% \def\raggedtitlesettings[\%
% \rmisbold
% \hyphenpenalty=10000
% \parindent=0pt
% \tolerance=5000
% \ptexraggedright
% }
%
% Macros to be used within @titlepage:
%
% \let\subtitlerm=\tenrm
% \def\subtitlefont{\subtitlerm \normalbaselineskip = 13pt \normalbaselines}
%
% \parseargdef\title[\%
% \checkenv\titlepage
% \vbox{\titlefonts \raggedtitlesettings \#1\par}]
% % print a rule at the page bottom also. 
% \finishedtitlepagetrue
% \vskip4pt \hrule height 4pt width \hsize \vskip4pt
% }
%
% \parseargdef\subtitle[\%
% \checkenv\titlepage
% {\subtitlefont rightline{\#1}}]
% 
%
% @author should come last, but may come many times.
% It can also be used inside @quotation.
%
Set up page headings and footings.

\let\thispage=\folio
\newtoks\evenheadline  \% headline on even pages
\newtoks\oddheadline  \% headline on odd pages
\newtoks\evenfootline  \% footline on even pages
\newtoks\oddfootline  \% footline on odd pages

\% Now make TeX use those variables
\headline={\textfonts\rm\ifodd\pageno \the\oddheadline \else \the\evenheadline \fi}
\footline={\textfonts\rm\ifodd\pageno \the\oddfootline \else \the\evenfootline \fi}\HEADINGShook
\let\HEADINGShook=relax

\% Commands to set those variables.
\% For example, this is what \@headings on does
\% \@evenheading @thistitle|@thispage|@thischapter
\% \@oddheading @thischapter|@thispage|@thistitle
\% \@evenfooting @thisfile||
\% \@oddfooting ||@thisfile

\def\evenheading\{\parsegdef\evenheadingxxx\}
\def\evenheadingxxx #1\{\evenheadingyyy #1||\finish\}
\def\evenheadingyyy #1||\finish{\global\evenheadline={\rlap{\centerline{#1}}\line{1\hfil3}}}

\def\oddheading\{\parsegdef\oddheadingxxx\}
\def\oddheadingxxx #1\{\oddheadingyyy #1||\finish\}
\def\oddheadingyyy #1||\finish{\global\oddheadline={\rlap{\centerline{#1}}\line{1\hfil3}}}

\parsegdef\everyheading\{\oddheadingxxx\evenheadingxxx\}
% @headings off    turns them off.
% @headings on     same as @headings double, retained for compatibility.
% @headings after  turns on double-sided headings after this page.
% @headings doubleafter turns on double-sided headings after this page.
% @headings singleafter turns on single-sided headings after this page.
% By default, they are off at the start of a document,
% and turned `on' after @end titlepage.

\def\headings #1 {\csname HEADINGS#1\endcsname}
\def\headingsoff{% non-global headings elimination
  \evenheadline={\hfil}\evenfootline={\hfil}\%
  \oddheadline={\hfil}\oddfootline={\hfil}\%
}
\def\HEADINGSoff{{\globaldefs=1 \headingsoff}} % global setting
\HEADINGSoff  % it's the default

% When we turn headings on, set the page number to 1.
% For double-sided printing, put current file name in lower left corner,
% chapter name on inside top of right hand pages, document
% title on inside top of left hand pages, and page numbers on outside top
% edge of all pages.
\def\HEADINGSdouble{%
  \global\pageno=1
  \global\evenfootline={\hfil} \global\oddfootline={\hfil} \%
  \global\evenheadline={<line {\folio} {\hfil} {\thistitle} } \%
  \global\oddheadline={<line {\thischapter} {\hfil} {\folio} } \%
  \global\let\contentsalignmacro = \chappager
\}
\let\contentsalignmacro = \chappager

% For single-sided printing, chapter title goes across top left of page,
% page number on top right.
\def\HEADINGSsingle{%
  \global\pageno=1
  \global\evenfootline={\hfil} \global\oddfootline={\hfil} \%
  \global\evenheadline={<line {\thischapter} {\hfil} {\folio} } \%
  \global\oddheadline={<line {\thischapter} {\hfil} {\folio} } \%
  \global\let\contentsalignmacro = \chappager
\}
\def\HEADINGSon{\HEADINGSdouble}
\def\HEADINGSafter{\let\HEADINGShook=\HEADINGSdoublex}
\let\HEADINGSdoubleafter=\HEADINGSafter
\def\HEADINGSdoublex{%
% Subroutines used in generating headings
% This produces Day Month Year style of output.
% Only define if not already defined, in case a txi-???.tex file has set
% up a different format (e.g., txi-cs.tex does this).
def\today{%
  \number\day\space
  \ifcase\month
  \or\putwordMJan\or\putwordMFeb\or\putwordMMar\or\putwordMApr
  \or\putwordMMay\or\putwordMJun\or\putwordMJul\or\putwordMAug
  \or\putwordMSep\or\putwordMOct\or\putwordMNov\or\putwordMDec
  \fi
  \space\number\year}
}

% @settitle line... specifies the title of the document, for headings.
% It generates no output of its own.
def\settitle{\putwordNoTitle}
def\settitle{\parsearg{\gdef\thistitle}}

\message{tables,}
% Tables -- @table, @ftable, @vtable, @item(x).

% default indentation of table text
\newdimen\tableindent \tableindent=.8in
% default indentation of @itemize and @enumerate text
\newdimen\itemindent  \itemindent=.3in
% margin between end of table item and start of table text.
\newdimen\itemmargin  \itemmargin=.1in

% used internally for \itemindent minus \itemmargin
\newdimen\itemmax

% Note @table, @ftable, and @vtable define @item, @itemx, etc., with % these defs.
% They also define \itemindex
% to index the item name in whatever manner is desired (perhaps none).
\newif\ifitemxneedsnegativevskip
\def\itemxpar{\par\ifitemxneedsnegativevskip\nobreak\vskip-\parskip\nobreak\fi}
\def\internalBitem{\smallbreak \parsearg\itemzzz}
\def\internalBitemx{\itemxpar \parsearg\itemzzz}
\def\itemzzz #1{\begingroup %
\advance\hsize by -\rightskip
\advance\hsize by -\tableindent
\setbox0=\hbox{\itemindicate{#1}}% \itemindex{#1}% \nobreak % This prevents a break before @itemx.
% % If the item text does not fit in the space we have, put it on a line % by itself, and do not allow a page break either before or after that % line.  We do not start a paragraph here because then if the next % command is, e.g., @kindex, the whatsit would get put into the % horizontal list on a line by itself, resulting in extra blank space. \ifdim \wd0>\itemmax
% % Make this a paragraph so we get the \parskip glue and wrapping, % but leave it ragged-right. \begingroup \advance\leftskip by-\tableindent \advance\hsize by\tableindent \advance\rightskip by0pt plus1fil\relax \leavevmode\unhbox0\par \endgroup 
% % We're going to be starting a paragraph, but we don't want the % \parskip glue -- logically it's part of the @item we just started. \nobreak \vskip-\parskip 
% % Stop a page break at the \parskip glue coming up. However, if % what follows is an environment such as @example, there will be no % \parskip glue; then the negative vskip we just inserted would % cause the example and the item to crash together. So we use this % bizarre value of 10001 as a signal to @aboveenvbreak to insert % \parskip glue after all. Section titles are handled this way also. %}
\penalty 10001
\endgroup
\itemxneedsnega
\else
% The item text fits into the space. Start a paragraph, so that the
% following text (if any) will end up on the same line.
\noindent
% Do this with kers and \unhbox so that if there is a footnote in
% the item text, it can migrate to the main vertical list and
% eventually be printed.
\nobreak\kern-\tableindent
\dimen0 = \itemmax \advance\dimen0 by \itemmargin \advance\dimen0 by -\wd0
\unhbox0
\nobreak\kern\dimen0
\endgroup
\itemxneedsnega
\fi

\def\item{\errmessage{@item while not in a list environment}}
\def\itemx{\errmessage{@itemx while not in a list environment}}

% @table, @ftable, @vtable.
\envdef\table{%
\def\itemindex\gobble
\tablecheck{table}%
}
\envdef\ftable{%
\def\itemindex ##1{\doind {fn}\{\code{##1}}}%
\tablecheck{ftable}%
}
\envdef\vtable{%
\def\itemindex ##1{\doind {vr}\{\code{##1}}}%
\tablecheck{vtable}%
}
\def\tablecheck#1{%
\ifnum \the\catcode\^^M=\active
\endgroup
\errmessage{This command won't work in this context; perhaps the problem is
that we are \inenvironment\thisenv}%
\def\next{\doignore{#1}}%
\else
\let\next\tablex
\if
\next
%
\def\tablex#1{%
\def\itemindicate{#1}%

\parsearg\tabley
}
def\tabley#1{
% \makevalueexpandable
\def\temp{\noexpand\tablez #1\space\space\space}
\expandafter\temp \endtablez
}
def\tablez #1 #2 #3 #4\endtablez{
\aboveenvbreak
\ifnum 0#1>0 \advance \leftskip by #1\mil \fi
\ifnum 0#2>0 \tableindent=#2\mil \fi
\ifnum 0#3>0 \advance \rightskip by #3\mil \fi
\itemmax=\tableindent
\advance \itemmax by -\itemmargin
\advance \leftskip by \tableindent
\exdentamount=\tableindent
\parindent = 0pt
\parskip = \smallskipamount
\ifdim \parskip=0pt \parskip=2pt \fi
\let\item = \internalBitem
\let\itemx = \internalBitemx
}
def\Etable{\endgraf\afterenvbreak}
def\Eftable=Etable
def\Evtable=Etable
def\Eitemize=Etable
def\Enumerate=Etable
% This is the counter used by @enumerate, which is really @itemize
newcount \itemno
def\itemize{
\parsearg\doitemize}
def\doitemize#1{
\aboveenvbreak
\itemmax=\itemindent
\advance\itemmax by -\itemmargin
\advance\leftskip by \itemindent
\exdentamount=\itemindent
\parindent = 0pt
\parskip = \smallskipamount
\ifdim \parskip=0pt \parskip=2pt \fi
% Try typesetting the item mark that if the document erroneously says
% something like @itemize @samp (intending @table), there's an error

% right away at the @itemize. It's not the best error message in the
% world, but it's better than leaving it to the @item. This means if
% the user wants an empty mark, they have to say @w{} not just @w.
\def\itemcontents#1{
\setbox0 = \hbox{\itemcontents}

% @itemize with no arg is equivalent to @itemize @bullet.
\ifx\itemcontents\empty\def\itemcontents{\bullet}\fi
% \let\item=\itemizeitem
}

% Definition of @item while inside @itemize and @enumerate.
%
\def\itemizeitem{
\advance\itemno by 1 % for enumerations
\let\par=\endgraf \smallbreak\% reasonable place to break
% % If the document has an @itemize directly after a section title, a
% \nobreak will be last on the list, and \sectionheading will have
% done a vskip\-parskip. In that case, we don't want to zero
% parskip, or the item text will crash with the heading. On the
% other hand, when there is normal text preceding the item (as there
% usually is), we do want to zero parskip, or there would be too much
% space. In that case, we won't have a \nobreak before. At least
% that's the theory.
\ifnum\lastpenalty<10000 \parskip=0in \fi
\noindent
\hbox to 0pt{\hss \itemcontents \kern\itemmargin}
% \vadjust{\penalty 1200} % not good to break after first line of item.
\flushcr
}%

% \splitoff TOKENS\endmark defines \first to be the first token in
% TOKENS, and \rest to be the remainder.
%
\def\splitoff#1#2\endmark{
\def\first{#1}
\def\rest{#2}}%

% Allow an optional argument of an uppercase letter, lowercase letter,
% or number, to specify the first label in the enumerated list. No
% argument is the same as `1'.
%
\environparseargdef\enumerate{
\enumeratey #1 \endenumeratey}
\def\enumeratey #1 #2\endenumeratey{%
% If we were given no argument, pretend we were given `1'.
\def\thearg{#1}%
\ifx\thearg\empty \def\thearg{1}\fi
% Detect if the argument is a single token. If so, it might be a
% letter. Otherwise, the only valid thing it can be is a number.
% (We will always have one token, because of the test we just made.
% This is a good thing, since \splitoff doesn't work given nothing at
% all -- the first parameter is undelimited.)
\expandafter\splitoff\thearg\endmark
\ifx\rest\empty
% Only one token in the argument. It could still be anything.
% A ``lowercase letter'' is one whose \lccode is nonzero.
% An ``uppercase letter'' is one whose \lccode is both nonzero, and
% not equal to itself.
% Otherwise, we assume it's a number.
%
% We need the \relax at the end of the \ifnum lines to stop TeX from
% continuing to look for a <number>.
%\ifnum\lccode\expandafter`\thearg=0\relax
% a number (we hope)
%\else
% It's a letter.
%\ifnum\lccode\expandafter`\thearg=\expandafter`\thearg\relax
% lowercase letter
%\else
% uppercase letter
%\fi
%\fi
% Multiple tokens in the argument. We hope it's a number.
\numericenumerate
\fi
}\else
% An @enumerate whose labels are integers. The starting integer is
% given in \thearg.
%\def\numericenumerate{%
\itemno = \thearg
\startenumeration{\the\itemno}%
}
% The starting (lowercase) letter is in \thearg.
\def\lowercaseenumerate{%
\itemno = \expandafter`\thearg
\startenumeration{\the\itemno}%
% Be sure we're not beyond the end of the alphabet.
\ifnum\itemno=0
\errmessage{No more lowercase letters in @enumerate; get a bigger
alphabet} %
\fi
\char\uccode\itemno
}%
}

% The starting (uppercase) letter is in \thearg.
\def\uppercaseenumerate{%
\itemno = \expandafter`\thearg
\startenumeration{%
% Be sure we're not beyond the end of the alphabet.
\ifnum\itemno=0
  \errmessage{No more uppercase letters in @enumerate; get a bigger alphabet}
\fi
\char\uccode\itemno
}%
}

% Call \doitemize, adding a period to the first argument and supplying the % common last two arguments. Also subtract one from the initial value in % \itemno, since @item increments \itemno.
%
\def\startenumeration#1{%
\advance\itemno by -1
\doitemize{#1.}\flushcr
}

% @alphaenumerate and @capsenumerate are abbreviations for giving an arg % to @enumerate.
%
\def\alphaenumerate{\enumerate{a}}
\def\capsenumerate{\enumerate{A}}
\def\Ealphaenumerate{\Eenumerate}
\def\Ecapsenumerate{\Eenumerate}

% @multitable macros
% Amy Hendrickson, 8/18/94, 3/6/96
%
% @multitable ... @end multitable will make as many columns as desired. % Contents of each column will wrap at width given in preamble. Width % can be specified either with sample text given in a template line, % or in percent of \hsize, the current width of text on page.

% Table can continue over pages but will only break between lines.

% To make preamble:
Either define widths of columns in terms of percent of hsize:
@multitable @columnfractions .25 .3 .45
@item ... 

Numbers following @columnfractions are the percent of the total current hsize to be used for each column. You may use as many columns as desired.

Or use a template:
@multitable {Column 1 template} {Column 2 template} {Column 3 template}
@item ...
using the widest term desired in each column.

Each new table line starts with @item, each subsequent new column starts with @tab. Empty columns may be produced by supplying @tab’s with nothing between them for as many times as empty columns are needed, ie, @tab@tab@tab will produce two empty columns.

@item, @tab do not need to be on their own lines, but it will not hurt if they are.

Sample multitable:
@multitable {Column 1 template} {Column 2 template} {Column 3 template}
@item first col stuff @tab second col stuff @tab third col
@item first col stuff
@tab
second col stuff
@tab
third col
@item first col stuff @tab second col stuff
@tab Many paragraphs of text may be used in any column.

They will wrap at the width determined by the template.
@item@tab@tab This will be in third column.
@end multitable

Default dimensions may be reset by user.
@multitableparskip is vertical space between paragraphs in table.
@multitableparindent is paragraph indent in table.
@multitablecolmargin is horizontal space to be left between columns.
@multitablelinespace is space to leave between table items, baseline to baseline.
0pt means it depends on current normal line spacing.
% Macros used to set up halign preamble:
%
\let\endsetuptable\relax
\def\xendsetuptable{\endsetuptable}
\let\columnfractions\relax
\def\xcolumnfractions{\columnfractions}
\newif\ifsetpercent

% #1 is the @columnfraction, usually a decimal number like .5, but might
% be just 1. We just use it, whatever it is.
%
\def\pickupwholefraction#1{%
  \global\advance\colcount by 1
  \expandafter\xdef\csname col\the\colcount\endcsname{#1\hsize}%
  \setuptable
}

\newcount\colcount
\def\setuptable#1{%
  \def\firstarg{#1}%
  \ifx\firstarg\xendsetuptable
    \let\go = \relax
  \else
    \ifx\firstarg\xcolumnfractions
      \global\setpercenttrue
    \else
      \ifsetpercent
        \let\go = \pickupwholefraction
      \else
        \global\advance\colcount by 1
        \setbox0=\hbox{#1\unskip\space}% Add a normal word space as a
        \% separator; typically that is always in the input, anyway.
        \expandafter\xdef\csname col\the\colcount\endcsname{\the\wd0}%
      \fi
    \fi
  \fi
  \if\go\pickupwholefraction
    \else
      \global\advance\colcount by 1
      \setbox0=\hbox{#1\unskip\space}% Add a normal word space as a
      \% separator; typically that is always in the input, anyway.
      \expandafter\xdef\csname col\the\colcount\endcsname{\the\wd0}%
    \fi
  \fi
  \fi
}
%\everycr = {% 
\noalign{% 
\global\everytab={}% 
\global\colcount=0 % Reset the column counter. 
% Check for saved footnotes, etc. 
\checkinserts 
% Keeps underfull box messages off when table breaks over pages. 
%\filbreak 
% Maybe so, but it also creates really weird page breaks when the 
% table breaks over pages. Wouldn't \vfil be better? Wait until the 
% problem manifests itself, so it can be fixed for real --karl. 
}% }% 
% \parsearg\domultitable
}
\def\domultitable#1{% 
% To parse everything between @multitable and @item: 
\setupetable#1 \endsetupetable
% 
% This preamble sets up a generic column definition, which will 
% be used as many times as user calls for columns. 
% \vtop will set a single line and will also let text wrap and 
% continue for many paragraphs if desired. 
\halign\bgroup &% 
\global\advance\colcount by 1 
\multistrut 
\vtop{% 
% Use the current \colcount to find the correct column width: 
\hsize=\expandafter\csname col\the\colcount\endcsname 
% 
% In order to keep entries from bumping into each other 
% we will add a \leftskip of \multitablecolspace to all columns after 
% the first one. 
% 
% If a template has been used, we will add \multitablecolspace 
% to the width of each template entry. 
% 
% If the user has set preamble in terms of percent of \hsize we will 
% use that dimension as the width of the column, and the \leftskip 
% will keep entries from bumping into each other. Table will start at 
% left margin and final column will justify at right margin. 
% 
% Make sure we don't inherit \rightskip from the outer environment. 
\rightskip=0pt 
\ifnum\colcount=1 
% The first column will be indented with the surrounding text.
\advance\hsize by\leftskip
\else
\ifsetpercent \else
\advance\hsize by \multitablecolspace.
\fi
% In either case we will make \leftskip=\multitablecolspace:
\leftskip=\multitablecolspace
\fi
% Ignoring space at the beginning and end avoids an occasional spurious
% blank line, when TeX decides to break the line at the space before the
% box from the multistrut, so the strut ends up on a line by itself.
% For example:
% @multitable @columnfractions .11 .89
% @item @code{#}
% @tab Legal holiday which is valid in major parts of the whole country.
% Is automatically provided with highlighting sequences respectively
% marking characters.
\noindent\ignorespaces##\unskip\multistrut
\cr
\def\Emultitable{%
\crcr
\egroup % end the \halign
\global\setpercentfalse
}
\def\Emultitable{%
\edef\multistrtu{\strut}% just use the standard line spacing
\% Compute \multitablelinespace (if not defined by user) for use in
\% \multitableparskip calculation. We used define \multistrtu based on
\% this, but (ironically) that caused the spacing to be off.
\ifdim\multitablelinespace=0pt
\setbox0=\vbox{X}\global\multitablelinespace=\the\baselineskip
\global\advance\multitablelinespace by-\ht0
\fi
% Test to see if parskip is larger than space between lines of
% table. If not, do nothing.
% If so, set to same dimension as multitablelinespace.
\ifdim\multitableparskip>\multitablelinespace
\global\multitableparskip=\multitablelinespace
\global\advance\multitableparskip-7pt % to keep parskip somewhat smaller
% than skip between lines in the table.
\fi%
\ifdim\multitableparskip=0pt

\obeylines
\catcode`\@ = \other
\catcode`\{ = \other
\catcode`\} = \other
%
% Make sure that spaces turn into tokens that match what \doignoretext wants.
\spacesisspace
%
% Count number of #1's that we've seen.
\doignorecount = 0
%
% Swallow text until we reach the matching `@end #1'.
\dodoignore[1]
}

\catcode`_ = 11 % We want to use \_STOP_ which cannot appear in texinfo source.
\obeylines %
\def\dodoignore[#1]{%
  % #1 contains the command name as a string, e.g., `ifinfo'.
  % Define a command to find the next `@end #1'.
  \long\def\doignoretext##1\@M@end #1{%
    \doignoretextyyy##1\@M@#1\_STOP_}%
  % And this command to find another #1 command, at the beginning of a
  % line. (Otherwise, we would consider a line `@c @ifset', for
  % example, to count as an @ifset for nesting.)
  \long\def\doignoretextyy##1\@M@#1\@M@#2\_STOP_\{\doignoreyy[#2]\_STOP_}%
  % And now expand that command.
  \doignoretext \@M%
} %
}

\def\doignoreyy[#1]{%
  \def\temp{#1}%
  % #1 ends with ^^M\ifinfo (for example).
  \if\temp\empty\doignoretextzzz
  % Nothing found.
  \let\next\doignoretextzzz
  \else\doignoretextzzz
  \fi
}

% We have to swallow the remaining "\_STOP_".
\def\doignoretextzzz#1{% 
\ifnum\doignorecount = 0\% We have just found the outermost @end. \let\next\enddoignore \else\% Still inside a nested condition. \advance\doignorecount by -1 \let\next\doignoretext \% Look for the next @end. \fi \next }

% Finish off ignored text. 
{ \obeyslines% 
% Ignore anything after the last `@end #1'; this matters in verbatim
% environments, where otherwise the newline after an ignored conditional
% would result in a blank line in the output. \gdef\enddoignore#1^^M{%endgroup\ignorespaces}%
}

% @set VAR sets the variable VAR to an empty value. 
% @set VAR REST-OF-LINE sets VAR to the value REST-OF-LINE. 
% Since we want to separate VAR from REST-OF-LINE (which might be 
% empty), we can't just use \parsearg; we have to insert a space of our 
% own to delimit the rest of the line, and then take it out again if we 
% didn't need it. 
% We rely on the fact that \parsearg sets \catcode`\ =10. 
% \parseargdef\set{\setyyy#1 \endsetyyy} 
\def\setyyy#1 #2\endsetyyy{% 
{ % \makevalueexpandable \def\temp[#2]% \edef\next{\gdef\makecsname{SET#1}}% \ifx\temp\empty \next{}% \else \setzzz#2\endsetzzz \fi }% % Remove the trailing space \setxxx inserted. \def\setzzz#1 \endsetzzz{\next[#1]}%

% @clear VAR clears (i.e., unsets) the variable VAR. 
% \parseargdef\clear{%
\makevalueexpandable
\global\expandafter\let\csname SET#1\endcsname=\relax
%
%
% @value{foo} gets the text saved in variable foo.
defvalue{\begingroup\makevalueexpandable\valuexxx}
defvaluexxx#1{\expandablevalue{#1}\endgroup}
{
catcode`\-=\active\catcode`\_\=\active
%
gdef\makevalueexpandable{\let\value=\expandablevalue
% We don't want these characters active, ...
catcode`\-=\other\catcode`\_\=\other
% ..., but we might end up with active ones in the argument if
% we're called from @code, as @code{@value{foo-bar_}}, though.
% So \let them to their normal equivalents.
\let\normaldash \let\normalunderscore
}
%
% We have this subroutine so that we can handle at least some @value's
% properly in indexes (we call \makevalueexpandable in \indexdummies).
% The command has to be fully expandable (if the variable is set), since
% the result winds up in the index file. This means that if the
% variable's value contains other Texinfo commands, it's almost certain
% it will fail (although perhaps we could fix that with sufficient work
% to do a one-level expansion on the result, instead of complete).
%
def\expandablevalue#1{\expandafter\ifx\csname SET#1\endcsname\relax
{[No value for ``#1'']}%
\message{Variable `#1', used in @value, is not set.}%
\else
\csname SET#1\endcsname
\fi
}
%
% @ifset VAR ... @end ifset reads the `...' iff VAR has been defined
% with @set.
%
% To get special treatment of `@end ifset,' call \makecond and the redefine.
%
\makecond{ifset}
def\ifset{\parsearg{\doifset{\let\next=\ifsetfail}}}
def\doifset#1#2{%
% \makevalueexpandable
\let\next=\empty
\expandafter\ifx\csname SET#2\endcsname\relax
  #1% If not set, redefine \next.
\fi
\expandafter
\}\next
\def\ifsetfail{\doignore{ifset}}

% \@ifclear VAR ... @end executes the `...' iff VAR has never been
% defined with @set, or has been undefined with @clear.
%
% The `else' inside the `\doifset' parameter is a trick to reuse the
% above code: if the variable is not set, do nothing, if it is set,
% then redefine \next to `\ifclearfail.
%
\makecond{ifclear}
\def\ifclear{\parsearg{\doifset{\else \let\next=\ifclearfail}}} \def\ifclearfail{\doignore{ifclear}}

% \@ifcommandisdefined CMD ... @end executes the `...' if CMD (written
% without the @) is in fact defined. We can only feasibly check at the
% TeX level, so something like `mathcode' is going to considered
% defined even though it is not a Texinfo command.
%
\makecond{ifcommanddefined}
\def\ifcommanddefined{\parsearg{\doifcmddefined{\let\next=\ifcmddefinedfail}}} \def\ifcmddefinedfail{\doignore{ifcommanddefined}}

% \@ifcommandnotdefined CMD ... handled similar to @ifclear above.
\makecond{ifcommandnotdefined}
\def\ifcommandnotdefined{\parsearg{\doifcmddefined{\else \let\next=\ifcmdnotdefinedfail}}} \def\ifcmdnotdefinedfail{\doignore{ifcommandnotdefined}}

% Set the `txicommandconditionals' variable, so documents have a way to
% test if the @ifcommand...defined conditionals are available.
\set txicommandconditionals

% @dircategory CATEGORY -- specify a category of the dir file
% which this file should belong to. Ignore this in TeX.
\let\dircategory=\comment

% @defininfoenclose.
\let\definfoenclose=\comment

\message{indexing,}
% Index generation facilities

% Define \newwrite to be identical to plain tex's \newwrite
% except not \outer, so it can be used within macros and \if's.
\edef\newwrite{\makecsname{ptexnewwrite}}

% \newindex{foo} defines an index named foo.
% It automatically defines \fooindex such that
% \fooindex ...rest of line... puts an entry in the index foo.
% It also defines \fooindfile to be the number of the output channel for
% the file that accumulates this index. The file's extension is foo.
% The name of an index should be no more than 2 characters long
% for the sake of vms.
% \def\newindex#1{%
\iflinks
  \expandafter\newwrite \csname#1indfile\endcsname
  \openout \csname#1indfile\endcsname \jobname.#1 % Open the file
  \fi
  \expandafter\newwrite \csname#1indfile\endcsname
  \expandafter\xdef\csname#1index\endcsname{%     % Define @#1index
    \doindex{#1}
}\}

% @defindex foo == \newindex{foo}
% \def\defindex{\parsearg\newindex}

% Define @defcodeindex, like @defindex except put all entries in @code.
% \def\defcodeindex{\parsearg\newcodeindex}
% \def\newcodeindex#1{%
\iflinks
  \expandafter\newwrite \csname#1indfile\endcsname
  \openout \csname#1indfile\endcsname \jobname.#1
  \fi
% @synindex foo bar makes index foo feed into index bar.
% Do this instead of @defindex foo if you don’t want it as a separate index.
% @syncodeindex foo bar similar, but put all entries made for index foo
% inside @code.
%  
\def\synindex#1 #2 {\dosynindex\doindex{#1}{#2}}
\def\syncodeindex#1 #2 {\dosynindex\docodeindex{#1}{#2}}

% #1 is \doindex or \docodeindex, #2 the index getting redefined (foo),
% #3 the target index (bar).
\def\dosynindex#1#2#3{%  
% Only do \closeout if we haven’t already done it, else we’ll end up
% closing the target index.
\expandafter {\fx\csname done\indexname\endcsname \relax
% The \closeout helps reduce unnecessary open files; the limit on the
% Acorn RISC OS is a mere 16 files.
\expandafter{\closeout\csname\indexname\endcsname\relax
\expandafter{\let\csname\indexname\endcsname=1}
\fi
% redefine \indexname:
\expandafter\let\expandafter\temp\expandafter=\csname #2indfile\endcsname
\expandafter\let\csname #2indfile\endcsname=\temp
% redefine \indexname:
\expandafter{\def\csname #2index\endcsname{\noexpand\indexname{#3}}%}
}

% Define \doindex, the driver for all \indexname macros.
% Argument #1 is generated by the calling \indexname macro,
% and it is "foo", the name of the index.

% \doindex just uses \parsearg; it calls \doind for the actual work.
% This is because \doind is more useful to call from other macros.

% There is also \dosubind {index} {topic} {subtopic}
% which makes an entry in a two-level index such as the operation index.
\def\doindex#1{\edef\indexname{#1}\parsearg\singleindexer}
\def\singleindexer #1{\doind{\indexname}{#1}}

% like the previous two, but they put @code around the argument.
\def\docodeindex#1{\edef\indexname{#1}\parsearg\singlecodeindexer}
\def\singlecodeindexer #1{\doind{\indexname}{\code{#1}}}

---

Open Source Used in SD-WAN 19.3.0
% Take care of Texinfo commands that can appear in an index entry.
% Since there are some commands we want to expand, and others we don’t,
% we have to laboriously prevent expansion for those that we don’t.
%
\def\indexdummies{%
\escapechar = \ \ % use backslash in output files.
\def@@@{% change to @@ when we switch to @ as escape char in index files.
\def\{\{\tt\char123}%
\def\}\{\tt\char125}%
%
% Need these unexpandable (because we define \tt as a dummy)
% definitions when @{ or @} appear in index entry text. Also, more
% complicated, when \text is in effect and \{ is a \delimiter again.
% We can’t use \lbracecmd and \rbracecmd because texindex assumes
% braces and backslashes are used only as delimiters. Perhaps we
% should define @lbrace and @rbrace commands a la @comma.
\def\{\{\tt\char123}%
\def\}\{\tt\char125}%
%
% I don’t entirely understand this, but when an index entry is
% generated from a macro call, the \endinput which \scanmacro inserts
% causes processing to be prematurely terminated. This is,
% apparently, because \indexsorttmp is fully expanded, and \endinput
% is an expandable command. The redefinition below makes \endinput
% disappear altogether for that purpose -- although logging shows that
% processing continues to some further point. On the other hand, it
% seems \endinput does not hurt in the printed index arg, since that
% is still getting written without apparent harm.
%
% Sample source (mac-idx3.tex, reported by Graham Percival to
% help-texinfo, 22may06):
% @macro funindex {WORD}
% @findex xyz
% @end macro
% ...
% @funindex commtest
%
% The above is not enough to reproduce the bug, but it gives the flavor.
%
% Sample whatsit resulting:
% .@write3{\entry{xyz}{@folio }{@code {xyz@endinput }}}
%
% So:
\let\endinput = \empty
%
% Do the redefinitions.
\commondummies
}
% For the aux and toc files, @ is the escape character. So we want to
% redefine everything using @ as the escape character (instead of
% \realbackslash, still used for index files). When everything uses @,
% this will be simpler.
%
\def\atdummies{%
\def\@{@@}%
\def\{ = \braceatcmd
\let\} = \rbraceatcmd
%
% Do the redefinitions.
\commondummies
\otherbackslash
}

% Called from \indexdummies and \atdummies.
%
\def\commondummies{%
%
% \definedummyword defines \#1 as \string\#1\space, thus effectively
% preventing its expansion. This is used only for control words,
% not control letters, because the \space would be incorrect for
% control characters, but is needed to separate the control word
% from whatever follows.
%
% For control letters, we have \definedummyletter, which omits the
% space.
%
% These can be used both for control words that take an argument and
% those that do not. If it is followed by \{arg\} in the input, then
% that will dutifully get written to the index (or wherever).
%
\def\definedummyword ##1{\def##1{\string##1\space}}%
\def\definedummyletter##1{\def##1{\string##1}}%
\let\definedummyaccent\definedummyletter
%
\commondummiesnofonts
%
\definedummyletter\_%
\definedummyletter\-%
%
% Non-English letters.
\definedummyword\AA
\definedummyword\AE
\definedummyword\DH
\definedummyword\L
Although these internal commands shouldn’t show up, sometimes they do.

% Assorted special characters.

\% We want to disable all macros so that they are not expanded by \write.
\macrolist
\%\n\normalturnoffactive\n\%
\% Handle some cases of @value -- where it does not contain any\n\% (non-fully-expandable) commands.
\makevalueexpandable
\}%
\% \commondummiesnofonts: common to \commondummies and \indexnofonts.\n\%
\def\commondummiesnofonts{%\n\% Control letters and accents.\n\definedummyletter!%\n\definedummyaccent"%\n\definedummyaccent\%\n\definedummyletter*%\n\definedummyaccent,\%\n\definedummyletter.,%\n\definedummyletter/V%\n\definedummyletter\%\n\definedummyaccent=%\n\definedummyletter=?%\n\definedummyaccent^%\n\definedummyaccent\%\n\definedummyaccent\--%\n\definedummyword\u\n\definedummyword\v\n\definedummyword\H\n\definedummyword\dotaccent\n\definedummyword\ogonek
% \indexnofonts is used when outputting the strings to sort the index
% by, and when constructing control sequence names. It eliminates all
% control sequences and just writes whatever the best ASCII sort string
% would be for a given command (usually its argument).
%
\def\indexnofonts{%
% Accent commands should become @asis.
\def\definedummyaccent##1{\let##1\asis}%
% We can just ignore other control letters.
\def\definedummyletter##1{\let##1\empty}%
% All control words become @asis by default; overrides below.
\let\definedummyword\definedummyaccent
%
\commondummiesnofonts
%
% Don't no-op \tt, since it isn't a user-level command
% and is used in the definitions of the active chars like <, >, [, etc.
% Likewise with the other plain tex font commands.
%\let\tt=\asis
%
\def\ { }%
\def\@{@}%
\def\_\{\normalunderscore}%
\def\-{}% @- shouldn't affect sorting
%
% Unfortunately, texindex is not prepared to handle braces in the
% content at all. So for index sorting, we map @ { and @ } to strings
% starting with [; since that ASCII character is between ASCII { and }.
\def\{|\{a}%
\def\bracechar{[a]}%
%
\def\|\{b}%
\def\bracechar{[b]}%
%
% Non-English letters.
\def\AA{AA}%
\def\AE{AE}%
\def\DH{DZZ}%
\def\L{L}%
\def\OE{OE}%
\def\O{O}%
\def\TH{ZZZ}%
\def\aa{aa}%
\def\ae{ae}%
\def\dh{dzz}%
\def\exclamdown{!}%
\def\{1}%
\def\oe{oe}%
\macrolist
}

% Undocumented (for FSFS 2nd ed.): @set txiindexlquoteignore makes us
% ignore left quotes in the sort term.
{\catcode`\=\active
 \gdef\indexlquoteignore{\let`=\empty}

\let\indexbackslash=0  % overridden during \printindex.
\let\SETmarginindex=\relax % put index entries in margin (undocumented)?

% Most index entries go through here, but \dosubind is the general case.
% #1 is the index name, #2 is the entry text.
\def\doind#1#2{\dosubind{#1}{#2}{}}

% Workhorse for all \fooindexes.
% #1 is name of index, #2 is stuff to put there, #3 is subentry --
% empty if called from \doind, as we usually are (the main exception
% is with most defuns, which call us directly).
%
\def\dosubind#1#2#3{%
  \iflinks
  {%
    % Store the main index entry text (including the third arg).
    \toks0 = {#2}%
    % If third arg is present, precede it with a space.
    \edef\thirdarg{#3}%
    \ifx\thirdarg\empty \else
      \toks0 = \expandafter{\the\toks0 \space #3}%
    \fi
    %
    \edef\writeto{\csname#1indfile\endcsname}%
    %
    \safewhatsit\dosubindwrite
  }%
  \fi
%
\endgraf}

% Write the entry in \toks0 to the index file:
%
\def\dosubindwrite{\toks0}
% Put the index entry in the margin if desired.
\ifx\SETmarginindexrelax\else
  \insertmargin{\hbox{\vrule height8pt depth3pt width0pt \the\toks0}}\%
\fi
%
% Remember, we are within a group.
\indexdummies % Must do this here, since \bf, etc expand at this stage
\def\backslashcurfont{\indexbackslash}% \indexbackslash isn't defined now
  % so it will be output as is; and it will print as backslash.
%
% Process the index entry with all font commands turned off, to
% get the string to sort by.
{\indexnofonts
  \edef\temp{\the\toks0}% need full expansion
  \xdef\indexsorttmp{\temp}%
}%
%
% Set up the complete index entry, with both the sort key and
% the original text, including any font commands. We write
% three arguments to \entry to the .?? file (four in the
% subentry case), texindex reduces to two when writing the .??s
% sorted result.
\edef\temp{%
  \write\writeto{%
    \string\entry{\indexsorttmp}{\noexpand\folio}{\the\toks0}}%
}%
\temp
}

% Take care of unwanted page breaks/skips around a whatsit:
%
% If a skip is the last thing on the list now, preserve it
% by backing up by \lastskip, doing the \write, then inserting
% the skip again. Otherwise, the whatsit generated by the
% \write or \pdfdest will make \lastskip zero. The result is that
% sequences like this:
% @end defun
% @tindex whatever
% @defun ...
% will have extra space inserted, because the \medbreak in the
% start of the @defun won't see the skip inserted by the @end of
% the previous defun.
%
% But don't do any of this if we're not in vertical mode. We
% don't want to do a \vskip and prematurely end a paragraph.
%
% Avoid page breaks due to these extra skips, too.
%
% But wait, there is a catch there:
% We’ll have to check whether \lastskip is zero skip. \ifdim is not
% sufficient for this purpose, as it ignores stretch and shrink parts
% of the skip. The only way seems to be to check the textual
% representation of the skip.
%
% The following is almost like \def\zeroskipmacro{0.0pt} except that
% the ``p'' and ``t'' characters have catcode \other, not 11 (letter).
%
% \edef\zeroskipmacro{\expandafter\the\csname z@skip\endcsname}
%
% \newskip\whatsitskip
% \newcount\whatsitpenalty
%
% ..., ready, GO:
%
% \def\safewhatsit#1{\ifhmode
#1%
%\else
% \lastskip and \lastpenalty cannot both be nonzero simultaneously.
% \whatsitskip = \lastskip
% \edef\lastskipmacro{\the\lastskip}\%
% \whatstipenalty = \lastpenalty
%
% If \lastskip is nonzero, that means the last item was a
% skip. And since a skip is discardable, that means this
% -\whatsitskip glue we’re inserting is preceded by a
% non-discardable item, therefore it is not a potential
% breakpoint, therefore no \nobreak needed.
% ifx\lastskipmacro\zeroskipmacro \else
% \vskip-\whatsitskip
% \fi
% \ifx\lastskipmacro\zeroskipmacro
% If \lastskip was zero, perhaps the last item was a penalty, and
% perhaps it was >=10000, e.g., a \nobreak. In that case, we want
% to re-insert the same penalty (values >10000 are used for various
% signals); since we just inserted a non-discardable item, any
% following glue (such as a \parskip) would be a breakpoint. For example:
% @defn deffn-whatever
% @vindex index-whatever
% Description.
% would allow a break between the index-whatever whatsit
% and the "Description." paragraph.
% ifnum\whatstipenalty>9999 \penalty\whatstipenalty \fi
\else
% On the other hand, if we had a nonzero \lastskip,
% this make-up glue would be preceded by a non-discardable item
% (the whatsit from the \write), so we must insert a \nobreak.
\nobreak\vskip\whatsitskip
\fi
\fi}

% The index entry written in the file actually looks like
% \entry {sortstring} {page} {topic}
% or
% \entry {sortstring} {page} {topic} {subtopic}
% The texindex program reads in these files and writes files
% containing these kinds of lines:
% \initial {c}
% before the first topic whose initial is c
% \entry {topic} {pagelist}
% for a topic that is used without subtopics
% \primary {topic}
% for the beginning of a topic that is used with subtopics
% \secondary {subtopic} {pagelist}
% for each subtopic.

% Define the user-accessible indexing commands
% @findex, @vindex, @kindex, @cindex.
\def\findex {\fnindex}
\def\kindex {\kyindex}
\def\cindex {\cpindex}
\def\vindex {\vrindex}
\def\tindex {\tpindex}
\def\pindex {\pgindex}
\def\cindexsub {%begingroup\obeylines\cindexsub
{\obeylines %
gdef\cindexsub "#1" #2^^M{\endgroup %
dosubind{cp} [#2] [#1]}}

% Define the macros used in formatting output of the sorted index material.

% @printindex causes a particular index (the ??s file) to get printed.
% It does not print any chapter heading (usually an @unnumbered).
%\
\parseargdef\printindex{%begingroup
\dobreak \chapheadingskip{10000}\
% \smallfonts \rm
\tolerance = 9500
\plainfrenchspacing
\everypar = {}% don't want the \ kern\-parindent from indentation suppression.
%
% See if the index file exists and is nonempty.
% Change catcode of @ here so that if the index file contains
% \initial { @ }
% as its first line, TeX doesn't complain about mismatched braces
% (because it thinks @ } is a control sequence).
\catcode`\@ = 11
\openin 1 \jobname.#1s
\ifeof 1
% \enddoublecolumns gets confused if there is no text in the index,
% and it loses the chapter title and the aux file entries for the
% index. The easiest way to prevent this problem is to make sure
% there is some text.
\putwordIndexNonexistent
\else
%
% If the index file exists but is empty, then \openin leaves \ifeof
% false. We have to make TeX try to read something from the file, so
% it can discover if there is anything in it.
\read 1 to \temp
\ifeof 1
\putwordIndexIsEmpty
\else
% Index files are almost Texinfo source, but we use \ as the escape
% character. It would be better to use @, but that's too big a change
% to make right now.
\def\indexbackslash{\backslashcurfont}%
\catcode`\\ = 0
\escapechar = `\%
\begindoublecolumns
\input \jobname.#1s
\enddoublecolumns
\fi
\fi
\closein 1
\endgroup}

% These macros are used by the sorted index file itself.
% Change them to control the appearance of the index.

\def\initial#1{%
% Some minor font changes for the special characters.
\let\tentt=\sectt \let\tt=\sectt \let\sf=\sectt
%
% Remove any glue we may have, we'll be inserting our own.
\removelastskip
% We like breaks before the index initials, so insert a bonus.
\nobreak
\vskip 0pt plus 3\baselineskip
\penalty 0
\vskip 0pt plus -3\baselineskip
%
% Typeset the initial. Making this add up to a whole number of
% baselineskips increases the chance of the dots lining up from column
% to column. It still won't often be perfect, because of the stretch
% we need before each entry, but it's better.
%
% No shrink because it confuses \balancecolumns.
\vskip 1.67\baselineskip plus .5\baselineskip
\leftline{\secbf #1}%%
% Do our best not to break after the initial.
\nobreak
\vskip .33\baselineskip plus .1\baselineskip
}}

% \entry typesets a paragraph consisting of the text (#1), dot leaders, and
% then page number (#2) flushed to the right margin. It is used for index
% and table of contents entries. The paragraph is indented by \leftskip.
%
% A straightforward implementation would start like this:
%\def\entry#1#2{...
% But this freezes the catcodes in the argument, and can cause problems to
% @code, which sets - active. This problem was fixed by a kludge---
% ```-``` was active throughout whole index, but this isn't really right.
% The right solution is to prevent \entry from swallowing the whole text.
% --kasal, 21nov03
\def\entry{%
\begingroup
%
% Start a new paragraph if necessary, so our assignments below can't
% affect previous text.
\par
%
% Do not fill out the last line with white space.
\parfillskip = 0in
%
% No extra space above this paragraph.
\parskip = 0in
%
% Do not prefer a separate line ending with a hyphen to fewer lines.
\finalhyphendemerits = 0
%
% \hangindent is only relevant when the entry text and page number
% don't both fit on one line. In that case, bob suggests starting the
dots pretty far over on the line. Unfortunately, a large
indentation looks wrong when the entry text itself is broken across
lines. So we use a small indentation and put up with long leaders.

% \hangafter is reset to 1 (which is the value we want) at the start
% of each paragraph, so we need not do anything with that.
% \hangindent = 2em
%
% When the entry text needs to be broken, just fill out the first line
% with blank space.
% \rightskip = 0pt plus1fil
%
% A bit of stretch before each entry for the benefit of balancing
% columns.
% \vskip 0pt plus1pt
%
% When reading the text of entry, convert explicit line breaks
% from @* into spaces. The user might give these in long section
% titles, for instance.
% \def*@[unskip\space\ignorespaces]%
% \def\entrybreak{\hfil\break}%
%
% Swallow the left brace of the text (first parameter):
% \afterassignment\doentry
% \let\temp =
%
% When reading the text of entry, convert explicit line breaks
% from @* into spaces. The user might give these in long section
% titles, for instance.
% \def*@[unskip\space\ignorespaces]%
% \def\entrybreak{\hfil\break}%
%
% Swallow the left brace of the text (first parameter):
% \afterassignment\doentry
% \let\temp =
%
% Swallow the left brace of the text (first parameter):
% \afterassignment\doentry
% \let\temp =
% % And now comes the text of the entry.
%
% #1 is the page number.
%
% The following is kludged to not output a line of dots in the index if
% there are no page numbers. The next person who breaks this will be
% cursed by a Unix daemon.
% \setbox\boxA = \hbox{#1}%
% \ifdim\wd\boxA = 0pt
% \% % This line with blank space. (The \hfil is overwhelmed with the
% % fill leaders glue in \indexdotfill if the page number does fit.)
\null\nobreak\indexdotfill % Have leaders before the page number.
%
% The \`\ here is removed by the implicit \unskip that TeX does as
% part of (the primitive) \par. Without it, a spurious underfull
% \hbox ensues.
\ifpdf
\pdfgettoks#1.%
\the\toksA
\else
#1%
\fi
\fi
\endgroup
%
% Like plain.tex's \dotfill, except uses up at least 1 em.
\def\indexdotfill{\cleaders
\hbox{$\mathsurround=0pt \mkern1.5mu.\mkern1.5mu$}
\hskip 1em plus 1fill}
\def\primary #1{\line{#1\hfil}}
\newskip\secondaryindent \secondaryindent=0.5cm
\def\secondary#1#2{\parfillskip=0in \parskip=0in
\hangindent=1in \hangafter=1
\noindent\hskip\secondaryindent\hbox{#1}\indexdotfill
\ifpdf
\pdfgettoks#2.\the\toksA % The page number ends the paragraph.
\else
#2
\fi
\par}
%
% Define two-column mode, which we use to typeset indexes.
% Adapted from the TeXbook, page 416, which is to say,
% the manmac.tex format used to print the TeXbook itself.
\catcode`@=11
\newbox\partialpage
\newdimen\doublecolumnhsize
\def\begindoublecolumns{\begingroup % ended by \enddoublecolumns

% Grab any single-column material above us.
\% Here is a possibility not foreseen in manmac: if we accumulate a
\% whole lot of material, we might end up calling this \output
\% routine twice in a row (see the doublecol-lose test, which is
\% essentially a couple of indexes with \setchapternewpage off). In
\% that case we just ship out what is in \partialpage with the normal
\% output routine. Generally, \partialpage will be empty when this
\% runs and this will be a no-op. See the indexspread.tex test case.
\ifvoid\partialpage \else
  \onepageout{\pagecontents\partialpage} \fi
\%eject \% run that output routine to set \partialpage
\% Use the double-column output routine for subsequent pages.
\output = {\doublecolumnout} \%
\% Change the page size parameters. We could do this once outside this
\% routine, in each of \smallbook, \afourpaper, and the default 8.5x11
\% format, but then we repeat the same computation. Repeating a couple
\% of assignments once per index is clearly meaningless for the
\% execution time, so we may as well do it in one place.
\% First we halve the line length, less a little for the gutter between
\% the columns. We compute the gutter based on the line length, so it
\% changes automatically with the paper format. The magic constant
\% below is chosen so that the gutter has the same value (well, +-<1pt)
\% as it did when we hard-coded it.
\% We put the result in a separate register, \doublecolumnhsize, so we
\% can restore it in \pagesofar, after \hsize itself has (potentially)
\% been clobbered.
\% \doublecolumnhsize = \hsize
  \begin{verbatim}
  \advance\doublecolumnhsize by -.04154\hsize
  \divide\doublecolumnhsize by 2
  \hsize = \doublecolumnhsize
  \end{verbatim}
\% Double the \vsize as well. (We don't need a separate register here,
\% since nobody clobbers \vsize.)
\vsize = 2\vsize
% The double-column output routine for all double-column pages except
% the last.
%
\def\doublecolumnout{%
\splitopskip=\topskip \splitmaxdepth=\maxdepth
% Get the available space for the double columns -- the normal
% (undoubled) page height minus any material left over from the
% previous page.
\dimen@ = \vsize
\divide\dimen@ by 2
\advance\dimen@ by -\ht\partialpage
%
% box0 will be the left-hand column, box2 the right.
\setbox0=\vsplit255 to\dimen@ \setbox2=\vsplit255 to\dimen@
\onepageout\pagesofar
\unvbox255
\penalty\outputpenalty
}%
%
% Re-output the contents of the output page -- any previous material,
% followed by the two boxes we just split, in box0 and box2.
\def\pagesofar{%
\unvbox\partialpage
%
\hsize = \doublecolumnhsize
\wd0=\hsize \wd2=\hsize
\hbox to\pagewidth{\box0\hfil\box2}%}
%
% All done with double columns.
\def\enddoublecolumns{%
% The following penalty ensures that the page builder is exercised
% _before_ we change the output routine. This is necessary in the
% following situation:
%
% The last section of the index consists only of a single entry.
% Before this section, \pagetotal is less than \pagegoal, so no
% break occurs before the last section starts. However, the last
% section, consisting of \initial and the single \entry, does not
% fit on the page and has to be broken off. Without the following
% penalty the page builder will not be exercised until \eject
% below, and by that time we'll already have changed the output
% routine to the \balancecolumns version, so the next-to-last
% double-column page will be processed with \balancecolumns, which
% is wrong: The two columns will go to the main vertical list, with
% the broken-off section in the recent contributions. As soon as
the output routine finishes, TeX starts reconsidering the page break. The two columns and the broken-off section both fit on the page, because the two columns now take up only half of the page goal. When TeX sees \eject from below which follows the final section, it invokes the new output routine that we've set after \balancecolumns below; \onepageout will try to fit the two columns and the final section into the vbox of \pageheight (see \pagebody), causing an overfull box.

Note that glue won't work here, because glue does not exercise the page builder, unlike penalties (see The TeXbook, pp. 280-281).
\penalty0
\output = {%
% Split the last of the double-column material. Leave it on the current page, no automatic page break.
\balancecolumns
%
% If we end up splitting too much material for the current page, though, there will be another page break right after this \output invocation ends. Having called \balancecolumns once, we do not want to call it again. Therefore, reset \output to its normal definition right away. (We hope \balancecolumns will never be called on to balance too much material, but if it is, this makes the output somewhat more palatable.)
\global\output = \onepageout{\pagecontents{PAGE}}%
}%
\eject
\endgroup % started in \begindoublecolumns
%
\pagegoal was set to the doubled \vsize above, since we restarted the current page. We're now back to normal single-column typesetting, so reset \pagegoal to the normal \vsize (after the \endgroup where \vsize got restored).
\pagegoal = \vsize
}
%
Called at the end of the double column material.
\def\balancecolumns{%
\setbox0 = \vbox{\unvbox255} % like \box255 but more efficient, see p.120.
\dimen@ = \ht0
\advance\dimen@ by \topskip
\advance\dimen@ by -\baselineskip
\divide\dimen@ by 2 % target to split to
\debug\message{final 2-column material height=\ht0, target=\dimen@.}%
\splittopskip = \topskip
% Loop until we get a decent breakpoint.
{ %
% badness = 10000
% loop
%global\setbox3 = \copy0
%global\setbox1 = \vsplit3 to \dimen@
%dim\ht3>\dimen@
%global\advance\dimen@ by 1pt
%repeat
%
%debug\message{split to \the\dimen@, column heights: \the\ht1, \the\ht3.}%
\setbox0=\vbox to\dimen@{\unvbox1}
\setbox2=\vbox to\dimen@{\unvbox3}
%
\pagesofar
}
\catcode`@ = `other

\message{sectioning,}
% Chapters, sections, etc.

% Let's start with @part.
\outer\parseargdef\part{\partzzz{#1}}
\def\partzzz#1{%
  \chapoddpage
  \null
  \vskip.3\vsize  % move it down on the page a bit
  \begingroup
    \noindent \titlefonts\rmisbold #1\par % the text
    \let\lastnode=\empty      % no node to associate with
    \writetocentry{part}{#1}{% but put it in the toc
      \headingsoff              % no headline or footline on the part page
    }
    \chapoddpage
  \endgroup
}
% unnumberedno is an oxymoron. But we count the unnumbered
% sections so that we can refer to them unambiguously in the pdf
% outlines by their "section number". We avoid collisions with chapter
% numbers by starting them at 10000. (If a document ever has 10000
% chapters, we're in trouble anyway, I'm sure.)
\newcount\unnumberedno \unnumberedno = 10000
\newcount\chapno
\newcount\secno    \secno=0
\newcount\subsecno \subsecno=0
\newcount\subsubsecno \subsubsecno=0

% This counter is funny since it counts through charcodes of letters A, B, ...
\newcount\appendixno \appendixno = `@
% We do the following ugly conditional instead of the above simple
% construct for the sake of pdftex, which needs the actual
% letter in the expansion, not just typeset.
%
\def\appendixletter{%
  \ifnum\appendixno=`A A%
  \else\ifnum\appendixno=`B B%
  \else\ifnum\appendixno=`C C%
  \else\ifnum\appendixno=`D D%
  \else\ifnum\appendixno=`E E%
  \else\ifnum\appendixno=`F F%
  \else\ifnum\appendixno=`G G%
  \else\ifnum\appendixno=`H H%
  \else\ifnum\appendixno=`I I%
  \else\ifnum\appendixno=`J J%
  \else\ifnum\appendixno=`K K%
  \else\ifnum\appendixno=`L L%
  \else\ifnum\appendixno=`M M%
  \else\ifnum\appendixno=`N N%
  \else\ifnum\appendixno=`O O%
  \else\ifnum\appendixno=`P P%
  \else\ifnum\appendixno=`Q Q%
  \else\ifnum\appendixno=`R R%
  \else\ifnum\appendixno=`S S%
  \else\ifnum\appendixno=`T T%
  \else\ifnum\appendixno=`U U%
  \else\ifnum\appendixno=`V V%
  \else\ifnum\appendixno=`W W%
  \else\ifnum\appendixno=`X X%
  \else\ifnum\appendixno=`Y Y%
  \else\ifnum\appendixno=`Z Z%
  \% The \the is necessary, despite appearances, because \appendixletter is
  \% expanded while writing the .toc file. \char\appendixno is not
  \% expandable, thus it is written literally, thus all appendixes come out
  \% with the same letter (or @) in the toc without it.
  \else\char\the\appendixno}
%
% Each @chapter defines these (using marks) as the number+name, number
% and name of the chapter. Page headings and footings can use
% these. @section does likewise.
\def\thischapter{} 
\def\thischapternum{} 
\def\thischaptername{} 
\def\thissection{}
\def\thissectionnum{ }
\def\thissectionname{ }

\newcount\absseclevel % used to calculate proper heading level
\newcount\secbase\secbase=0 % @raisesections/@lowersections modify this count

% @raisesections: treat @section as chapter, @subsection as section, etc.
\def\raisesections{\global\advance\secbase by -1}
\let\up=\raisesections % original BFox name

% @lowersections: treat @chapter as section, @section as subsection, etc.
\def\lowersections{\global\advance\secbase by 1}
\let\down=\lowersections % original BFox name

% we only have subsub.
\chardef\maxseclevel = 3
%
% A numbered section within an unnumbered changes to unnumbered too.
% To achieve this, remember the "biggest" unnum. sec. we are currently in:
\chardef\unnlevel = \maxseclevel
%
% Trace whether the current chapter is an appendix or not:
% \chapheadtype is "N" or "A", unnumbered chapters are ignored.
\def\chapheadtype{N}

% Choose a heading macro
% #1 is heading type
% #2 is heading level
% #3 is text for heading
\def\genhead#1#2#3{%
% Compute the abs. sec. level:
\absseclevel=#2
\advance\absseclevel by \secbase
% Make sure \absseclevel doesn't fall outside the range:
\ifnum \absseclevel < 0
 \absseclevel = 0
\else
 \ifnum \absseclevel > 3
  \absseclevel = 3
 \fi
\fi
% The heading type:
\def\headtype{#1}%
\if \headtype U%
 \ifnum \absseclevel < \unnlevel
  \chardef\unnlevel = \absseclevel
\fi
\fi
% @chapter, @appendix, @unnumbered. Increment top-level counter, reset
% all lower-level sectioning counters to zero.
%
% Also set \chaplevelprefix, which we prepend to @float sequence numbers
% (e.g., figures), q.v. By default (before any chapter), that is empty.
\let\chaplevelprefix = \empty
%
\outer\parseargdef\chapter{\numhead0{#1}} % normally numhead0 calls chapterzzz
\def\chapterzzz#1{% 
% section resetting is \global in case the chapter is in a group, such
% as an @include file.
\global\secno=0 \global\subsecno=0 \global\subsubsecno=0
\global\advance\chapno by 1
%
% Used for @float.
\gdef\chaplevelprefix{\the\chapno.}%
\resetallfloatnos
%
% \putwordChapter can contain complex things in translations.
\toks0=\expandafter{\putwordChapter}%
\message{\the\toks0 \space \the\chapno}%
%
% Write the actual heading.
\chapmacro{#1}{Ynumbered}{\the\chapno}%
%
% So @section and the like are numbered underneath this chapter.
\global\let\section = \numberedsec
\global\let\subsection = \numberedsubsec
\global\let\subsubsection = \numberedsubsubsec
%
\outer\parseargdef\appendix{\apphead0{#1}} % normally calls appendixzzz
%
\def\appendixzzz#1{% 
\global\secno=0 \global\subsecno=0 \global\subsubsecno=0
\global\advance\appendixno by 1
\gdef\chaplevelprefix{\appendixletter.}%
\resetallfloatnos
%
% \putwordAppendix can contain complex things in translations.
\toks0=\expandafter{\putwordAppendix}%
\message{\the\toks0 \space \appendixletter}%
%
% So @section and the like are numbered underneath this appendix.
\global\let\section = \appendixsec
\global\let\subsection = \appendixsubsec
\global\let\subsubsection = \appendixsubsubsec
\% normally \unmhead0 calls \unnumberedzzz:
\outer\parseargdef\unnumbered{\unmhead0[#1]}
\def\unnumberedzzz#1{%
  \global\secno=0 \global\subsecno=0 \global\subsubsecno=0
  \global\advance\unnumberedno by 1
  \%
  \% Since an unnumbered has no number, no prefix for figures.
  \global\let\chaplevelprefix = \empty
  \resetallfloatnos
  \%
  \%
  \% This used to be simply \message{#1}, but \TeX{} fully expands the
  \% argument to \message. Therefore, if #1 contained @-commands, \TeX{}
  \% expanded them. For example, in `@unnumbered The @cite{Book}', \TeX{}
  \% expanded @cite (which turns out to cause errors because \cite is meant
  \% to be executed, not expanded).
  \%
  \%
  \% Anyway, we don't want the fully-expanded definition of @cite to appear
  \% as a result of the \message, we just want `@cite' itself. We use
  \% \texttt{\the<toks register>} to achieve this: \TeX{} expands \texttt{\the<toks>}
  \% only once, \%
  \% simply yielding the contents of <toks register>. (We also do this for
  \% the toc entries.)
  \toks0 = {#1}%
  \message{((\the\toks0))}%
  \%
  \chapmacro{#1}{Ynothing}{\the\unnumberedno}%
  \%
  \global\let\section = \unnumberedsec
  \global\let\subsection = \unnumberedsubsec
  \global\let\subsubsection = \unnumberedsubsubsec
}\%

\% @centerchap is like @unnumbered, but the heading is centered.
\outer\parseargdef\centerchap{%
  \%
  \% Well, we could do the following in a group, but that would break
  \% an assumption that \chapmacro is called at the outermost level.
  \%
  \% Thus we are safer this way: --kasal, 24feb04
  \let\centerparametersmaybe = \centerparameters
  \unmhead0[#1]%
  \let\centerparametersmaybe = \relax
}\%

\%

\% @top is like @unnumbered.
\let\top\unnumbered

\%

% Sections.
\%
% normally numbered subsubseczzz:
\outer\parseargdef\numberedsubsubsec\{numhead3\{#1\}}
\def\numberedsubsubseczzz\#1\{
  \global\advance\subsubsecno by 1
  \sectionheading\{#1\} \{subsubsec\} \{Ynumbered\}%
    \{the\chapno.\the\secno.\the\subsecno.\the\subsubsecno\}%
}

% normally appendix subsubseczzz:
\outer\parseargdef\appendixsubsubsec\{apphead3\{#1\}}
\def\appendixsubsubseczzz\#1\{
  \global\advance\subsubsecno by 1
  \sectionheading\{#1\} \{subsubsec\} \{Yappendix\}%
    \{appendixletter.\the\secno.\the\subsecno.\the\subsubsecno\}%
}

% normally unnumbered subsubseczzz:
\outer\parseargdef\unnumberedsubsubsec\{unnmhead3\{#1\}}
\def\unnumberedsubsubseczzz\#1\{
  \global\advance\subsubsecno by 1
  \sectionheading\{#1\} \{subsubsec\} \{Ynothing\}%
    \{the\unnumberedno.\the\secno.\the\subsecno.\the\subsubsecno\}%
}

% These macros control what the section commands do, according
% to what kind of chapter we are in (ordinary, appendix, or unnumbered).
% Define them by default for a numbered chapter.
\let\section = \numberedsec
\let\subsection = \numberedsubsec
\let\subsubsection = \numberedsubsubsec

% Define @majorheading, @heading and @subheading

\def\majorheading\{
  \{\advance\chapheadingskip by 10pt \chapbreak \}%
  \parsearg\chapheadingzzz
}

\def\chapheading\{\chapbreak \parsearg\chapheadingzzz\%
\def\chapheadingzzz\#1\{
  \vbox{\chapfonts \raggedtitlesettings #1\par}%
  \nobreak\bigskip \nobreak
  \suppressfirstparagraphindent
}

% @heading, @subheading, @subsubheading.
\parseargdef\heading\{sectionheading\{#1\} \{sec\} \{Yomitfromtoc\} \%
  \suppressfirstparagraphindent\}
% These macros generate a chapter, section, etc. heading only
% (including whitespace, linebreaking, etc. around it),
% given all the information in convenient, parsed form.

% Args are the skip and penalty (usually negative)
\def\dobreak#1#2{\par\ifdim\lastskip<#1\removelastskip\penalty#2\vskip#1\fi}

% Parameter controlling skip before chapter headings (if needed)
\newskip\chapheadingskip

% Define plain chapter starts, and page on/off switching for it.
\def\chapbreak{\dobreak \chapheadingskip {-4000}}
\def\chappager{\par\vfill\supereject}
% Because \domark is called before \chapoddpage, the filler page will
% get the headings for the next chapter, which is wrong. But we don’t
% care — we just disable all headings on the filler page.
\def\chapoddpage{\chappager
  \ifodd\pageno \else
    \begingroup
      \headingsoff
      \null
      \chappager
    \endgroup
  \fi
}

\def\setchapternewpage #1 {\csname CHAPPAG#1\endcsname}

\def\CHAPPAGoff[\% \global\let\contentsalignmacro = \chappager
  \global\let\pchapsepmacro=\chapbreak
  \global\let\pagealignmacro=\chappager]

\def\CHAPPAGon[\% \global\let\contentsalignmacro = \chappager
  \global\let\pchapsepmacro=\chappager
  \global\let\pagealignmacro=\chappager
  \global\def\HEADINGSon{\HEADINGSsingle}]

\def\CHAPPAGodd[\% \global\let\contentsalignmacro = \chapoddpage
  \global\let\pchapsepmacro=\chapoddpage
  \global\let\pagealignmacro=\chapoddpage
% Chapter opening.
% #1 is the text, #2 is the section type (Ynumbered, Ynothing,
% Yappendix, Yomitfromtoc), #3 the chapter number.
% To test against our argument.
\def\Ynothingkeyword{Ynothing}
\def\Yomitfromtockeyword{Yomitfromtoc}
\def\Yappendixkeyword{Yappendix}
%
\def\chapmacro#1#2#3{%
% Insert the first mark before the heading break (see notes for \domark).
\let\prevchapterdefs=\lastchapterdefs
\let\prevsectiondefs=\lastsectiondefs
\gdef\lastsectiondefs{\gdef\thissectionnum{}%}
\gdef\thissectionname{#1}\gdef\thissection{}%
%
\def\temptype[#2]{%
\ifx\temptype\Ynothingkeyword
\gdef\lastchapterdefs{\gdef\thischaptername{#1}\gdef\thischapternum{}%
\gdef\thischapter{}}%
\else
\ifx\temptype\Yomitfromtockeyword
\gdef\lastchapterdefs{\gdef\thischaptername{#1}\gdef\thischapternum{}%
\gdef\thischapter{}}%
\else
\ifx\temptype\Yappendixkeyword
\toks0={#1}\
\xdef\lastchapterdefs{\gdef\thischaptername{\noexpand\the\toks0}%
\gdef\thischapternum{\appendixletter}%
\gdef\thischapter{
oexpand\putwordAppendix{}%}
\gdef\thischapternum:
\gdef\thischaptername{}}%
\else
\toks0={#1}%
\def\lastchapterdefs{%
\gdef\noexpand\thischaptername{\the\toks0}%
\gdef\noexpand\thischapternum{\appendixletter}%
\% \noexpand\putwordAppendix avoids expanding indigestible
\% commands in some of the translations.
\gdef\noexpand\thischapter{\noexpand\putwordAppendix{}}
\noexpand\thischapternum:
\noexpand\thischaptername{}}%
\else
\toks0={#1}%
\def\lastchapterdefs{%
\gdef\noexpand\thischaptername{\the\toks0}%
\gdef\noexpand\thischapternum{\the\chapno}%
\% \noexpand\putwordChapter avoids expanding indigestible
\% commands in some of the translations.
\gdef\noexpand\thischapter{\noexpand\putwordChapter{}}
% the pdfdest) after any page break, but before the actual text has
% been typeset. If the destination for the pdf outline is after the
% text, then jumping from the outline may wind up with the text not
% being visible, for instance under high magnification.
\donoderef{#2}%
%
% Typeset the actual heading.
\nobreak % Avoid page breaks at the interline glue.
\vbox{\raggedtitlesettings \hangindent=\wd0 \centerparametersmaybe
 \unhbox0 #1\par}%

\nobreak\bigskip % no page break after a chapter title
\nobreak

}% @centerchap -- centered and unnumbered.
def\centerparametersmaybe = \relax
def\centerparameters{%
  \advance\rightskip by 3\rightskip
  \leftskip = \rightskip
  \parfillskip = 0pt
}

% I don't think this chapter style is supported any more, so I'm not
% updating it with the new noderef stuff. We'll see. --karl, 11aug03.
%
def\setchapterstyle #1 {\csname CHAPF#1\endcsname}
%
def\unnchfopen #1{%
chapoddpage
\vbox{\chapfonts \raggedtitlesettings #1\par}%
\nobreak\bigskip\nobreak
}
def\chfopen #1#2{chapoddpage {\chapfonts
\vbox to 3in{\vfil \hbox to\hsize{\hfil #2} \hbox to\hsize{\hfil #1} \vfil}}%
\par\penalty 5000 %
}
def\centerchfopen #1{%
chapoddpage
\vbox{\chapfonts \raggedtitlesettings \hfill #1\hfill}%
\nobreak\bigskip \nobreak
}
def\CHAPFopen{%
\global\let\chapmacro=\chfopen 
\global\let\centerchapmacro=\centerchfopen}
% Section titles. These macros combine the section number parts and call the generic \sectionheading to do the printing.
%
\newskip\secheadingskip
\def\secheadingbreak{\dobreak \secheadingskip[-1000]}

% Subsection titles.
\newskip\subsecheadingskip
\def\subsecheadingbreak{\dobreak \subsecheadingskip[-500]}

% Subsubsection titles.
\def\subsubsecheadingskip{\subsecheadingskip}
\def\subsubsecheadingbreak{\subsecheadingbreak}

% Print any size, any type, section title.
%
% #1 is the text, #2 is the section level (sec/subsec/subsubsec), #3 is the section type for xrefs (Ynumbered, Ynothing, Yappendix), #4 is the section number.
%
\def\seckeyword{sec}
%
\def\sectionheading#1#2#3#4{% 
  \checkenv{}% should not be in an environment.
  \% Switch to the right set of fonts.
  \csname #2fonts\endcsname \rmisbold
  \% \def\sectionlevel{#2}
  \def\temptype{#3}
  \%
  % Insert first mark before the heading break (see notes for \domark).
  \let\prevsectiondefs=\lastsectiondefs
  \ifx\empty\temptype\nomark
  \ifx\sectionlevel\seckeyword
    \gdef\lastsectiondefs{\gdef\thissectionname{#1}\gdef\thissectionnum{#4}}%
  \else
    \gdef\lastsectiondefs{\gdef\thissectionnum{#4}}%
  \fi
  \fi
  \else\ifx\empty\temptype\nomark
  \else\ifx\empty\temptype\nomark
    \ifx\sectionlevel\seckeyword
      \toks0={#1}%
      \ddef\lastsectiondefs{\gdef\thissectionname{\the\toks0}}%
      \gdef\noexpand\thissection\thissectionnum{#4}%
    \fi
  \fi
\fi
\fi

%
% \noexpand\putwordSection avoids expanding indigestible
% commands in some of the translations.
\gdef\noexpand\thissection{\noexpand\putwordSection{ }
\noexpand\thissectionnum:
\noexpand\thissectionname{}}
%
\if\fi
\else
\ifx\sectionlevel\seckeyword
\toks0={#1}%
\edef\lastsectiondefs{%
\gdef\noexpand\thissectionname{\the\toks0}%
\gdef\noexpand\thissectionnum{#4}%
\gdef\noexpand\putwordSection{ }
\noexpand\thissectionnum:
\noexpand\thissectionname{}}%
%
\fi
\fi
\fi
\fi
\fi
\% Go into vertical mode. Usually we'll already be there, but we
\% don't want the following whatsit to end up in a preceding paragraph
\% if the document didn't happen to have a blank line.
\par
\%
\% Output the mark. Pass it through \safewhatsit, to take care of
\% the preceding space.
\safewhatsit\domark
\%
\% Insert space above the heading.
\csname #2headingbreak\endcsname
\%
\% Now the second mark, after the heading break. No break points
\% between here and the heading.
\let\prevsectiondefs=\lastsectiondefs
\domark
\%
\% Only insert the space after the number if we have a section number.
\ifx\temptype\Ynothingkeyword
\setbox0 = \ hbox { } %
\def\tocstyle { unn } %
\gdef\lastsection{#1} %
\else\ifx\temptype\Yomitfromtockeyword
% for @headings -- no section number, don’t include in toc,
% and don’t redefine \lastsection.
\setbox0 = \ hbox { } %
\else\fi
\fi
% This is so the last item on the main vertical list is a known
% \penalty > 10000, so \startdefun, etc., can recognize the situation
% and do the needful.
\penalty 10001
}

\message{toc,}
% Table of contents.
\newwrite\tocfile

% Write an entry to the toc file, opening it if necessary.
% Called from @chapter, etc.
%
% Example usage: \writetocentry{sec}{Section Name}{\the\chapno.\the\secno}
% We append the current node name (if any) and page number as additional
% arguments for the \{chap,sec,...\}entry macros which will eventually
% read this. The node name is used in the pdf outlines as the
% destination to jump to.
%
% We open the .toc file for writing here instead of at \setfilename (or
% any other fixed time) so that \contents can be anywhere in the document.
% But if \#1 is `omit', then we don't do anything. This is used for the
% table of contents chapter openings themselves.
%
\newif\iftocfileopened
\edef\omitkeyword{omit}%
%
\def\writetocentry#1#2#3{%
\edef\writetoctype{#1}%
\ifx\writetoctype\omitkeyword \else
\iftocfileopened\else
\immediate\openout\tocfile = \jobname.toc
\global\tocfileopenedtrue
\fi
\fi
%
% Tell \shipout to create a pdf destination on each page, if we're
% writing pdf. These are used in the table of contents. We can't
% just write one on every page because the title pages are numbered
% 1 and 2 (the page numbers aren't printed), and so are the first
% two pages of the document. Thus, we'd have two destinations named
% `1', and two named `2'.
\ifpdf \global\pdfmakepagedesttrue \fi
%

% These characters do not print properly in the Computer Modern roman
% fonts, so we must take special care. This is more or less redundant
% with the Texinfo input format setup at the end of this file.
%
def\activecatcodes{%
  \catcode`\"=active
  \catcode`\$=active
  \catcode`\<=active
  \catcode`\>=active
  \catcode`\\=active
  \catcode`\^=active
  \catcode`\_=active
  \catcode`\|=active
  \catcode`\-=active
}
%

% Read the toc file, which is essentially Texinfo input.
def\readtocfile{%
  \setupdatafile
  \activecatcodes
  \input \tocreadfilename
}

\newskip\contentsrightmargin \contentsrightmargin=1in
\newcount\savepageno \lastnegativepageno = -1

% Prepare to read what we've written to \tocfile.
%
def\startcontents#1{%
  % If @setchapternewpage on, and @headings double, the contents should
  % start on an odd page, unlike chapters. Thus, we maintain
  % \contentsalignmacro in parallel with \pagealignmacro.
  % From: Torbjorn Granlund <tege@matematik.su.se>
  \contentsalignmacro
  \immediate\closeout\tocfile
%
  % Don't need to put `Contents' or `Short Contents' in the headline.
  % It is abundantly clear what they are.
  \chapmacro{#1}{Yomitfromtoc}{]}
}
% \savepageno = \pageno
\begingroup               % Set up to handle contents files properly.
  \raggedbottom            % Worry more about breakpoints than the bottom.
  \advance\hsize by -\contentsrightmargin % Don't use the full line length.
%\% Roman numerals for page numbers.
  \ifnum \pageno>0 \global\pageno = \lastnegativepageno \fi
%
% redefined for the two-volume lispref. We always output on
% \jobname.toc even if this is redefined.
%
\def\tocreadfilename{\jobname.toc}
%
% Normal (long) toc.
%
\def\contents{%
  \startcontents{\putwordTOC}%
  \openin 1 \tocreadfilename\space
  \ifeof 1 \else
    \readtocfile
  \fi
  \vfill \eject
  \contentsalignmacro % in case @setchapternewpage odd is in effect
  \ifeof 1 \else
    \pdfmakeoutlines
  \fi
  \closein 1
  \endgroup
  \lastnegativepageno = \pageno
  \global\pageno = \savepageno
%
% And just the chapters.
\def\summarycontents{%
  \startcontents{\putwordShortTOC}%
    %
    \let\partentry = \shortpartentry
    \let\numchapentry = \shortchapentry
    \let\appentry = \shortchapentry
    \let\unnchapentry = \shortunnchapentry
    % We want a true roman here for the page numbers.
    \secfonts
    \let\rm=\shortcontrm \let\bf=\shortcontbf
    \let\sl=\shortcontsl \let\tt=\shortconttt
    \rm
    \hyphenpenalty = 10000
}
\advance\baselineskip by 1pt % Open it up a little.
\def\numsecentry##1##2##3##4{} \\
\let\appsecentry = \numsecentry \\
\let\unnsecentry = \numsecentry \\
\let\numsubsecentry = \numsecentry \\
\let\appssecentry = \numsecentry \\
\let\unnssecentry = \numsecentry \\
\let\numsubsecentry = \numsecentry \\
\let\appssecentry = \numsecentry \\
\let\unnssecentry = \numsecentry \\
\let\numsubsecentry = \numsecentry \\
\openin 1 \tocreadfilename \space \\
\ifeof 1 \else \\
\readtocfile \\
\fi \\
\vfill \eject \\
\contentsalignmacro % in case \setchapternewpage odd is in effect \\
\endgroup \\
\lastnegativepageno = \pageno \\
\global\pageno = \savepageno \\
} \\
\let\shortcontents = \summarycontents \\

% Typeset the label for a chapter or appendix for the short contents. 
% The arg is, e.g., `A' for an appendix, or `3' for a chapter. 
% 
% \def\shortchaplabel#1{ 
% \hbox to 1em{#1\hss} 
% 
% This space should be enough, since a single number is .5em, and the 
% widest letter (M) is 1em, at least in the Computer Modern fonts. 
% But use \hss just in case. 
% (This space doesn't include the extra space that gets added after 
% the label; that gets put in by \shortchapentry above.) 
% 
% We'd like to right-justify chapter numbers, but that looks strange 
% with appendix letters. And right-justifying numbers and 
% left-justifying letters looks strange when there is less than 10 
% chapters. Have to read the whole toc once to know how many chapters 
% there are before deciding ... 
% \hbox to 1em{#1\hss} 
% } \\

% These macros generate individual entries in the table of contents. 
% The first argument is the chapter or section name. 
% The last argument is the page number. 
% The arguments in between are the chapter number, section number, ... 

% Parts, in the main contents. Replace the part number, which doesn't 
% exist, with an empty box. Let's hope all the numbers have the same width.
% This parameter controls the indentation of the various levels. % Same as \defaultparindent.
\newdimen{tocindent} \tocindent = 15pt

% Now for the actual typesetting. In all these, #1 is the text and #2 is the % page number.
% % If the toc has to be broken over pages, we want it to be at chapters % if at all possible; hence the \penalty.
\def\dochapentry#1#2{\penalty-300 \vskip1\baselineskip plus.33\baselineskip minus.25\baselineskip \begingroup \chapentryfonts \tocentry{#1}{\dopageno\bgroup#2\egroup}\endgroup \nobreak \vskip .25\baselineskip plus.1\baselineskip }

\def\dosecentry#1#2{\begingroup \secentryfonts \leftskip=\tocindent \tocentry{#1}{\dopageno\bgroup#2\egroup}\endgroup}

\def\dosubsecentry#1#2{\begingroup \subsecentryfonts \leftskip=2\tocindent \tocentry{#1}{\dopageno\bgroup#2\egroup}\endgroup}

\def\dosubsubsecentry#1#2{\begingroup \subsubsecentryfonts \leftskip=3\tocindent \tocentry{#1}{\dopageno\bgroup#2\egroup}\endgroup}

% We use the same \entry macro as for the index entries.
\let\tocentry = \entry

% Space between chapter (or whatever) number and the title.
\def\labelspace{\hspace{1em} \relax}

\def\dopageno#1{{\rm #1}}
\def\doshortpageno#1{{\rm #1}}
\def\chapentryfonts{\secfonts \rm}
\def\secentryfonts{\textfonts}
\def\subsecentryfonts{\textfonts}
\def\subsubsecentryfonts{\textfonts}
\message{environments.}
% @foo ... @end foo.

% @tex ... @end tex escapes into raw TeX temporarily.
% One exception: @ is still an escape character, so that @end tex works.
% But @ or @@ will get a plain @ character.

\envdef\tex{%
  \setupmarkupstyle{tex}%
  \catcode `\=0 \catcode `{=1 \catcode `}=2
  \catcode `\$=3 \catcode `\&=4 \catcode `\#=6
  \catcode `\^=7 \catcode `\_=8 \catcode `\-=\active \let\-=\tie
  \catcode `\%=14
  \catcode `\+=\other
  \catcode `\-=\other
  \catcode `\|=\other
  \catcode `\<=\other
  \catcode `\|=\other
  \catcode `\|=\other
  \catode `\|=\other
  \escapechar=`\%
%
% ’ is active in math mode (mathcode"8000). So reset it, and all our
% other math active characters (just in case), to plain’s definitions.
% \mathactive
%
\let\b=\ptexb
\let\bullet=\ptexbullet
\let\c=\ptexc
\let\,=\ptexcomma
\let\.=\ptexdot
\let\ldots=\ptexdots
\let\equiv=\ptexequiv
\let\!=\ptexexclam
\let\i=\ptexi
\let\indent=\ptexindent
\let\noindent=\ptexnoindent
\let\{|=\ptexlbrack
\let\+=\tabalign
\let\}]=\ptexrbrack
\let\\=/\ptexslash
\let\*=\ptexstar
\let\%=\ptext
\expandafter \let\csname top\endcsname=\ptexp % outer
\let\frenchspacing=\plainfrenchspacing
%
\def\endldots{\mathinner{\ldots\ldots\ldots\ldots}}%
% There is no need to define \texttt{Etex}.

% Define \texttt{lisp} ... \texttt{end lisp}.
% \texttt{lisp} environment forms a group so it can rebind things,
% including the definition of \texttt{end lisp} (which normally is erroneous).

% Amount to narrow the margins by for @lisp.
\newskip\lispnarrowing \lispnarrowing = 0.4in

% This is the definition that ^^M gets inside @lisp, @example, and other
% such environments. 'null is better than a space, since it doesn't
% have any width.
\def\lisppar{\null\endgraf}

% This space is always present above and below environments.
\newskip\envskipamount \envskipamount = 0pt

% Make spacing and below environment symmetrical. We use \texttt{parskip} here
% to help in doing that, since in @example-like environments \texttt{parskip}
% is reset to zero; thus the \texttt{afterenvbreak} inserts no space -- but the
% start of the next paragraph will insert \texttt{parskip}.
%
% \def\aboveenvbreak[{}%
% \texttt{=10000} instead of <10000 because of a special case in \texttt{itemzzz} and
% \texttt{sectionheading}, q.v.
% \ifnum \lastpenalty=10000 \else
% \texttt{advance\texttt{envskipamount} by \texttt{parskip}}
% \endgraf
% \ifdim\lastskip<\envskipamount
% \texttt{removelastskip}
% \texttt{it's not a good place to break if the last penalty was \texttt{nobreak}}
% \texttt{or better ...}
% \fi\texttt{envskipamount}<10000 \texttt{\penalty=-50} \fi
% \texttt{vskip}\texttt{envskipamount}
% \fi
% \fi
% ]
%
% \let\afterenvbreak = \aboveenvbreak
%
% \texttt{nonarrowing} is a flag. If "set", \texttt{lisp} etc don't narrow margins; it will
% also clear it, so that its embedded environments do the narrowing again.
% \let\nonarrowing=\relax
%
% @cartouche ... @end cartouche: draw rectangle w/rounded corners around
% We want to swallow spaces (but not other tokens) after the fake
% @indent in our nonfill-environments, where spaces are normally
% active and set to @tie, resulting in them not being ignored after
% @indent.
\gdef\nonfillindent{\futurelet\temp\nonfillindentcheck}\
\gdef\nonfillindentcheck{%
\ifx\temp%
\expandafter\nonfillindentgobble%
\else%
\leavevmode\nonfillindentbox%
\fi%
}%
\endgroup
\def\nonfillindentgobble#1{\nonfillindent}
\def\nonfillindentbox{\hbox to \nonfillparindent{\hss}}

% If you want all examples etc. small: @set dispenvsize small.
% If you want even small examples the full size: @set dispenvsize nosmall.
% This affects the following displayed environments:
% @example, @display, @format, @lisp
%
\def\smallword{small}
\def\nosmallword{nosmall}
\let\SETdispenvsize\relax
\def\setnormaldispenv{%
\ifx\SETdispenvsize\smallword
% end paragraph for sake of leading, in case document has no blank
% line. This is redundant with what happens in \aboveenvbreak, but
% we need to do it before changing the fonts, and it's inconvenient
% to change the fonts afterward.
\ifnum\lastpenalty=10000\else\endgraf\fi
\smallexamplefonts \rm
\fi
}
\def\setsmalldispenv{%
\ifx\SETdispenvsize\nosmallword
\else
\ifnum\lastpenalty=10000\else\endgraf\fi
\smallexamplefonts \rm
\fi
}

% We often define two environments, @foo and @smallfoo.
% Let's do it in one command. #1 is the env name, #2 the definition.
\def\makedispenvdef#1#2{%
\expandafter\envdef\csname#1\endcsname {\setnormaldispenv #2}\
\expandafter\envdef\csname#1\endcsname {\setsmalldispenv #2}\
\expandafter\let\csname E#1\endcsname \afterenvbreak
}
\expandafter\let\csname Esmall#1\endcsname \afterenvbreak

\maketwodispenvdef#1#2#3{%
\makedispenvdef{#1}{#3}%
\makedispenvdef{#2}{#3}%
}
%
% @lisp: indented, narrowed, typewriter font;
% @example: same as @lisp.
%
% @smallexample and @smalllisp: use smaller fonts.
% Originally contributed by Pavel@xerox.
%
\maketwodispenvdef[lisp]{example}{%

\nonfillstart
\tt\setupmarkupstyle{example}%
\let\kbdfont = \kbdexamplefont % Allow @kbd to do something special.
\gobble % eat return
}
%
% @display/@smalldisplay: same as @lisp except keep current font.
%
\maketwodispenvdef{display}{%

\nonfillstart
\gobble
}
%
% @format/@smallformat: same as @display except don’t narrow margins.
%
\maketwodispenvdef{format}{%
\let\nonarrowing = t%
\nonfillstart
\gobble
}
%
% @flushleft: same as @format, but doesn’t obey \SETdispenvsize.
\envdef\flushleft{%
\let\nonarrowing = t%
\nonfillstart
\gobble
}
\let\Eflushleft = \afterenvbreak
%
% @flushright.
%
\envdef\flushright{%
\let\nonarrowing = t%

\nonfillstart
\advance\leftskip by 0pt plus 1fillrelax
\gobble
}
\let\Eflushright = \afterenvbreak
% @raggedright does more-or-less normal line breaking but no right justification. From plain.tex.
\envdef\raggedright{% \rightskip0pt plus2em \spaceskip.3333em \xspaceskip.5em\relax
}
\let\Eraggedright\par
\envdef\raggedleft{% \parindent=0pt \leftskip0pt plus2em \spaceskip.3333em \xspaceskip.5em \parfillskip=0pt \hbadness=10000 % Last line will usually be underfull, so turn off % badness reporting.
}
\let\Eraggedleft\par
\envdef\raggedcenter{% \parindent=0pt \rightskip0pt plus1em \leftskip0pt plus1em \spaceskip.3333em \xspaceskip.5em \parfillskip=0pt \hbadness=10000 % Last line will usually be underfull, so turn off % badness reporting.
}
\let\Eraggedcenter\par
% @quotation does normal linebreaking (hence we can't use \nonfillstart) % and narrows the margins. We keep \parskip nonzero in general, since % we're doing normal filling. So, when using \aboveenvbreak and % \afterenvbreak, temporarily make \parskip 0.
% \makedispenvdef \quotation { \quotationstart }
% \def\quotationstart { \indentedblockstart % same as \indentedblock, but increase right margin too. \ifx\nonarrowing\relax \advance\rightskip by \disnarrowing \i \parsearg\quotationlabel }
%
% We have retained a nonzero parskip for the environment, since we're % doing normal filling.
% we need the curly braces so that makeinfo sees the @verb command, eg:
% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
%
%
% [Knuth] p.344; only we need to do the other characters Texinfo sets
% active too. Otherwise, they get lost as the first character on a
% verbatim line.
\def\dospecials{%
\do\ \do\\\do\{\do\}\do\$\do\&%
\do\#\do\^\do\^^K\do\_\do\^^A\do\%\do\~%
\do\<\do\>\do\|\do\@\do+\do\"%
% Don't do the quotes -- if we do, @set txicodequoteundirected and
% @set txicodequotebacktick will not have effect on @verb and
% @verbatim, and ?` and !` ligatures won't get disabled.
%\do\`\do\'%
}
%
% [Knuth] p. 380
\def\uncatcodespecials{%
\def\do##1{\catcode`##1=\other}\dospecials}
%
% Setup for the @verb command.
%
% Eight spaces for a tab
\begingroup
\catcode`\^^I=\active
\gdef\tabeightspaces{\catcode`\^^I=\active\def^^I{\ \ \ \ \ \ \ \ }}
\endgroup
%
\def\setupverb{%
\tt % easiest (and conventionally used) font for verbatim
\def\par{\leavevmode\endgraf}%
\setupmarkupstyle{verb}%
\tabeightspaces
% Respect line breaks,
% print special symbols as themselves, and
% make each space count
% must do in this order:
\obeylines \uncatcodespecials \sepspaces
}
% Setup for the @verbatim environment
%
% Real tab expansion.
\newdimen\tabw \setbox0=\hbox{\tt\space} \tabw=8\wd0 % tab amount
%
% We typeset each line of the verbatim in an \hbox, so we can handle

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% tabs. The \global is in case the verbatim line starts with an accent, % or some other command that starts with a begin-group. Otherwise, the % entire \verbbox would disappear at the corresponding end-group, before % it is typeset. Meanwhile, we can’t have nested verbatim commands % (can we?), so the \global won’t be overwriting itself.
\newbox\verbbox
\def\starttabbox\{
\global\setbox\verbbox\hbox\bgroup
\begin{group}
\catcode`\^^I=\active
\gdef\tabexpand\{
\catcode`\^^I=\active
\def\^^I\{\leavevmode\egroup
\dimen\verbbox=\wd\verbbox % the width so far, or since the previous tab
\divide\dimen\verbbox by\tabw
\multiply\dimen\verbbox by\tabw % compute previous multiple of \tabw
\advance\dimen\verbbox by\tabw % advance to next multiple of \tabw
\wd\verbbox=\dimen\verbbox \box\verbbox \starttabbox
\}% 
\}
\endgroup

% start the verbatim environment.
\def\setupverbatim\{
\let\nonarrowing=t%
\nonfillstart
\tt % easiest (and conventionally used) font for verbatim % The \leavevmode here is for blank lines. Otherwise, we would % never \starttabbox and the \egroup would end verbatim mode.
\def\par\{\leavevmode\egroup\box\verbbox\endgraf\}%
\tabexpand
\setupmarkupstyle{verbatim}%
% Respect line breaks, % print special symbols as themselves, and % make each space count. % Must do in this order:
\obeylines \uncatcodespecials \sepspaces
\everypar{\starttabbox}% 
%
% Do the \verb magic: verbatim text is quoted by unique % delimiter characters. Before first delimiter expect a % right brace, after last delimiter expect closing brace:
% % \def\doverb’{<char>#1<char>’}{#1}
% % [Knuth] p. 382; only eat outer { }
\begin{group}
\catcode`\[=1\catcode`\]=2\catcode`\{=\other\catcode`\}=\other
\gdef\doverb{#1[\def\next\##1#1][\##1\endgroup]\next]
\endgroup
%
\def\verb{\begingroup\setupverb\doverb}
%
%
% Do the \verbatim magic: define the macro \doverbatim so that
% the (first) argument ends when '@end verbatim' is reached, ie:
%
% \def\doverbatim#1@end verbatim[#1]
%
% For Texinfo it's a lot easier than for LaTeX,
% because texinfo's \verbatim doesn't stop at 'end{verbatim}':
% we need not redefine \', '{' and '}'.
%
% Inspired by LaTeX's verbatim command set [latex.ltx]
%
\begingroup
\catcode`\[=\active
\obeylines
%
% ignore everything up to the first ^^M, that's the newline at the end
% of the @verbatim input line itself. Otherwise we get an extra blank
% line in the output.
\xdef\doverbatim#1^^M#2@end verbatim{#2\noexpand\end\gobble verbatim}%
%n We really want {...\end verbatim} in the body of the macro, but
%n without the active space; thus we have to use \xdef and \gobble.
\endgroup
%
\envdef\verbatim{\setupverbatim\doverbatim}
\let\Everbatim = \afterenvbreak

% @verbatiminclude FILE - insert text of file in verbatim environment.
%
\def\verbatiminclude{\parseargusing\filenamecatcodes\doverbatiminclude}
%
\def\doverbatiminclude#1{%
  \makevalueexpandable
  \setupverbatim
  \indexnofonts % Allow `@@' and other weird things in file names.
  \wlog{texinfo.tex: doing @verbatiminclude of #1^^J}%
  \input #1
  \afterenvbreak
}
% @copying ... @end copying.
% Save the text away for @insertcopying later.
%
% We save the uninterpreted tokens, rather than creating a box.
% Saving the text in a box would be much easier, but then all the
% typesetting commands (@smallbook, font changes, etc.) have to be done
% beforehand -- and a) we want @copying to be done first in the source
% file; b) letting users define the frontmatter in as flexible order as
% possible is very desirable.
%
\def\copying{\checkenv{}\begingroup\scanargctxt\docopying}
\def\docopying#1@end copying{\endgroup\def\copyingtext{#1}}
%
\def\insertcopying{\begingroup
\parindent = 0pt  % paragraph indentation looks wrong on title page
\scanexp\copyingtext
\endgroup}

\message{defuns,}
% @defun etc.
\newskip\defbodyindent \defbodyindent=.4in
\newskip\defargsindent \defargsindent=50pt
\newskip\deflastargmargin \deflastargmargin=18pt
\newcount\defunpenalty

% Start the processing of @deffn:
\def\startdefun{%
\ifnum\lastpenalty<10000
\medbreak
\defunpenalty=10003 % Will keep this @deffn together with the
% following @def command, see below.
%                  % Following @def command, see below.
  % if there are two @def commands in a row, we'll have a \nobreak,
  % which is there to keep the function description together with its
  % header. But if there's nothing but headers, we need to allow a
  % break somewhere. Check specifically for penalty 10002, inserted
  % by \printdefunline, instead of 10000, since the sectioning
  % commands also insert a nobreak penalty, and we don't want to allow
  % a break between a section heading and a defun.
  %
% As a further refinement, we avoid "club" headers by signalling
% with penalty of 10003 after the very first @deffn in the
% sequence (see above), and penalty of 10002 after any following % @def command.
\ifnum\lastpenalty=10002 \penalty2000 \else \defunpenalty=10002 \fi
% Similarly, after a section heading, do not allow a break.
% But do insert the glue.
\medskip % preceded by discardable penalty, so not a breakpoint
\fi
%
\parindent=0in
\advance\leftskip by \defbodyindent
\exdentamount=\defbodyindent
}

\def\dodefunx#1{%
% First, check whether we are in the right environment:
\checkenv#1%
%
% As above, allow line break if we have multiple x headers in a row.
% It's not a great place, though.
\ifnum\lastpenalty=10002 \penalty3000 \else \defunpenalty=10002 \fi
%
% And now, it's time to reuse the body of the original defun:
\expandafter\gobbledefun#1%
}
\def\gobbledefun#1\startdefun{}

% \printdefunline \deffnheader{text}
%
\def\printdefunline#1#2{%
\begingroup
% call \deffnheader:
#1#2 \endheader
% common ending:
\interlinepenalty = 10000
\advance\rightskip by 0pt plus 1fil\relax
\endgraf
\nobreak\wskip \parskip
\penalty\defunpenalty \% signal to \startdefun and \dodefunx
% Some of the @defun-type tags do not enable magic parentheses,
% rendering the following check redundant. But we don't optimize.
\checkparencounts
\endgroup
}

\def\Edefun{\endgraf\medbreak}

% \makedefun{deffn} creates \deffn, \deffnx and \Edeffn;
% the only thing remaining is to define \deffnheader.
%
\def
\makedefun#1{\
\expandafter\let\csname E#1\endcsname = \Edefun
\edef\temp{\noexpand\domakedefun
\makecsname{#1}\makecsname{#1x}\makecsname{#1header}}\%
\temp
}
%
% \domakedefun \deffn \deffnx \deffnheader
%
% Define \deffn and \deffnx, without parameters.
% \deffnheader has to be defined explicitly.
%
\def
\domakedefun#1#2#3{\
\envdef#1{\
\startdefun
\doingtypefnfalse % distinguish typed functions from all else
\parseargusing\activeparens{\printdefunline#3}%
}%
\def#2{\dodefunx#1}%
\def#3%
}
%
\newif\ifdoingtypefn       % doing typed function?
\newif\ifrettypetypeownline % typeset return type on its own line?
%
% @deftypefnnewline on|off says whether the return type of typed functions
% are printed on their own line. This affects @deftypefn, @deftypefun,
% @deftypeop, and @deftypemethod.
%
\parseargdef\deftypefnnewline{\
\def\temp{#1}\
\ifx\temp\onword
\expandafter\let\csname SETtxideftypefnnl\endcsname = \empty
\else\ifx\temp\offword
\expandafter\let\csname SETtxideftypefnnl\endcsname = \relax
\else
\errhelp = \EMsimple
\errmessage{Unknown \@txideftypefnnl value \'\temp',
must be on|off}%
\fi
\fi
%
% Untyped functions:
Untyped variables:

\makedefun{defvr}{#1 \{\deftypevrheader{#1} \} \} }

\makedefun{defcv}{#1 \{\defcvof{#1 \ putwordof}\} }

\defcvof{category of\class \var \args}
\deftypecvof{#1 #2 \} }

Types:

\makedefun{deftp}{#1 #2 #3 \{\deftypefnheader{#2} \} \} }

\makedefun{defun}{\putwordDeffunc \} }

\makedefun{defmac}{\putwordDefmac \} }

\makedefun{defspec}{\putwordDefspec \} }

\makedefun{deftypefun}{\putwordDeffunc \} }

\makedefun{defvar}{\putwordDefvar \} }

\makedefun{defopt}{\putwordDefopt \} }

\makedefun{deftypevar}{\putwordDefvar \} }

\makedefun{defmethod}{\putwordMethodon \} }

\makedefun{deftypemethod}{\putwordMethodon \} }

\makedefun{defivar}{\putwordInstanceVariableof \} }

\makedefun{deftypeivar}{\putwordInstanceVariableof \} }

% \defname, which formats the name of the @def (not the args).
% #1 is the category, such as "Function".
% #2 is the return type, if any.
% #3 is the function name.

% We are followed by (but not passed) the arguments, if any.
% \par
% Get the values of \leftskip and \rightskip as they were outside the @def...
% Allow all lines to be underfull without complaint:
tolerance=10000 \hbadness=10000
\exdentamount=\defbodyindent

{%
defun fonts. We use typewriter by default (used to be bold) because:
  . we're printing identifiers, they should be in tt in principle.
  . in languages with many accents, such as Czech or French, it's
    common to leave accents off identifiers. The result looks ok in
    tt, but exceedingly strange in rm.
  . we don't want -- and --- to be treated as ligatures.
  . this still does not fix the ?' and !' ligatures, but so far no
    one has made identifiers using them :).
def \tt
def\temp[#2]% text of the return type
\ifx\temp\empty\else
  \tclosetemp% typeset the return type
\ifrettypeownline
  % put return type on its own line; prohibit line break following:
  \hfilvadjust{\nobreak}break
\else
  \space % type on same line, so just followed by a space
\fi
\fi
% no return type
#3% output function name
}%
{\rm\enskip}% hskip 0.5 em of \tenrm
%
defunargs#1[% use sl by default (not ttsl),
tt for the names.
def \sl \hyphenchar\font=0%
%
% On the other hand, if an argument has two dashes (for instance), we
% want a way to get ttsl. We used to recommend @var for that, so
% leave the code in, but it's strange for @var to lead to typewriter.
% Nowadays we recommend @code, since the difference between a ttsl hyphen
% and a tt hyphen is pretty tiny. @code also disables ?' !'.
def\var##1{{\setupmarkupstyle{var}\ttslanted{##1}}}%
% We want ()&[] to print specially on the defun line.
% \def\activeparens{%
  \catcode`\(=\active \catcode`\)=\active
  \catcode`\[=\active \catcode`\]=\active
  \catcode`\&=\active
}

% Make control sequences which act like normal parenthesis chars.
% Be sure that we always have a definition for `(', etc. For example,
% if the fn name has parens in it, \boldbrax will not be in effect yet,
% so TeX would otherwise complain about undefined control sequence.
{%
\activeparens
\global\let(=\lparen \global\let)=\rparen
\global\let[=\lbrack \global\let]=\rbrack
\global\let\& = \&

\gdef\boldbrax{\let(=\opnr\let)=\clnr\let[=\lbrb\let]=\rbrb}
\gdef\magicamp{\let\&=\amprm}
%
\newcount\parencount

% If we encounter &foo, then turn on ()-hacking afterwards
\newif\ifampseen
\def\amprm#1 {\ampseentrue{\bf\&#1 } }

\def\parenfont{%
  \ifampseen
    % At the first level, print parens in roman,
    % otherwise use the default font.
    \ifnum \parencount=1 \rm \fi
  \else
    % The \sf parens (in \boldbrax) actually are a little bolder than
    % the contained text. This is especially needed for [ and ] .
    \sf
  \fi
}
\def\infirstlevel#1{%
  \ifampseen
    \ifnum\parencount=1
      %
      \fi
      \else
    \fi
}
\def\unfirstlevel#1{%
  \ifampseen
    \ifnum\parencount=1
      %
      \fi
      \else
    \fi
}
\def\bfafterword#1 {#1 \bf}
\def\opnr {%
  \global\advance\parencount by 1
  \{\parenfont {}%
  \infirstlevel \bfafterword
  \}
\def\clnr {%
  \{\parenfont {}%
  \infirstlevel \sl
  \global\advance\parencount by -1
  \}

\newcount\brackcount
\def\lbrb {%
  \global\advance\brackcount by 1
  \{\bf [}%
  \}
\def\rbrb {%
  \{\bf ]}%
  \global\advance\brackcount by -1
  \}
\def\checkparencounts {%
  \ifnum\parencount=0 \else \badparencount \fi
  \ifnum\brackcount=0 \else \badbrackcount \fi
  \}
% these should not use \errmessage; the glibc manual, at least, actually
% has such constructs (when documenting function pointers).
\def\badparencount {%
  \message {Warning: unbalanced parentheses in @def...}%
  \global\parencount=0
  \}
\def\badbrackcount {%
  \message {Warning: unbalanced square brackets in @def...}%
  \global\brackcount=0
  }
\message {macros,}
% @macro.

% To do this right we need a feature of e-TeX, \scantokens,
% which we arrange to emulate with a temporary file in ordinary TeX.
\ifx\eTeXversion\thisisundefined
\newwrite\macscribble
\def\scantokens#1{%
 \toks0={#1}%
 \immediate\openout\macscribble=\jobname.tmp
 \immediate\write\macscribble{\the\toks0}%
 \immediate\closeout\macscribble
 \input \jobname.tmp
}
}\fi

\def\scanmacro#1{\begingroup
 \newlinechar`\^^M
 \let\xeatspaces\eatspaces
%
% Undo catcode changes of \startcontents and \doprintindex
% When called from @insertcopying or (short)caption, we need active
% backslash to get it printed correctly. Previously, we had
% \catcode`\=@=other instead. We'll see whether a problem appears
% with macro expansion.--kasal, 19aug04
 \catcode`@=0 \catcode`\=\active \escapechar=`\@
%
% ... and for \example:
 \spaceisspace
%
% The \empty here causes a following catcode 5 newline to be eaten as
% part of reading whitespace after a control sequence. It does not
% eat a catcode 13 newline. There's no good way to handle the two
% cases (untried: maybe e-TeX's \everyeof could help, though plain TeX
% would then have different behavior). See the Macro Details node in
% the manual for the workaround we recommend for macros and
% line-oriented commands.
%
\scantokens{#1\empty}%
\endgroup}

\def\scanexp#1{%
 \def\temp{\noexpand\scanmacro{#1}}%
 \temp
}

\newcount\paramno   % Count of parameters
\newtoks\macname    % Macro name
\newif\ifrecursive  % Is it recursive?

% List of all defined macros in the form
%   \definedummyword\macro1\definedummyword\macro2...
% Currently is also contains all @aliases; the list can be split
% if there is a need.
\def\macrolist{ }

% Add the macro to \macrolist
\def\addtomacrolist#1{\expandafter\addtomacrolistxxx \csname#1\endcsname}
\def\addtomacrolistxxx#1{\toks0 = \expandafter{\macrolist\definedummyword#1}\%\xdef\macrolist{\the\toks0}\%}

% Utility routines.
% This does \let #1 = #2, with \csnames; that is,
% \let \csname#1\endcsname = \csname#2\endcsname
% (except of course we have to play expansion games).
% \def\cslet#1#2{\expandafter\let\csname#1\expandafter\endcsname\csname#2\endcsname}
% Trim leading and trailing spaces off a string.
% Concepts from aro-bend problem 15 (see CTAN).
{\catcode`@=11\gdef\eatspaces #1{\expandafter\trim@\expandafter{#1\hspace{1pt}}}\gdef\trim@ #1{\trim@@@\empty\hspace{1pt}}\gdef\unbrace#1{#1}}

% Trim a single trailing ^^M off a string.
{\catcode`\^^M=other\catcode`Q=3%\gdef\eatcr #1{\eatcra #1Q\hspace{1pt}}\gdef\eatcra#1Q\hspace{1pt}{\eatcrb#1Q}\gdef\eatcrb#1Q#2Q{#1}}

% Macro bodies are absorbed as an argument in a context where
% all characters are catcode 10, 11 or 12, except \ which is active
% (as in normal texinfo). It is necessary to change the definition of
% \ to recognize macro arguments; this is the job of \mbodybackslash.
% Non-ASCII encodings make 8-bit characters active, so un-activate
% them to avoid their expansion. Must do this non-globally, to
% confine the change to the current group.
% It's necessary to have hard CRs when the macro is executed. This is
% done by making ^^M (\endlinechar) catcode 12 when reading the macro
% body, and then making it the \newlinechar in \scanmacro.
%
\def\scanctxt{% used as subroutine
    \catcode`\"=\other
    \catcode`\+=\other
    \catcode`\<=\other
    \catcode`\>=\other
    \catcode`\@=\other
    \catcode`\^=\other
    \catcode`\_=\other
    \catcode`\|=\other
    \catcode`\-=\other
    \ifx\declaredencoding\ascii \else \setnonasciicharscatcodenonglobal\other \fi
}

\def\scanargctxt{% used for copying and captions, not macros.
    \scanctxt
    \catcode`\\=\other
    \catcode`^^M=\other
}

\def\macrobodyctxt{% used for @macro definitions
    \scanctxt
    \catcode`\{=\other
    \catcode`\}=\other
    \catcode`^^M=\other
    \usembodybackslash
}

\def\macroargctxt{% used when scanning invocations
    \scanctxt
    \catcode`\\=0
}

% why catcode 0 for \ in the above?  To recognize \\{| |} as "escapes"
% for the single characters \ | }.  Thus, we end up with the "commands"
% that would be written @\ @{ } in a Texinfo document.
%
% We already have @ | and @}.  For @\, we define it here, and only for
% this purpose, to produce a typewriter backslash (so, the @\ that we
% define for @math can't be used with @macro calls):
%
\def\normalbackslash{%
%
% We would like to do this for \, too, since that is what makeinfo does.
% But it is not possible, because Texinfo already has a command @, for a
% cedilla accent.  Documents must use @comma{} instead.
%
\% \texttt{\textbackslash\ anythingelse} will almost certainly be an error of some kind.

\% \texttt{\textbackslash\ mbodybackslash} is the definition of \texttt{\textbackslash} in @macro bodies.  
\% It maps \texttt{\textbackslash foo} => \texttt{\csname macarg.foo\endcsname} => \#N
\% where N is the macro parameter number.  
\% We define \texttt{\csname macarg.\endcsname} to be \texttt{\textbackslash realbackslash}, so 
\% \texttt{\textbackslash} in macro replacement text gets you a backslash.

% 
\{\texttt{\catcode`@=0 @catcode`\@=@active  
@gdef@usembodybackslash{@let\@mbodybackslash}  
@gdef@mbodybackslash#1\{@csname macarg.#1@endcsname}\}  
\expandafter\def\csname macarg.\endcsname{\textbackslash realbackslash}  
\def\margbackslash#1{\char\#1 }  
\def\macro{\recursivefalse\parsearg\macroxxx}  
\def\rmacro{\recursivetrue\parsearg\macroxxx}  
\def\macroxxx#1{\getargs{#1}% now \macname is the macname and \argl the arglist  
\if\argl\empty\relax% no arguments  
\paramno=0\relax\else\expandafter\parsemargdef \argl;\%  
\if\paramno>256\relax%  
\if\eTeXversion\thisisundefined\errhelp = \EMsimple\errmessage{You need e\TeX to compile a file with macros with more than 256 arguments}\fi\fi\else\expandafter\ifx\csname \the\macname\endcsname \relax\else  
\message{Warning: redefining \the\macname}  
\global\cslet{macsave.\the\macname}{\the\macname}\global\expandafter\let\csname ismacro.\the\macname\endcsname=1\global\addtomacrolist{\the\macname}\% \fi\fi\global\begingroup\macrobodyctxt\ifdefrecursive\expandafter\parsermacbody\else\expandafter\parsemacbody\fi\global\edef\unmacro{\%
\if1\csname ismacro.#1\endcsname
\global\cslet{#1}{macsave.#1}\
\global\expandafter\let \csname ismacro.#1\endcsname=0\%
% Remove the macro name from \macrolist:
\begingroup
\expandafter\let\csname#1\endcsname \relax
\let\definedummyword\unmacrodo
\xdef\macrolist{\macrolist}\
\endgroup
\else
\errmessage{Macro #1 not defined}\
\fi
}

% Called by \do from \dounmacro on each macro. The idea is to omit any
% macro definitions that have been changed to \relax.
%
\def\unmacrodo#1{%
\ifx #1\relax
% remove this
\else
\noexpand\definedummyword \noexpand#1% 
\fi
}

% This makes use of the obscure feature that if the last token of a
% \texttt{<parameter list>} is $\#$, then the preceding argument is delimited by
% an opening brace, and that opening brace is not consumed.
\def\getargs#1{\getargsxxx#1{} }
\def\getargsxxx#1#2#{\getmacname #1 \relax\getmacargs}
\def\getmacname#1 #2\relax\macname={#1}
\def\getmacargs#1{\def\argl{#1}}

% For macro processing make $\@$ a letter so that we can make Texinfo private macro names.
\edef\textiatcatcode{\the\catcode\@}
\catcode `@=11\relax

% Parse the optional \texttt{\{params\}} list. Set up \texttt{\paramno} and \texttt{\paramlist}
% so \texttt{\defmacro} knows what to do. Define \texttt{\macarg.BLAH} for each BLAH
% in the params list to some hook where the argument si to be expanded. If
% there are less than 10 arguments that hook is to be replaced by \texttt{\#\#N} where N
% is the position in that list, that is to say the macro arguments are to be
% defined `a la TeX in the macro body.
%
% That gets used by \texttt{\mbodybackslash} (above).
%
% We need to get `macro parameter char $\#$ into several definitions.
% The technique used is stolen from LaTeX: let \texttt{\hash} be something
% unexpansible, insert that wherever you need a #, and then redefine
% it to # just before using the token list produced.
%
% The same technique is used to protect \#spaces till just before
% the macro is used.
%
% If there are 10 or more arguments, a different technique is used, where the
% hook remains in the body, and when macro is to be expanded the body is
% processed again to replace the arguments.
%
% In that case, the hook is \the\#oks N-1, and we simply set \#oks N-1 to the
% argument N value and then \edef the body (nothing else will expand because of
% the catcode regime underwhich the body was input).
%
% If you compile with TeX (not eTeX), and you have macros with 10 or more
% arguments, you need that no macro has more than 256 arguments, otherwise an
% error is produced.
\def\parsemargdef#1;{%
\paramno=0\def\paramlist{ }%
\let\hash\relax
\let\#spaces\relax
\parsemargdefxxx#1,;,
% In case that there are 10 or more arguments we parse again the arguments
% list to set new definitions for the \macarg.BLAH macros corresponding to
% each BLAH argument. It was anyhow needed to parse already once this list
% in order to count the arguments, and as macros with at most 9 arguments
% are by far more frequent than macro with 10 or more arguments, defining
% twice the \macarg.BLAH macros does not cost too much processing power.
\ifnum\paramno<10\relax\else
 \paramno0\relax
 \parsemmanyargdef@@#1;,,% 10 or more arguments
 \fi
}
\def\parsemargdefxxx#1,{%
\if#1;\let\next=\relax
\else \let\next=\parsemargdefxxx
 \advance\paramno by 1
 \expandafter\edef\csname macarg.\#spaces{#1}\endcsname
 \{\#spaces{\hash\the\paramno}\}\%
 \edef\paramlist{\paramlist\hash\the\paramno.}\%
 \fi\next}
\def\parsemmanyargdef@@#1;{%
\if#1;\let\next=\relax
\else \let\next=\parsemmanyargdef@@
 \edef\tempb{\#spaces{#1}}%
 \expandafter\def\expandafter\tempa
\expandafter{\csname macarg.*\endcsname}

% Note that we need some extra \noexpand\noexpand, this is because we
% don't want \the to be expanded in the \parasemacbody as it uses an
% \xdef.
\expandafter{\edef\tempa
{\noexpand\noexpand\noexpand\the\toks\the\paramno} \%
\advance\paramno by 1\relax\%}
\fi
}next\%

% These two commands read recursive and nonrecursive macro bodies.
% (They're different since rec and nonrec macros end differently.) %
\%
\catcode `@=11 \relax
\let\endargs@\relax
\let\nil@\relax
\def\nilm@{\nil@}\
\long\def\nilim@{\nil@}\
\%
\%
\catcode `@=11 \relax
\let\endargs@\relax
\let\nil@\relax
\def\nilm@{\nil@}\
\long\def\nilim@{\nil@}\
\%
\%
\catcode `@=11 \relax
\let\endargs@\relax
\let\nil@\relax
\def\nilm@{\nil@}\
\long\def\nilim@{\nil@}\
% This macro is expanded during the Texinfo macro expansion, not during its
% definition. It gets all the arguments values and assigns them to macros
% macarg.ARGNAME
% % #1 is the macro name
% #2 is the list of argument names
% #3 is the list of argument values
\def\getargvals@#1#2#3{% 
\def\macargdeflist@{} 
\def\saveparamlist@{#2}% Need to keep a copy for parameter expansion. 
\def\paramlist{#2,\nil@} 
\def\macroname{#1} 
\begingroup 
\macroargctxt 
\def\argvaluelist{#3,\nil@} 
\def\@tempa{#3} 
\ifx\@tempa\empty 
\setemptyargvalues@ 
\else 
\getargvals@ 
\fi 
}
\def\getargvals@@{% 
\def\paramlist\nilm@ \% Some sanity check needed here that \argvaluelist is also empty. 
\def\argvaluelist\nilm@ 
\else 
\errhelp = \EMsimple 
\errmessage{Too many arguments in macro `\macroname'!}% 
\fi 
\let\next\macargexpandinbody@ \else 
\def\argvaluelist\nilm@ \% No more arguments values passed to macro. Set remaining named-arg 
\% macros to empty. 
\let\next\setemptyargvalues@ \else 
\% pop current arg name into \@tempb 
\def\@tempb##1{\pop@{\@tempb}{\paramlist}##1\endargs@} \% 
\expandafter\@tempb\expandafter{\paramlist} \% 
\% pop current argument value into \@tempc 
\def\@tempc##1{\longpop@{\@tempc}{\argvaluelist}##1\endargs@} \% 
\expandafter\@tempc\expandafter{\argvaluelist} \% 
\% Here \@tempb is the current arg name and \@tempc is the current arg value. 
\% First place the new argument macro definition into \@tempd 
\expandafter\macname\expandafter{\@tempc} \% 
\expandafter\let\csname macarg.@tempbendcsname\relax 
\expandafter\def\expandafter{\csname macarg.@tempbendcsname\} \% 
\edef\@tempe{\def{\the\macname}} \% 
\push@{\@tempd}{\@tempe}{\macargdeflist@} \% 
\let\next\getargvals@@ 
\fi 
\fi 
\next }

\def\push@#1#2{% 
\expandafter\expandafter\expandafter\def
\expandafter\expandafter\expandafter#2% 
\expandafter#1#2} %

% Replace arguments by their values in the macro body, and place the result 
% in macro \@tempa 
\def\macvalstoargs@{% 
% To do this we use the property that token registers that are \the'ed 
% within an \edef expand only once. So we are going to place all argument
% values into respective token registers.
%
% First we save the token context, and initialize argument numbering.
\begingroup
% Then, for each argument number #N, we place the corresponding argument
% value into a new token list register \toks#N
\expandafter\putargsintokens@\saveparamlist@;,%;
% Then, we expand the body so that argument are replaced by their
% values. The trick for values not to be expanded themselves is that they
% are within tokens and that tokens expand only once in an \edef .
\edef\@tempc{\csname mac.\macroname .body@endcsname}%
% Now we restore the token stack pointer to free the token list registers
% which we have used, but we make sure that expanded body is saved after
% group.
\expandafter\edef\expandafter\@tempa\expandafter{\@tempc}
\endgroup
\macargexpandinbody@[%
%% Define the named-macro outside of this group and then close this group.
\expandafter\endgroup
\macargdeflist@
% First the replace in body the macro arguments by their values, the result
% is in \@tempa .
\macvalstoargs@
% Then we point at the \norecurse or \gobble (for recursive) macro value
% with \@tempb .
\expandafter\let\expandafter\@tempb\csname mac.\macroname .recurse@endcsname
% Depending on whether it is recursive or not, we need some tailing
% \egroup .
\ifx\@tempb\gobble
  \let@tempc\relax
\else
  \let@tempc\egroup
\fi
% And now we do the real job:
\edef\@tempd{\noexpand\@tempb{\macroname}\noexpand\scanmacro{\@tempa}\@tempc}%
\@tempd
}
\def\putargsintokens@#1,{%
  \if#1;\let\next\relax
  \else
    \let\next\putargsintokens@
  \fi
% First we allocate the new token list register, and give it a temporary
% alias \@tempb .
\toksdef\@tempb{the}\paramno
% Then we place the argument value into that token list register.
\expandafter\let\expandafter\@tempa\csname macarg.#1\endcsname
\expandafter\@tempb\expandafter{\@tempa}%
\advance\paramno by 1\relax
\fi
\next
}

% Save the token stack pointer into macro #1
\def\texisavetoksstackpoint#1{\edef#1{\the\@cclvi}}
% Restore the token stack pointer from number in macro #1
\def\texirestoretoksstackpoint#1{\expandafter\mathchardef\expandafter\@cclvi#1\relax}
% newtoks that can be used non \outer .
\def\texinonouternewtoks{\alloc@ 5\toks \toksdef \@cclvi}

% Tailing missing arguments are set to empty
\def\setemptyargvalues@ {%
\ufx\paramlist\nilm@
 \let\next\macarg\expandinbody@
\else
 \expandafter\setemptyargvaluesparser@\paramlist\endargs@
 \let\next\setemptyargvalues@
\fi
\next
}

\def\setemptyargvaluesparser@#1,#2\endargs@{%
\expandafter\def\expandafter\@tempa\expandafter{\expandafter{\csname macarg.#1\endcsname{}}}%
\push@@\@tempa\macarg\deflist@
\def\paramlist(#2)%
}

% #1 is the element target macro
% #2 is the list macro
% #3,#4\endargs@ is the list value
\def\pop@#1#2#3,#4\endargs@{%
\def#1{#3}%
\def#2{#4}%
}
\long\def\longpop@#1#2#3,#4\endargs@{%
\long\def#1{#3}%
\long\def#2{#4}%
}

% This defines a Texinfo @macro. There are eight cases: recursive and
% nonrecursive macros of zero, one, up to nine, and many arguments.
% Much magic with \expandafter here.
% \xdef is used so that macro definitions will survive the file
% they're defined in; @include reads the file inside a group.
%
def\defmacro{
  \let\hash=##% convert placeholders to macro parameter chars
  \ife recursive
    \ifcase\paramno
      % 0
      \expandafter\xdef\csname the\macname\endcsname [ %
        \noexpand\scanmacro{\temp}] %
    \or % 1
      \expandafter\xdef\csname the\macname\endcsname [ %
        \bgroup\noexpand\macroargctxt
        \noexpand\braceorline
        \expandafter\noexpand\csname the\macname xx\endcsname} %
      \expandafter\xdef\csname the\macname xx\endcsname##1 {%
        \egroup\noexpand\scanmacro{\temp} ] %
    \else
      \ifnum\paramno<10\relax % at most 9
        \expandafter\xdef\csname the\macname\endcsname [ %
          \bgroup\noexpand\macroargctxt
          \noexpand\braceorline
          \expandafter\noexpand\csname the\macname xx\endcsname} %
        \expandafter\xdef\csname the\macname xx\endcsname##1 {%
          \egroup\noexpand\scanmacro{\temp}] %
      \else % 10 or more
        \expandafter\xdef\csname the\macname\endcsname [ %
          \noexpand\getargvals@{\the\macname}{\argl}] %
      \%\global\expandafter\let\csname mac.\the\macname .body\endcsname\temp
      \global\expandafter\let\csname mac.\the\macname .recurse\endcsname\gobble
    \fi
  \fi
  \else
    \ifcase\paramno
      % 0
      \expandafter\xdef\csname the\macname\endcsname [ %
        \noexpand\norecursion{\the\macname} %
      \noexpand\scanmacro{\temp}\egroup] %
    \or % 1
      \expandafter\xdef\csname the\macname\endcsname [ %
        \bgroup\noexpand\macroargctxt
    \fi
\fi
\else
  \ifcase\paramno
    % 0
    \expandafter\xdef\csname the\macname\endcsname [ %
      \noexpand\norecursion{\the\macname} %
    \noexpand\scanmacro{\temp}\egroup] %
  \or % 1
    \expandafter\xdef\csname the\macname\endcsname [ %
      \bgroup\noexpand\macroargctxt

% We need some trickery to remove the optional spaces around the equal
% sign. Make them active and then expand them all to nothing.
%
\def\alias\{%\parseargusing\obeyspaces\aliasxxx\}
\def\aliasxxx #1\relax{%\def\aliasyyy#1=#2\relax{%
  \%\expandafter\let\obeyedspace=\empty
  \addtomacrolist{#1}%
  \next{\global\let\makecsname{#1}=%\makecsname{#2}}%
}\next%
}

\message{cross references,}
\newwrite\auxfile
\newif\ifhavexrefs    % True if xref values are known.
\newif\ifwarnedxrefs  % True if we warned once that they aren't known.

% @inforef is relatively simple.
\def\inforef #1\relax{%\inforefzzz #1,,,,**}{%
  \putwordSee{} \putwordInfo{} \putwordfile{} \file\ignorespaces #3{}},
  node \samp\ignorespaces#1{}%
%
% @node's only job in TeX is to define \lastnode, which is used in
% cross-references. The @node line might or might not have commas, and
% might or might not have spaces before the first comma, like:
% @node foo, bar, ...
% We don't want such trailing spaces in the node name.
%
\parseargdef\node\{%\checkenv{}\donode #1,,\finishnodeparse\%
  \%\also remove a trailing comma, in case of something like this:
  \% @node Help-Cross,, Cross-refs
  \def\donode#1,,#2\finishnodeparse{\dodonode #1,#2\finishnodeparse}
  \def\dodonode#1,#2\finishnodeparse{\gdef\lastnode{#1}}
%
  \let\uninode=\node
  \let\lastnode=\empty
%
  \% Write a cross-reference definition for the current node. #1 is the
  \% type (Ynumbered, Yappendix, Ynothing).
  \%
  \def\donoderef#1{\%}
  \iffx\lastnode\empty\else
\def\temp[#1]{%\ifx\temp\onword\expandafter\let\csname SETxref-automatic-section-title\endcsname = \empty\else\ifx\temp\offword\expandafter\let\csname SETxref-automatic-section-title\endcsname = \relax\else\errhelp = \EMsimple\errmessage{Unknown @xrefautomaticsectiontitle value `\temp', must be on|off}\fi\fi}%

%@xref, @pxref, and @ref generate cross-references. For \xrefX, #1 is %the node name, #2 the name of the Info cross-reference, #3 the printed %node name, #4 the name of the Info file, #5 the name of the printed %manual. All but the node name can be omitted.%
\def\pxref#1{\putwordsee{} \xrefX[#1,,,,,,]}\def\xref#1{\putwordSee{} \xrefX[#1,,,,,,]}\def\ref#1{\xrefX[#1,,,,,,]}%\newbox\toprefbox\newbox\printedrefnamebox\newbox\infofilenamebox\newbox\printedmanualbox%\xrefX[#1,#2,#3,#4,#5,#6]\begingroup\unsep
%Get args without leading/trailing spaces.\edef\printedefnname{\ignorespaces #3}\setbox\printedefnnamebox = \hbox{\printedefnname\unskip}\edef\infofilename{\ignorespaces #4}\setbox\infofilenamebox = \hbox{\infofilename\unskip}\edef\printedef{\ignorespaces #5}\setbox\printedefbox = \hbox{\printedef\unskip}\edef\printedefmanual{\ignorespaces #6}\setbox\printedefmanualbox = \hbox{\printedefmanual\unskip}%\If the printed reference name (arg #3) was not explicitly given in %the @xref, figure out what we want to use.\dimen0=\printedefnnamebox \ifdim\wd\printedefnnamebox=0pt %No printed node name was explicitly given.\expandafter\ifx\csname SETxref-automatic-section-title\endcsname \relax \relax\fi %Not auto section-title: use node name inside the square brackets.
% Float references are printed completely differently: "Figure 1.2"
% instead of "[somenode], p.3". We distinguish them by the
% LABEL-title being set to a magic string.
%
% Have to otherify everything special to allow the \csname to
% include an _ in the xref name, etc.
\indexnofonts
\turnoffactive
\expandafter\global\expandafter\let\expandafter\Xthisreftitle
\csname XR#1-title\endcsname
%
\iffloat\Xthisreftitle
% If the user specified the print name (third arg) to the ref,
% print it instead of our usual "Figure 1.2".
\ifdim\wd\printedrefnamebox = 0pt
  \refx{#1-snt}{}
\else
  \printedrefname
\fi
%
% If the user also gave the printed manual name (fifth arg), append
% "in MANUALNAME".
\ifdim \wd\printedmanualbox > 0pt
  \space \putwordin{} \cite{\printedmanual}\
\else
  \else
  \% node/anchor (non-float) references.
  \%
  \% If we use \unhbox to print the node names, TeX does not insert
  \% empty discretionary after hyphens, which means that it will not
  \% find a line break at a hyphen in a node names. Since some manuals
  \% are best written with fairly long node names, containing hyphens,
  \% this is a loss. Therefore, we give the text of the node name
  \% again, so it is as if TeX is seeing it for the first time.
  \%
  \ifdim \wd\printedmanualbox > 0pt
    \% Cross-manual reference with a printed manual name.
    \%
    \crossmanualxref{\cite{\printedmanual\unskip}}\%
  \else\ifdim \wd\infofilenamebox > 0pt
    \% Cross-manual reference with only an info filename (arg 4), no
    \%
    \crossmanualxref{\code{\infofilename\unskip}}\%
  \else

\else
% Reference within this manual.
%
% _ (for example) has to be the character _ for the purposes of the
% control sequence corresponding to the node, but it has to expand
% into the usual \leavevmode\vrule stuff for purposes of
% printing. So we \turnoffactive for the \refx-snt, back on for the
% printing, back off for the \refx-pg.
\turnoffactive
% Only output a following space if the -snt ref is nonempty; for
% @unnumbered and @anchor, it won't be.
\setbox2 = \hbox{\ignorespaces \refx{#1-snt}{}{}}%
\ifdim \wd2 > 0pt \refx{#1-snt}\space\fi
%
% output the `[mynode]' via the macro below so it can be overridden.
\xrefprintnodename printedrefname
%
% But we always want a comma and a space:
\space
%
% output the `page 3'.
\turnoffactive \putwordpage \tie \refx{#1-pg} {} %
\if\fi
\fi
\endlink
\endgroup
%
% Output a cross-manual xref to #1. Used just above (twice).
%
% Only include the text "Section `foo in" if the foo is neither
% missing or Top. Thus, \@xref{,...foo,The Foo Manual} outputs simply
% "see The Foo Manual", the idea being to refer to the whole manual.
%
% But, this being TeX, we can't easily compare our node name against the
% string "Top" while ignoring the possible spaces before and after in
% the input. By adding the arbitrary 7sp below, we make it much less
% likely that a real node name would have the same width as "Top" (e.g.,
% in a monospaced font). Hopefully it will never happen in practice.
%
% For the same basic reason, we retypeset the "Top" at every
% reference, since the current font is indeterminate.
%
\def\crossmanualxref#1{%
\setbox\toprefbox = \hbox{Top\kern7sp}%
\setbox2 = \hbox{\ignorespaces \printedrefname \unskip \kern7sp}%
\ifdim \wd2 > 7sp % nonempty?
 \ifdim \wd2 = \wd\toprefbox \else % same as Top?
 \putwordSection{} `"\printedrefname" \putwordin{}} \space
% This macro is called from \xrefX for the `[nodename]' part of xref
% output. It's a separate macro only so it can be changed more easily,
% since square brackets don't work well in some documents. Particularly
% one that Bob is working on :).  
% \def\xrefprintnodename#1{[#1]}

% Things referred to by \setref.
%
\def\Ynothing{}  
\def\Yomitfromtoc{}  
\def\Ynumbered{%
  \ifnum\secno=0
    \putwordChapter@tie \the\chapno  
  \else \ifnum\subsecno=0
    \putwordSection@tie \the\chapno.\the\secno  
  \else \ifnum\subsubsecno=0
    \putwordSection@tie \the\chapno.\the\secno.\the\subsecno  
  \else
    \putwordSection@tie \the\chapno.\the\secno.\the\subsecno.\the\subsubsecno
  \fi\fi\fi
}
\def\Yappendix{%
  \ifnum\secno=0
    \putwordAppendix@tie \char\the\appendixno{}%  
  \else \ifnum\subsecno=0
    \putwordSection@tie \char\the\appendixno.\the\secno  
  \else \ifnum\subsubsecno=0
    \putwordSection@tie \char\the\appendixno.\the\secno.\the\subsecno  
  \else
    \putwordSection@tie \char\the\appendixno.\the\secno.\the\subsecno.\the\subsubsecno
  \fi\fi\fi
}

% Define \refx{NAME}{SUFFIX} to reference a cross-reference string named NAME.
% If its value is nonempty, SUFFIX is output afterward.  
% \def\refx#1#2{\
%  \indexnofonts
%  \otherbackslash
%  \expandafter\global\expandafter\let\expandafter\thisrefX
\csname XR#1\endcsname
%
\if\the\thisrefX\relax
% If not defined, say something at least.
\angleleft undefined\angleright
\iflinks
\ifhavexrefs
{\toks0 = {#1}% avoid expansion of possibly-complex value
\message{\linenumber Undefined cross reference \"the\toks0'}.}%
\else
\ifwarnedxrefs\else
\global\warnedxrefstrue
\message{Cross reference values unknown; you must run TeX again.}%
\fi
\fi
\fi
\else
% It's defined, so just use it.
\thisrefX
\fi
#2% Output the suffix in any case.
}

% This is the macro invoked by entries in the aux file. Usually it's
% just a `\def` (we prepend XR to the control sequence name to avoid
% collisions). But if this is a float type, we have more work to do.
%
\def\xrdef#1#2{%
{% The node name might contain 8-bit characters, which in our current
% implementation are changed to commands like @'e. Don't let these
% mess up the control sequence name.
\indexnofonts
\turnoffactive
\xdef\safexrefname{#1}%
}%
%
\expandafter\gdef\csname XR\safexrefname\endcsname{#2}% remember this xref
%
% Was that xref control sequence that we just defined for a float?
\expandafter\iffloat\csname XR\safexrefname\endcsname
% it was a float, and we have the (safe) float type in \iffloattype.
\expandafter\let\expandafter\floatlist
\csname floatlist\iffloattype\endcsname
%
% Is this the first time we've seen this float type?
\expandafter\if\the\floatlist\relax
\toks0 = \{do\}% yes, so just \do
\else
\% had it before, so preserve previous elements in list.
\toks0 = \expandafter{\floatlist\do}%
\fi
\%
\% Remember this xref in the control sequence \floatlistFLOATTYPE,
\% for later use in \listoffloats.
\expandafter\xdef\csname floatlist\iffloattype\endcsname{\the\toks0
\}{\safexrefname}}%
\fi
}

\% Read the last existing aux file, if any. No error if none exists.
\%
\def\tryauxfile{%
\openin 1 \jobname.aux
\ifeof 1 \else
\readdatafile{aux}\
\global\havexrefstrue
\fi
\closein 1
}

\def\setupdatafile{%
\catcode\^^@=\other
\catcode\^^A=\other
\catcode\^^B=\other
\catcode\^^C=\other
\catcode\^^D=\other
\catcode\^^E=\other
\catcode\^^F=\other
\catcode\^^G=\other
\catcode\^^H=\other
\catcode\^^I=\other
\catcode\^^J=\other
\catcode\^^K=\other
\catcode\^^L=\other
\catcode\^^M=\other
\catcode\^^N=\other
\catcode\^^O=\other
\catcode\^^P=\other
\catcode\^^Q=\other
\catcode\^^R=\other
\catcode\^^S=\other
\catcode\^^T=\other
\catcode\^^U=\other
\catcode\^^V=\other
\catcode\^^W=\other
\catcode\^^X=\other
\catcode\^^Y=\other
\catcode\^^Z=\other
\catcode`\^^^=\other
\catcode`\^^_=\other

% It was suggested to set the catcode of ^ to 7, which would allow ^^e4 etc.
% in xref tags, i.e., node names. But since ^^e4 notation isn't
% supported in the main text, it doesn't seem desirable. Furthermore,
% that is not enough: for node names that actually contain a ^
% character, we would end up writing a line like this: `xrdef `\hat
% b-title`{\hat b} and `xrdef does a \csname...\endsname on the first
% argument, and \hat is not an expandable control sequence. It could
% all be worked out, but why? Either we support ^^ or we don't.
%
% The other change necessary for this was to define \auxhat:
% \def\auxhat{\def\^{'hat
% \def\b-title{\hat b} and \xrdef does a \csname...\endsname on the first
% argument, and \hat is not an expandable control sequence. It could
% all be worked out, but why? Either we support ^^ or we don't.
%
% The other change necessary for this was to define \auxhat:
% \def\auxhat{\def\^{'hat
% \def\b-title{\hat b} and \xrdef does a \csname...\endsname on the first
% argument, and \hat is not an expandable control sequence. It could
% all be worked out, but why? Either we support ^^ or we don't.
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% argument, and \hat is not an expandable control sequence. It could
% all be worked out, but why? Either we support ^^ or we don't.
% The trailing space in the following definition for supereject is
% vital for proper filling; pages come out unaligned when you do a
% pagealignmacro call if that space before the closing brace is
% removed. (Generally, numeric constants should always be followed by a
% space to prevent strange expansion errors.)
\def\supereject{\par\penalty -20000\footnoteno =0 }

% @footnotestyle is meaningful for Info output only.
\let\footnotestyle=\comment

% Auto-number footnotes. Otherwise like plain.
\def\footnote{\let\indent=\ptexindent
\let\noindent=\ptexnoindent
\global\advance\footnoteno by 1\@ne
\edef\thisfootno{$^\the\footnoteno}$%
% In case the footnote comes at the end of a sentence, preserve the
% extra spacing after we do the footnote number.
\let\@sfempty
\ifhmode\edef\@sf{\spacefactor\the\spacefactor}\ptexslash\fi
%
% Remove inadvertent blank space before typesetting the footnote number.
\unskip
\the\thisfootno\@sf}
% Don't bother with the trickery in plain.tex to not require the
% footnote text as a parameter. Our footnotes don't need to be so general.
%
% Oh yes, they do; otherwise, @ifset (and anything else that uses
% @parseargline) fails inside footnotes because the tokens are fixed when
% the footnote is read. --karl, 16nov96.
%
\gdef\dofootnote{%
\insert\footins\bgroup
% We want to typeset this text as a normal paragraph, even if the
% footnote reference occurs in (for example) a display environment.
% So reset some parameters.
\hsize=\pagewidth
\interlinepenalty\interfootnotelinepenalty
\splittopskip\ht\strutbox % top baseline for broken footnotes
\splitmaxdepth\dp\strutbox
\floatingpenalty\@MM
\leftskip\z@skip
\rightskip\z@skip
\spaceskip\z@skip
\xspaceskip\z@skip
\parindent\defaultparindent
%
\smallfonts \rm
%
% Because we use hanging indentation in footnotes, a @noindent appears
% to exdent this text, so make it be a no-op. makeinfo does not use
% hanging indentation so @noindent can still be needed within footnote
% text after an @example or the like (not that this is good style).
\let\noindent = \relax
%
% Hang the footnote text off the number. Use \everypar in case the
% footnote extends for more than one paragraph.
\everypar = \{\hang\}
\textindent\{thisfootno\}
%
% Don't crash into the line above the footnote text. Since this
% expands into a box, it must come within the paragraph, lest it
% provide a place where TeX can split the footnote.
\footstrut
%
% Invoke rest of plain TeX footnote routine.
\futurelet\next\fo@t
}
}%end \catcode `\@=11
% In case a \footnote appears in a vbox, save the footnote text and create
% the real \insert just after the vbox finished. Otherwise, the insertion
% would be lost.
% Similarly, if a \footnote appears inside an alignment, save the footnote
% text to a box and make the \insert when a row of the table is finished.
% And the same can be done for other insert classes. --kasal, 16nov03.

% Replace the \insert primitive by a cheating macro.
% Deeper inside, just make sure that the saved insertions are not spilled
% out prematurely.
%\def\startsavinginserts{%
% \ifx \insert\ptexinsert
% \let\insert\saveinsert
% \else
% \let\checkinserts\relax
% \fi
%
% This \insert replacement works for both \insert\footins{foo} and
% \insert\footins\bgroup foo\egroup, but it doesn't work for \insert27{foo}.
%\def\saveinsert#1{%
% \edef\next{\noexpand\savetobox \makeSAVEname#1}%
% \afterassignment\next
% \let\temp =
% }\def\makeSAVEname#1{\makecsname{SAVE\expandafter\gobble\string#1}}\def\savetobox#1{\global\setbox#1 = \vbox\bgroup \unvbox#1}\
% \def\checksaveins#1{\ifvoid#1\else \placesaveins#1\fi}
%\def\placesaveins#1{\ptexinsert \csname\expandafter\gobblesave@SAVE\string#1\endcsname
% {\box#1}}%
%
% eat \@SAVE -- beware, all of them have catcode \other:
%{\def\dospecials{\do S\do A\do V\do E}\uncatcodespecials % :-)}\gdef\gobblesave@SAVE{}}%
%
% initialization:
\def\newsaveins #1{%
 \edef\next{\noexpand\newsaveinsX \makeSAVEname#1}%
\next
}
def\newsaveinsX #1{%
casename newbox\endcsname #1%
\expandafter\def\expandafter\checkinserts\expandafter{%\checkinserts
\checksaveins #1}%
}

% initialize:
def\checkinserts\empty
def\newsaveins\footins
def\newsaveins\margin

% @image. We use the macros from epsf.tex to support this.
% If epsf.tex is not installed and @image is used, we complain.
%
% Check for and read epsf.tex up front. If we read it only at @image
% time, we might be inside a group, and then its definitions would get
% undone and the next image would fail.
\openin 1 = epsf.tex
\ifeof 1 \else
% Do not bother showing banner with epsf.tex v2.7k (available in
% doc/epsf.tex and on ctan).
def\epsfannounce{\toks0 = }%
\input epsf.tex
\fi
\closein 1
%
% We will only complain once about lack of epsf.tex.
\newif\ifwarnednoepsf
\newhelp\noepsfhelp{epsf.tex must be installed for images to
work. It is also included in the Texinfo distribution, or you can get
it from ftp://tug.org/tex/epsf.tex.}%

% def\image#1{%
\ife\epsfbox\thisisundefined
\if\warnednoepsf \else
\errhelp = \noepsfhelp
\errmessage{epsf.tex not found, images will be ignored}%
\global\warnednoepsftrue
\fi
\else
\imagexxx #1,,,,,\finish
\fi
%
% Arguments to @image:
% #1 is (mandatory) image filename; we tack on .eps extension.
% #2 is (optional) width, #3 is (optional) height.
% #4 is (ignored optional) html alt text.
% #5 is (ignored optional) extension.
% #6 is just the usual extra ignored arg for parsing stuff.
\newif\ifimagevmode
\def\imagevxxx#1,#2,#3,#4,#5,#6\finish{\begingroup
\catcode`\^^M = 5     % in case we're inside an example
\normalturnoffactive  % allow _ et al. in names
% If the image is by itself, center it.
\ifvmode
\imagevmodetrue
\else \ifx\centersub\centerV
% for @center @image, we need a vbox so we can have our vertical space
\imagevmodetrue
\vbox\bgroup % vbox has better behavior than vtop here\v
%\fi
\fi
%\ifimagevmode
\nobreak\medskip
% Usually we'll have text after the image which will insert
% \parskip glue, so insert it here too to equalize the space
% above and below.
\nobreak\vskip\parskip
\nobreak
\fi
% Leave vertical mode so that indentation from an enclosing
% environment such as @quotation is respected.
% However, if we're at the top level, we don't want the
% normal paragraph indentation.
% On the other hand, if we are in the case of @center @image, we don't
% want to start a paragraph, which will create a hsize-width box and
% eradicate the centering.
\ifx\centersub\centerV\else \noindent \fi
% % Output the image.
\ifpdf
\dopdfimage{#1}{#2}{#3}\
\else
% \epsfbox itself resets \epsfsizemin at each figure.
\setbox0 = \hbox{\ignorespaces #2}\ifdim\wd0 > 0pt \epsfxsize=#2\relax \fi
\setbox0 = \hbox{\ignorespaces #3}\ifdim\wd0 > 0pt \epsfysize=#3\relax \fi
\epsfbox{#1.eps}\
\fi
% \ifimagevmode
\medskip  % space after a standalone image
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\fi
\ifx\centersub\centerV \egroup \fi
\endgroup}

% @float FLOATTYPE,LABEL,LOC ... @end float for displayed figures, tables, % etc. We don't actually implement floating yet, we always include the % float "here". But it seemed the best name for the future.
%
\envparseargdef\float{\eatcommaspace\eatcommaspace\dofloat#1, , ,\finish}

% There may be a space before second and/or third parameter; delete it.
\def\eatcommaspace#1, {#1,}

% #1 is the optional FLOATTYPE, the text label for this float, typically % "Figure", "Table", "Example", etc. Can't contain commas. If omitted, % this float will not be numbered and cannot be referred to.
%
% #2 is the optional xref label. Also must be present for the float to % be referable.
%
% #3 is the optional positioning argument; for now, it is ignored. It % will somehow specify the positions allowed to float to (here, top, bottom).
%
% We keep a separate counter for each FLOATTYPE, which we reset at each % chapter-level command.
\let\resetallfloatnos=\empty
%
\def\dofloat#1,#2,#3,#4\finish{%
\let\thiscaption=\empty
\let\thisshortcaption=\empty
%
% don't lose footnotes inside @float.
%
% BEWARE: when the floats start float, we have to issue warning whenever an % insert appears inside a float which could possibly float. --kasal, 26may04
%
\startsavinginserts
%
% We can't be used inside a paragraph.
\par
%
\vtop\bgroup
\def\floattype{#1}%
\def\floatlabel{#2}%
\def\floatloc{#3}%
% we do nothing with this yet.
%
\ifx\floattype\empty
\let\safefloattype=\empty
\else
  \{% 
  \% the floattype might have accents or other special characters, 
  \% but we need to use it in a control sequence name.
  \indexnofonts
  \turnoffactive
  \xdef\safefloattype{\floattype}%
\%
\fi
\%
\% If label is given but no type, we handle that as the empty type.
\ifdef\floatlabel\empty\else
  \%
  \% We want each FLOATTYPE to be numbered separately (Figure 1, 
  \% Table 1, Figure 2, ...).  (And if no label, no number.) 
  \%
  \expandafter\getfloatno\csname\safefloattype\floatno\endcsname
  \global\advance\floatno by 1
  \%
  \%
  \% This magic value for lastsection is output by \setref as the 
  \% XREFLABEL-title value.  \xrefX uses it to distinguish float 
  \% labels (which have a completely different output format) from 
  \% node and anchor labels.  And \xrdef uses it to construct the 
  \% lists of floats.
  \%
  \edef\lastsection{\floatmagic=\safefloattype}%
  \setref{\floatlabel}{Yfloat}%
\%
\fi
\%
\% start with \parskip glue, I guess.
\vskip\parskip
\%
\% Don't suppress indentation if a float happens to start a section.
\restorefirstparagraphindent
\}

% we have these possibilities:
% @float Foo,lbl & @caption{Cap}: Foo 1.1: Cap
% @float Foo,lbl & no caption: Foo 1.1
% @float Foo & @caption{Cap}: Foo: Cap
% @float Foo & no caption: Foo
% @float ,lbl & Caption{Cap}: 1.1: Cap
% @float ,lbl & no caption: 1.1
% @float & @caption{Cap}: Cap
% @float & no caption:
\def\Efloat{\
\let\floatident = \empty \\
% 
% In all cases, if we have a float type, it comes first. 
\ifx\floattype\empty \else \def\floatident{\floattype}\fi \\
% 
% If we have an xref label, the number comes next. 
\ifx\floatlabel\empty \else 
\ifx\floattype\empty \else % if also had float type, need tie first. 
\appendtomacro\floatident{\tie}\% 
\fi 
% the number. 
\appendtomacro\floatident{\chaplevelprefix\the\floatno}\% 
\fi 
% 
% Start the printed caption with what we’ve constructed in 
% \floatident, but keep it separate; we need \floatident again. 
\let\captionline = \floatident \\
% 
\ifx\thiscaption\empty \else 
\ifx\floatident\empty \else 
\appendtomacro\captionline{: }% had ident, so need a colon between 
\fi 
% 
% caption text. 
\appendtomacro\captionline{\scanexp\thiscaption}\% 
\fi 
% 
% If we have anything to print, print it, with space before. 
% Eventually this needs to become an \insert. 
\ifx\captionline\empty \else 
\vskip.5\parskip 
\captionline 
% 
% Space below caption. 
\vskip\parskip 
\fi 
% 
% If have an xref label, write the list of floats info. Do this 
% after the caption, to avoid chance of it being a breakpoint. 
\ifx\floatlabel\empty \else 
\atdummies 
% 
% Write the text that goes in the lof to the aux file as 
% \floatlabel-lof. Besides \floatident, we include the short 
% caption if specified, else the full caption if specified, else nothing. 
% 
% \atdummies 
% 
% since we read the caption text in the macro world, where ^^M
% is turned into a normal character, we have to scan it back, so
% we don’t write the literal three characters “^^M” into the aux file.
\scanexp{
\xdef\noexpand\gtemp{\%\ifx\thisshortcaption\empty
\thiscaption\else\thisshortcaption\fi\}%
\immediate\write\auxfile{@xrdef{\floatident}
\ifx\gtemp\empty \else: \gtemp \fi} %
\fi
\egroup % end of \vtop
%
% place the captured inserts
%
% BEWARE: when the floats start floating, we have to issue warning
% whenever an insert appears inside a float which could possibly
% float. --kasal, 26may04
%
\checkinserts
}

% Append the tokens #2 to the definition of macro #1, not expanding either.
% \def\appendtomacro#1#2\% \expandafter\def\expandafter#1\expandafter{#1#2}\%
%
% @caption, @shortcaption
%
% \def\caption{\docaption\thiscaption}
% \def\shortcaption{\docaption\thisshortcaption}
% \def\docaption{\checkenv\float \bgroup\scanargctxt\defcaption}
% \def\defcaption#1#2{\egroup \def#1{#2}}

% The parameter is the control sequence identifying the counter we are
% going to use. Create it if it doesn’t exist and assign it to \floatno.
\def\getfloatno#1\%\relax
% Haven’t seen this figure type before.
\csname newcount\endcsname #1\%
%
% Remember to reset this floatno at the next chap.
\def\expandafter{\def\expandafter\resetallfloatnos}
\begin{itemize}
\item This is called on each entry in a list of floats. We're passed the
\item xref label, in the form LABEL-title, which is how we save it in the
\item aux file. We strip off the -title and look up \texttt{XR\texttt{LABEL-lof}}, which
\item has the text we're supposed to typeset here.
\item Figures without xref labels will not be included in the list (since
\item they won't appear in the aux file).
\end{itemize}

\message{localization,}
\message{For single-language documents, \texttt{\jobname} is usually given very
\message{early, just after \texttt{\jobnameencoding}. Single argument is the language
\message{\texttt{de} or locale (de\textunderscore DE) abbreviation.
\message{\}
\message{\catcode\_ = \active
\globaldefs=1
\parshape=1
\parseargdef\jobname{\begingroup
\let_=_\normalunderscore  % normal _ character for filenames
\tex % read txi-??\.tex file in plain TeX.
\text \message{Read the file by the name they passed if it exists.
\open 1 txi-#1.tex
\ifeof 1
\documentlanguagetrywithoutunderscore{#1\finish}\%
\else

% but there is no harm in adjusting the hyphenmin values regardless.
\global\lefthyphenmin = #2\relax
\global\righthyphenmin = #3\relax
}

% Helpers for encodings.
% Set the catcode of characters 128 through 255 to the specified number.
%
\def\setnonasciicharscatcode#1{%
  \count255=128
  \loop\ifnum\count255<256
    \global\catcode\count255=#1\relax
    \advance\count255 by 1
  \repeat
%
\def\setnonasciicharscatcodenonglobal#1{%
  \count255=128
  \loop\ifnum\count255<256
    \catcode\count255=#1\relax
    \advance\count255 by 1
  \repeat
%
%
% @documentencoding sets the definition of non-ASCII characters
% according to the specified encoding.
%
\parseargdef\documentencoding{%
% Encoding being declared for the document.
\def\declaredencoding{\csname #1.enc\endcsname}%
%
% Supported encodings: names converted to tokens in order to be able
% to compare them with \ifx.
\def\ascii{\csname US-ASCII.enc\endcsname}%
\def\latnine{\csname ISO-8859-15.enc\endcsname}%
\def\lattwo{\csname ISO-8859-2.enc\endcsname}%
\def\utfeight{\csname UTF-8.enc\endcsname}%
%
\ifx \declaredencoding \ascii
\asciichardefs
%\else \ifx \declaredencoding \lattwo
\setnonasciicharscatcode\active
\lattwochardefs
%\else \ifx \declaredencoding \latone
\setnonasciicharscatcode\active
%\fi\fi\fi
% A message to be logged when using a character that isn’t available
% the default font encoding (OT1).
% \def\missingcharmsg#1\message{Character missing in OT1 encoding: #1.}

% Take account of \c (plain) vs. \ (Texinfo) difference.
% \def\cedilla#1{\ifx\c\ptexc\c{#1}\else\{#1\}\fi}

% First, make active non-ASCII characters in order for them to be
% correctly categorized when TeX reads the replacement text of
% macros containing the character definitions.
% \setnonasciicharscatcode\active
%
% Latin1 (ISO-8859-1) character definitions.
% \def\latonechardefs{%
  \gdef^^a0{\tie}
  \gdef^^a1{\exclamdown}
  \gdef^^a2{\message{CENT SIGN}}
  \gdef^^a3{\pounds}
  \gdef^^a4{\message{CURRENCY SIGN}}
  \gdef^^a5{\message{YEN SIGN}}
  \gdef^^a6{\message{BROKEN BAR}}
  \gdef^^a7{\S}
  \gdef^^a8{\lnot}
  \gdef^^a9{\copyright}
  \gdef^^aa{\ordf}
  \gdef^^ab{\guillemetleft}
  \gdef^^ac{\$}
% UTF-8 character definitions.
%
% This code to support UTF-8 is based on LaTeX's utf8.def, with some
% changes for Texinfo conventions. It is included here under the GPL by
% permission from Frank Mittelbach and the LaTeX team.
%
\newcount\countUTFx
\newcount\countUTFy
\newcount\countUTFz

\edef\UTFviiiTwoOctets#1#2{{\UTFviiiDefined\csname u8:#1\string #2\endcsname}}

\edef\UTFviiiThreeOctets#1#2#3{{\UTFviiiDefined\csname u8:#1\string #2\string #3\endcsname}}

\edef\UTFviiiFourOctets#1#2#3#4{{\UTFviiiDefined\csname u8:#1\string #2\string #3\string #4\endcsname}}

\edef\UTFviiiDefined#1{%
\ifx #1\relax
\message{\linenumber Unicode char \string #1 not defined for Texinfo}%
\else
\expandafter \UTFviiiTwoOctets#1#1\expandafter \UTFviiiThreeOctets#1#2#2\expandafter \UTFviiiFourOctets#1#2#3#3
\fi}

\begingroup
\csname u8:##1\string ##2\string ##3\string \endcsname}\
def\UTFviiiFourOctets##1##2##3##4{\%
\csname u8:##1\string ##2\string ##3\string ##4\endcsname}\%
\expandafter\expandafter\expandafter
\expandafter\expandafter\expandafter\gdef\UTFviiiTmp{#2}\%
\endgroup}

\gdef\parseXMLCharref{\%
\ifnum\countUTFz < "A0\relax
\errhelp = \EMsimple
\errmessage{Cannot define Unicode char value < 00A0}\%
\else\ifnum\countUTFz < "800\relax
\parseUTFviiiA,\%
\parseUTFviiiB C\UTFviiiTwoOctets.,\%
\else\ifnum\countUTFz < "10000\relax
\parseUTFviiiA;\%
\parseUTFviiiA,\%
\parseUTFviiiB E\UTFviiiThreeOctets.;,\%
\else
\parseUTFviiiA;\%
\parseUTFviiiA,\%
\parseUTFviiiA!,\%
\parseUTFviiiB F\UTFviiiFourOctets.;!,;\%
\fi\fi\fi
}

\gdef\parseUTFviiiA#1{\%
\countUTFx = \countUTFz
\divide\countUTFz by 64
\countUTFy = \countUTFz
\multiply\countUTFz by 64
\advance\countUTFx by -\countUTFz
\advance\countUTFx by 128
\uccode `#1\countUTFx
\countUTFz = \countUTFy}

\gdef\parseUTFviiiB#1#2#3#4{\%
\advance\countUTFz by "#1\relax
\uccode `#3\countUTFz
\uppercase{\gdef\UTFviiiTmp{#2#3#4}}}
\endgroup

\def\utfeightchardefs{\%
\DeclareUnicodeCharacter{00A0}{\tie}
\DeclareUnicodeCharacter{00A1}{\exclamdown}
\DeclareUnicodeCharacter{00A3}{\pounds}
\DeclareUnicodeCharacter{00A8}{\textcircled{}}}

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% US-ASCII character definitions.
def\asciichardefs{% nothing need be done
  \relax
}

% Make non-ASCII characters printable again for compatibility with
% existing Texinfo documents that may use them, even without declaring a
% document encoding.
% \setnonasciicharscatcode \other

\message{formatting.}
\newdimen\defaultparindent \defaultparindent = 15pt

\chapheadingskip = 15pt plus 4pt minus 2pt
\secheadingskip = 12pt plus 3pt minus 2pt
\subsecheadingskip = 9pt plus 2pt minus 2pt

% Prevent underfull vbox error messages.
\vbadness = 10000

% Don't be very finicky about underfull hboxes, either.
\hbadness = 6666

% Following George Bush, get rid of widows and orphans.
\widowpenalty=10000
\clubpenalty=10000

% Use TeX 3.0's \emergencystretch to help line breaking, but if we're
% using an old version of TeX, don't do anything. We want the amount of
% stretch added to depend on the line length, hence the dependence on
% \hsize. We call this whenever the paper size is set.
% \def\setemergencystretch{%
  \ifx\emergencystretch\thisisundefined
    % Allow us to assign to\emergencystretch anyway.
    \def\emergencystretch{\dimen0}%
  \else
    \emergencystretch = .15\hsize
  \fi

% Double-side printing via postscript on Laserjet 4050
% prints double-sided nicely when \bindingoffset=10mm and \hoffset=-6mm.
% To change the settings for a different printer or situation, adjust
% \normaloffset until the front-side and back-side texts align. Then
% do the same for \bindingoffset. You can set these for testing in
% your texinfo source file like this:
% @tex
% \global\normaloffset = -6mm
% \global\bindingoffset = 10mm
% @end tex
_Internalpagesizes{673.2pt}{160mm}% that's 51 lines
{\voffset}{\hoffset}%
{\bindingoffset}{44pt}%
(297mm) (210mm)%

% _tolerance = 700
% _hfuzz = 1pt
% _contentsrightmargin = 0pt
% _defbodyindent = 5mm
} }

% Use @afivepaper to print on European A5 paper.
% From romildo@urano.iceb.ufop.br, 2 July 2000.
% He also recommends making @example and @lisp be small.
\def\afivepaper{{ \globaldefs = 1
\parskip = 2pt plus 1pt minus 0.1pt
\textleading = 12.5pt
%
\internalpagesizes{160mm}{120mm}%
{\voffset}{\hoffset}%
{\bindingoffset}{8pt}%
(210mm) (148mm)%
%
\lispnarrowing = 0.2in
\tolerance = 800
\hfuzz = 1.2pt
\contentsrightmargin = 0pt
\defbodyindent = 2mm
\tableindent = 12mm
} }

% A specific text layout, 24x15cm overall, intended for A4 paper.
\def\afourlatex{{ \globaldefs = 1
\afourpaper
\internalpagesizes{237mm}{150mm}%
{\voffset}{\hoffset}%
{\bindingoffset}{7mm}%
(297mm) (210mm)%
%
\% Must explicitly reset to 0 because we call \fourpaper. \
globaldefs = 0 
} 

\% Use @afourwide to print on A4 paper in landscape format. \
def\afourwide{ \globaldefs = 1 
\afourpaper 
\internalpagesizes{241mm}{165mm} \% 
  {\voffset} {-2.95mm} \% 
  {\bindingoffset} {7mm} \% 
  {297mm} {210mm} \% 
\globaldefs = 0 
} 

\% @pagesizes TEXTHEIGHT[,TEXTWIDTH] 
\% Perhaps we should allow setting the margins, \topskip, \parskip, 
\% and/or leading, also. Or perhaps we should compute them somehow. 
\% 
\parseargdef\pagesizes{\pagesizesyyy \#1,\finish} 
\def\pagesizesyyy#1,#2,#3\finish{{ \setbox0 = \hbox{\ignorespaces #2} \ifdim\wd0 > 0pt \hsize=#2\relax \fi 
\globaldefs = 1 
\% 
\parskip = 3pt plus 2pt minus 1pt 
\setleading{\textleading} \% 
\% 
\dimen0 = #1\relax 
\advance\dimen0 by \voffset 
\% 
\dimen2 = \hsize 
\advance\dimen2 by \normaloffset 
\% 
\internalpagesizes{#1}{\hsize} \% 
  {\voffset} {\normaloffset} \% 
  {\bindingoffset} {44pt} \% 
  {\dimen0} {\dimen2} \% 
} 

\% Set default to letter. 
\% 
\letterpaper 

\message{and turning on texinfo input format.} 
\def^^L{\par} % remove \outer, so ^L can appear in an @comment
% DEL is a comment character, in case @c does not suffice.
\catcode\^? = 14

% Define macros to output various characters with catcode for normal text.
\catcode`\"=\other \def\normaldoublequote{"}
\catcode\$=\other \def\normaldollar{$}% font-lock fix
\catcode`+=\other \def\normalplus{+}
\catcode`<=\other \def\normalless{<}
\catcode`=>\other \def\normalgreater{>}
\catcode`\^=\other \def\normalcaret{^}
\catcode`\_ = \other \def\normalunderscore{_}
\catcode`\| = \other \def\normalverticalbar{|}
\catcode`\~ = \other \def\normaltilde{~}

% This macro is used to make a character print one way in \tt
% (where it can probably be output as-is), and another way in other fonts,
% where something hairier probably needs to be done.
%
% #1 is what to print if we are indeed using \tt; #2 is what to print
% otherwise.  Since all the Computer Modern typewriter fonts have zero
% interword stretch (and shrink), and it is reasonable to expect all
% typewriter fonts to have this, we can check that font parameter.
%
\def\ifusingtt#1#2{\ifdim \fontdimen3\font=0pt #1\else #2\fi}

% Same as above, but check for italic font.  Actually this also catches
% non-italic slanted fonts since it is impossible to distinguish them from
% italic fonts.  But since this is only used by $ and it uses \sl anyway
% this is not a problem.
\def\ifusingit#1#2{\ifdim \fontdimen1\font>0pt #1\else #2\fi}

% Turn off all special characters except @
% (and those which the user can use as if they were ordinary).
% Most of these we simply print from the \tt font, but for some, we can
% use math or other variants that look better in normal text.

\catcode`\"=\active
\def\activedoublequote{[\tt\char34 ]}
\let"=\activedoublequote
\catcode`\_=\active
\def_=[{[\tt\char126 ]}
\chardef\hat=`\^{}
\catcode`\^=\active
\def^=[{[\tt \hat ]}]

\catcode`\_=\active
\def_.[\ifusingtt\normalunderscore]{_}
\let\realunder=_
% print a typewriter backslash, hence we use an explicit \mathchar,
% which is the decimal equivalent of "715c (class 7, e.g., use \fam;
% ignored family value; char position "5C). We can't use " for the
% usual hex value because it has already been made active.
@def@normalbackslash{{@tt @ifmmode @mathchar29020 @else @backslashcurfont @fi}}
@let@backslashchar = @normalbackslash % @backslashchar{} is for user documents.

% On startup, @fixbackslash assigns:
% @let \ = @normalbackslash
% \rawbackslash defines an active \ to do \backslashcurfont.
% \otherbackslash defines an active \ to be a literal `\\' character with
% catcode other. We switch back and forth between these.
@gdef@rawbackslash[@let=\backslashcurfont]
@gdef@otherbackslash[@let=\realbackslash]

% Same as @turnoffactive except outputs \ as \texttt{\char`\\} instead of
% the literal character `\'. Also revert - to its normal character, in
% case the active - from code has slipped in.
%
{ @catcode`- = @active
@gdef@normalturnoffactive{%          
@let-=@normaldash
@let"=@normaldoublequote
@let$=@normaldollar %$ font-lock fix
@let+=@normalplus
@let<=@normalless
@let>=@normalgreater
@let@=@normalbackslash
@let^=@normalcaret
@let_=@normalunderscore
@let|=@normalverticalbar
@let~=@normaltilde
@markupsetuplqdefault
@markupsetuprqdefault
@unsepspaces
}
%
% Make _ and + \other characters, temporarily.
% This is canceled by @fixbackslash.
@otherifyactive

% If a .fmt file is being used, we don't want the `\input texinfo' to show up.
% That is what \eatinput is for; after that, the `\' should revert to printing
% a backslash.
%
@gdef@eatinput input texinfo{@fixbackslash}
@global@let\ = @eatinput
% On the other hand, perhaps the file did not have a `\input texinfo'. Then
% the first `\' in the file would cause an error. This macro tries to fix
% that, assuming it is called before the first `\' could plausibly occur.
% Also turn back on active characters that might appear in the input
% file name, in case not using a pre-dumped format.
%
@gdef@fixbackslash{%
@ifx\@eatinput @let\ = @normalbackslash @fi
@catcode`+=@active
@catcode`_=@active
}

% Say @foo, not \foo, in error messages.
@escapechar = `@ @

% These (along with & and #) are made active for url-breaking, so need
% active definitions as the normal characters.
@def@normaldot{.}
@def@normalquest{?}
@def@normalslash{/}

% These look ok in all fonts, so just make them not special.
% @hashchar{} gets its own user-level command, because of #line.
@catcode`@& = @other
@def@normalamp{&}
@catcode`@# = @other
@def@normalhash{#}
@catcode`@% = @other
@def@normalpercent{%

@let @hashchar = @normalhash

@c Finally, make ` and ' active, so that txicodequoteundirected and
@c txicodequotebacktick work right in, e.g., @w{ @code{`foo'}}.  If we
@c don't make ` and ' active, @code will not get them as active chars.
@c Do this last of all since we use ` in the previous @catcode assignments.
@catcode`@` =@active
@catcode`@' =@active
@markupsetupqlqdefault
@markupsetuprqdefault

@c Local variables:
@c eval: (add-hook 'write-file-hooks 'time-stamp)
@c page-delimiter: "^\\message"
@c time-stamp-start: "def\\texinfoversion{"
@c time-stamp-format: "%:y-%02m-%02d.%02H"
@c time-stamp-end: "}"
@c End:

c vim:sw=2:
1.81 libffi/doc 3.2.1
1.81.1 Available under license:

#!/bin/sh

# ***** BEGIN LICENSE BLOCK ******
# Version: MPL 1.1/GPL 2.0/LGPL 2.1
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#
# The Original Code is the MSVC wrappificator.
#
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# and other provisions required by the GPL or the LGPL. If you do not delete
# the provisions above, a recipient may use your version of this file under
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#
# ***** END LICENSE BLOCK ******
GCC-compatible wrapper for cl.exe and ml.exe. Arguments are given in GCC format and translated into something sensible for cl or ml.

```
args_orig=$@
args="-nologo -W3"
static_crt=
dbg_crt=
cl="cl"
ml="ml"
safeseh="-safeseh"
output=

while [ $# -gt 0 ]
do
  case $1 in
    -*fexceptions)
      # Don't enable exceptions for now.
      #args="$args -EHac"
      shift 1
      ;;
    -*m32)
      shift 1
      ;;
    -*m64)
      ml="ml64" # "$MSVC/x86_amd64/ml64"
      safeseh=
      shift 1
      ;;
    -*clang-cl)
      cl="clang-cl"
      safeseh=
      shift 1
      ;;
    -*O*)
      args="$args -Od"
      shift 1
      ;;
    -*O*)
      # Runtime error checks (enabled by setting -RTC1 in the -DFFI_DEBUG case below) are not compatible with optimization flags and will cause the build to fail. Therefore, drop the optimization flag if -DFFI_DEBUG is also set.
      case $args_orig in
        *(.-DFFI_DEBUG*)
          args="$args"
```

# The ax_cc_maxopt.m4 macro from the upstream autoconf-archive project doesn't support MSVC and therefore ends up trying to use -O3. Use the equivalent "max optimization" flag for MSVC instead of erroring out.

case $1 in
  -O3)
    args="$args -O2"
  ;;
  *)
    args="$args $1"
  ;;
esac

opt="true"

shift 1

case $1 in
  -g)
    # Enable debug symbol generation.
    args="$args -Zi"
    shift 1
  ;;
  -DFFI_DEBUG)
    # Enable runtime error checks.
    args="$args -RTC1"
    defines="$defines $1"
    shift 1
  ;;
  -DUSE_STATIC_RTL)
    # Link against static CRT.
    static_crt=1
    shift 1
  ;;
  -DUSE_DEBUG_RTL)
    # Link against debug CRT.
    debug_crt=1
    shift 1
  ;;
  -c)
    args="$args -c"
    args="$(echo $args | sed 's%/Fe%/Fo%g')"
    single="-c"
    shift 1
  ;;
  -D*=
name="$\{echo $\{sed \'-D(\[\^[a-zA-Z0-9\=]+=%]\^=\=[\^a-zA-Z0-9\^=]+=%\})s/\^=\\^=/\^=\^/g\}\'"
value="$(echo $1|sed 's/-D[^=]*[^=]*=//g')"
args="$args -D{name}='$value'"
defines="$defines -D{name}='$value'"
shift 1
::
-D*)
    args="$args $1"
defines="$defines $1"
    shift 1
::
-I)
    args="$args -I$2"
    includes="$includes -I$2"
    shift 2
::
-I*)
    args="$args $1"
    includes="$includes $1"
    shift 1
::
-W|--Wextra)
    # TODO map extra warnings
    shift 1
::
-Wall)
    # -Wall on MSVC is overzealous, and we already build with -W3. Nothing
    # to do here.
    shift 1
::
-pedantic)
    # libffi tests -pedantic with -Wall, so drop it also.
    shift 1
::
-Werror)
    args="$args -WX"
    shift 1
::
-W*)
    # TODO map specific warnings
    shift 1
::
-S)
    args="$args -FAa"
    shift 1
::
-o)
    outdir="$dirname $2"
    base="$basename $2|sed 's/\.[^.]*/\//g')"
if [-n "$single" ]; then
    output="-Fo$2"
else
    output="-Fe$2"
fi
if [-n "$assembly" ]; then
    args="$args $output"
else
    args="$args $output -Fd$outdir/$base -Fp$outdir/$base -Fa$outdir/$base"
fi
shift 2
::
*.*.S)
    src=$1
    assembly="true"
    shift 1
::
*.*.c)
    args="$args $1"
    shift 1
::
*)
    # Assume it's an MSVC argument, and pass it through.
    args="$args $1"
    shift 1
::
esac
done

# If -Zi is specified, certain optimizations are implicitly disabled
# by MSVC. Add back those optimizations if this is an optimized build.
# NOTE: These arguments must come after all others.
if [-n "$opt" ]; then
    args="$args -link -OPT:REF -OPT:ICF -INCREMENTAL:NO"
fi

if [-n "$static_crt" ]; then
    md=-MT
else
    md=-MD
fi

if [-n "$debug_crt" ]; then
    md="$mdd"
fi

if [-n "$assembly" ]; then
    if [-z "$outdir" ]; then

outdir="."

else
    args="$md $args"
    echo "$cl $args"
    eval "($cl $args 2>&1 1>&3 | awk '{print $0} /D9002/ {error=1} END{exit error}' >&2) 3>&1"
    result=$?
fi

exit $result

% texinfo.tex -- TeX macros to handle Texinfo files.
%
% Load plain if necessary, i.e., if running under initex.
\expandafter\ifx\csname fmtname\endcsname\relax\input plain\fi
%
\def\texinfoversion{2013-02-01.11}
%
%
\% This texinfo.tex file is free software: you can redistribute it and/or
\% modify it under the terms of the GNU General Public License as
\% published by the Free Software Foundation, either version 3 of the
\% License, or (at your option) any later version.
%
\% This texinfo.tex file is distributed in the hope that it will be
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% a Texinfo source document, you may use the result without
% restriction. This Exception is an additional permission under section 7
% of the GNU General Public License, version 3 ("GPLv3").
%
% Please try the latest version of texinfo.tex before submitting bug
% reports; you can get the latest version from:
% http://ftp.gnu.org/gnu/texinfo/ (the Texinfo release area), or
% http://ftpmirror.gnu.org/texinfo/ (same, via a mirror), or
% http://www.gnu.org/software/texinfo/ (the Texinfo home page)
% The texinfo.tex in any given distribution could well be out
% of date, so if that's what you're using, please check.
%
% Send bug reports to bug-texinfo@gnu.org. Please include including a
% complete document in each bug report with which we can reproduce the
% problem. Patches are, of course, greatly appreciated.
%
% To process a Texinfo manual with TeX, it's most reliable to use the
% texi2dvi shell script that comes with the distribution. For a simple
% manual foo.texi, however, you can get away with this:
% tex foo.texi
% texindex foo.??
% tex foo.texi
% dvips foo.dvi -o # or whatever; this makes foo.ps.
% The extra TeX runs get the cross-reference information correct.
% Sometimes one run after texindex suffices, and sometimes you need more
% than two; texi2dvi does it as many times as necessary.
%
% It is possible to adapt texinfo.tex for other languages, to some
% extent. You can get the existing language-specific files from the
% full Texinfo distribution.
%
% The GNU Texinfo home page is http://www.gnu.org/software/texinfo.

\message{Loading texinfo [version \texinfoversion]:}
%
% If in a .fmt file, print the version number
% and turn on active characters that we couldn't do earlier because
% they might have appeared in the input file name.
\everyjob\message{[Texinfo version \texinfoversion]}\%
\catcode`+=\active \catcode`\_=\active
\chardef\other=12
\% We never want plain's \outer definition of + in Texinfo.
\% For @tex, we can use tabalign.
\let+ = \relax

\% Save some plain tex macros whose names we will redefine.
\let\ptexb=\b
\let\ptexbullet=\bullet
\let\ptexc=\c
\let\ptexcomma=,
\let\ptexdot=.
\let\ptexdots=\dots
\let\ptexend=\end
\let\ptexequiv=\equiv
\let\ptexexclam=!
\let\ptexfootnote=\footnote
\let\ptexgtr=>
\let\ptexhat=^\hat
\let\ptexindent=\indent
\let\ptexinsert=\insert
\let\ptexlbrace=\{
\let\ptexless=<
\let\ptexnewwrite=\newwrite
\let\ptexnoindent=\noindent
\let\ptexplus=+
\let\ptexraggedright=\raggedright
\let\ptexrbrace=\}
\let\ptexslash=\slash
\let\ptexstar=\star
\let\ptext=\t
\let\ptextop=\top
{\catcode`\='=active \global\let\ptexquoteright'}% active in plain's math mode

\% If this character appears in an error message or help string, it
\% starts a new line in the output.
\newlinechar = `\^^J

\% Use TeX 3.0's \inputlineno to get the line number, for better error
\% messages, but if we're using an old version of TeX, don't do anything.
\%
\ifx\inputlineno\thisisundefined
\let\linenumber = \empty % Pre-3.0.
\else
\def\linenumber{1.\the\inputlineno\space}
\fi

\% Set up fixed words for English if not already set.
\ifx\putwordAppendix\undefined \gdef\putwordAppendix{Appendix}\fi
% Since the category of space is not known, we have to be careful.
\chardef\nowspaces=10
\def\nowspaces{\catcode`\ =\spacecat}

% sometimes characters are active, so we need control sequences.
\chardef\ampChar =`&
\chardef\colonChar =`:
\chardef\commaChar =`,
\chardef\dashChar =`-
\chardef\dotChar   = `.\n\chardef\exclamChar= `!
\chardef\hashChar  = `#
\chardef\lquoteChar= ``
\chardef\questChar = `?
\chardef\rquoteChar= `'
\chardef\semiChar  = `;
\chardef\slashChar = `/
\chardef\underChar = `\_

% Ignore a token.
%
\def\gobble#1{}%

% The following is used inside several \edef's.
\def\makecsname#1{\expandafter\noexpand\csname#1\endcsname}

% Hyphenation fixes.
% hyphenation{
Flor-i-da Ghost-script Ghost-view Mac-OS Post-Script
ap-pen-dix bit-map bit-maps
data-base data-bases eshell fall-ing half-way long-est man-u-script
man-u-scripts mini-buf-fer mini-buf-fers over-view par-a-digm
par-a-digms rath-er rec-tan-gu-lar ro-bot-ics se-vere-ly set-up spa-ces
spell-ing spell-ings
stand-alone strong-est time-stamp time-stamps which-ever white-space
wide-spread wrap-around
%
}
% Margin to add to right of even pages, to left of odd pages.
% newdimen\bindingoffset
% newdimen\normaloffset
% newdimen\pagewidth newdimen\pageheight
%
% For a final copy, take out the rectangles
% that mark overfull boxes (in case you have decided
% that the text looks ok even though it passes the margin).
%
% def\finalout{\overfullrule=0pt }
%
% Sometimes it is convenient to have everything in the transcript file
% and nothing on the terminal. We don't just call \tracingall here,
% since that produces some useless output on the terminal. We also make
% some effort to order the tracing commands to reduce output in the log
% file; cf. trace.sty in LaTeX.
%
% def\loggingall{\begingroup \globaldefs = 1 \loggingall \endgroup}%
% def\loggingall{%
\tracingstats2
\tracingpages1
\tracinglostchars2 % 2 gives us more in etex
\tracingparagraphs1
\tracingoutput1
\tracingmacros2
\tracingrestores1
\showboxbreadth\maxdimen \showboxdepth\maxdimen
\ifx\TeXversion\thisisundefined\else % etex gives us more logging
\tracingscantokens1
\tracingifs1
\tracinggroups1
\tracingnesting2
\tracingassigns1
\fi
\tracingcommands3 % 3 gives us more in etex
\errorcontextlines16
%
% \@errormsg{MSG}. Do the index-like expansions on MSG, but if things
% aren't perfect, it's not the end of the world, being an error message,
% after all.
%
% \def\errormsg{\begingroup \indexofonts \doerrormsg}
% \def\doerrormsg#1{\errmessage{#1}}
%
% add check for \lastpenalty to plain’s definitions. If the last thing
% we did was a \nobreak, we don’t want to insert more space.
%
% \def\smallbreak{\ifnum\lastpenalty<10000\par\ifdim\lastskip<\smallskipamount
\removelastskip\penalty-50\smallskip\fi\fi}
% \def\medbreak{\ifnum\lastpenalty<10000\par\ifdim\lastskip<\medskipamount
\removelastskip\penalty-100\medskip\fi\fi}
% \def\bigbreak{\ifnum\lastpenalty<10000\par\ifdim\lastskip<\bigskipamount
\removelastskip\penalty-200\bigskip\fi\fi}
%
% Do @@cropmarks to get crop marks.
%
% \newif\ifcropmarks
% \let\cropmarks = \cropmarkstrue
%
% Dimensions to add cropmarks at corners.
% Added by P. A. MacKay, 12 Nov. 1986
%
% \newdimen\outerhsize \newdimen\outervsize % set by the paper size routines
% \newdimen\cornerlong \cornerlong=1pc
% \newdimen\cornerthick \cornerthick=.3pt
% \newdimen\topandbottommargin \topandbottommargin=.75in
% Output a mark which sets \thischapter, \thissection and \thiscolor.
% We dump everything together because we only have one kind of mark.
% This works because we only use \botmark / \topmark, not \firstmark.
%
% A mark contains a subexpression of the \ifcase ... \fi construct.
% \get*marks macros below extract the needed part using \ifcase.
%
% Another complication is to let the user choose whether \thischapter
% \thissection refers to the chapter (section) in effect at the top
% of a page, or that at the bottom of a page. The solution is
% described on page 260 of The TeXbook. It involves outputting two
% marks for the sectioning macros, one before the section break, and
% one after. I won't pretend I can describe this better than DEK...
\def\domark{\%\n  \toks0=\expandafter{\lastchapterdefs}\%\n  \toks2=\expandafter{\lastsectiondefs}\%\n  \toks4=\expandafter{\prevchapterdefs}\%\n  \toks6=\expandafter{\prevsectiondefs}\%\n  \toks8=\expandafter{\lastcolordefs}\%\n  \mark{\%\n    \the\toks0 \the\toks2\%\n    \noexpand\or \the\toks4 \the\toks6\%\n    \noexpand\else \the\toks8\%\n  }\%
}\}%
% \topmark doesn't work for the very first chapter (after the title
% page or the contents), so we use \firstmark there -- this gets us
% the mark with the chapter defs, unless the user sneaks in, e.g.,
% @setcolor (or @url, or @link, etc.) between @contents and the very
% first @chapter.
\def\gettopheadingmarks{\%\n  \ifcase0\topmark\fi\%\n  \ifx\thischapter\empty \ifcase0\firstmark\fi \fi\%\n}\}%
\def\getbottomheadingmarks{\ifcase1\botmark\fi}\}%
\def\getcolormarks{\ifcase2\topmark\fi}\}%
% Avoid "undefined control sequence" errors.
\def\lastchapterdefs{}\}%
\def\lastsectiondefs{}\}%
\def\prevchapterdefs{}\}%
\def\prevsectiondefs{}\}%
\def\lastcolordefs{}\}%
% Main output routine.
\chardef\PAGE = 255\}%
\output = {\onepageout{\pagecontents\PAGE} }\}
% Here are the rules for the cropmarks. Note that they are
% offset so that the space between them is truly \outerhsize or \outervsize
% (P. A. MacKay, 12 November, 1986)
%\def\ewtop{|\vrule height\cornerthick depth0pt width\cornerlong} 
\def\nsbot{|\vbox{\hrule height\cornerlong depth\cornerthick width\cornerthick}}
\def\ewbot{|\vrule height0pt depth\cornerthick width\cornerlong} 
\def\nsbot{|\vbox{\hrule height\cornerlong depth\cornerthick width\cornerthick}}

% Parse an argument, then pass it to #1. The argument is the rest of
% the input line (except we remove a trailing comment). #1 should be a
% macro which expects an ordinary undelimited TeX argument.
%\def\parsearg{|\parseargusing{} }
\def\parseargusing#1#2{\def\argtorun{#2} \begin{group}
\obeylines
\spaceisspace #1 
\parseargline{\empty} % Insert the \empty token, see \finishparsearg below.
\end{group}
\def\parseargline#1^^M{\end{group} % End of the group started in \parsearg.
\argremovecomment #1 \comment \ArgTerm}
\def\argremovec#1 \c \#2 \ArgTerm{\argcheckspaces #1 \^^M \ArgTerm}
\def\argcheckspaces#1 \^^M{\argcheckspacesX #1 \^^M \^^M}

% First remove any @comment, then any @c comment.
\def\argremovecomment#1 \comment #2 \ArgTerm{\argremovevec #1 \c \ArgTerm}
\def\argremovevec#1 \c #2 \ArgTerm{\argcheckspaces #1 \^^M \ArgTerm}

% Each occurrence of `\^^M' or `<space>\^^M' is replaced by a single space.
% \argremovevec might leave us with trailing space, e.g.,
% @end itemize @c foo
% This space token undergoes the same procedure and is eventually removed
% by \finishparsearg.
%\def\argcheckspacesX #1 \^^M{\argcheckspacesX #1 \^^M \^^M}
\def\argchecksX#1 \^^M{\argchecksY#1\^^M} \\
\def\argchecksY#1\^^M#2\^^M#3\ArgTerm{\% \\
\let\temp{#3}\% \\
% Do not use \next, perhaps the caller of \parsearg uses it; reuse \temp: \\
\let\temp\finishparsearg \\
\else \\
\let\temp\argchecks \\
\fi \\
% Put the space token in: \\
\temp#1 #3\ArgTerm 
} \\
% If a _delimited_ argument is enclosed in braces, they get stripped; so 
% to get _exactly_ the rest of the line, we had to prevent such situation. 
% We prepended an \empty token at the very beginning and we expand it now, 
% just before passing the control to \argtorun. 
% (Similarly, we have to think about #3 of \argchecksY above: it is 
% either the null string, or it ends with \^^M---thus there is no danger 
% that a pair of braces would be stripped. 
% 
% But first, we have to remove the trailing space token. 
% 
\def\finishparsearg#1 \ArgTerm{\expandafter\argtorun\expandafter[#1]} 
\% \parseargdef\foo{...} 
% is roughly equivalent to 
\% \def\foo{\parsearg\Xfoo} 
\% \def\Xfoo#1{...} 
% 
% Actually, I use \csname\string\foo\endcsname, ie. \foo, as it is my 
% favourite TeX trick. --kasal, 16nov03 
\def\parseargdef#1{% 
\expandafter\doparseargdef \csname\string#1\endcsname #1% 
} 
\def\doparseargdef#1#2{% 
\def#2{\parsearg#1} 
\def#1##1% 
} 
% Several utility definitions with active space: 
{
\obeyspaces 
\gdef\obeyedspace{ } 
% Make each space character in the input produce a normal interword 
% space in the output. Don't allow a line break at this space, as this
% is used only in environments like @example, where each line of input
% should produce a line of output anyway.
%
\gdef\sepspaces{\obeyspaces\let =\tie}
%
% If an index command is used in an @example environment, any spaces
% therein should become regular spaces in the raw index file, not the
% expansion of \tie (leavevmode \penalty @M \).
\gdef\unsepspaces{\let =\space}
}

\def\flushcr{\ifx\par\lisppar \def\next##1{}\else \let\next=\relax \fi \next}

% Define the framework for environments in texinfo.tex. It's used like this:
%
% \envdef\foo{...}
% \def\Efoo{...}
%
% It's the responsibility of \envdef to insert \begingroup before the
% actual body; @end closes the group after calling \Efoo. \envdef also
% defines \thisenv, so the current environment is known; @end checks
% whether the environment name matches. The \checkenv macro can also be
% used to check whether the current environment is the one expected.
%
% Non-false conditionals (@iftex, @ifset) don't fit into this, so they
% are not treated as environments; they don't open a group. (The
% implementation of @end takes care not to call \endgroup in this
% special case.)

% At run-time, environments start with this:
\def\startenvironment#1{\begingroup\def\thisenv{#1}}
% initialize
\let\thisenv\empty

% ... but they get defined via ``\envdef\foo{...}'':
\long\def\envdef#1#2{\def#1{\startenvironment#1#2}}
\long\def\envparseargdef#1#2{\parseargdef#1{\startenvironment#1#2}}

% Check whether we're in the right environment:
\def\checkenv#1{%
\def\temp{#1}%
\ifa\thisenv\temp
\else
  \badenverr
\fi%
}
% Environment mismatch, #1 expected:
def\badenverr{
  \errhelp = \EMsimple
  \errmessage{This command can appear only \inenvironment\temp,
    not \inenvironment\thisenv}%
}
def\inenvironment#1{%
  \ifx#1\empty
    outside of any environment%
  \else
    in environment \expandafter\string#1%
  \fi
}

% @end foo executes the definition of \Efoo.
% But first, it executes a specialized version of \checkenv
%\parseargdef\end{%
  \if 1\csname iscond.#1\endcsname
  \else
    The general wording of \badenverr may not be ideal.
    \checkenv\csname#1\endcsname
    \csname E#1\endcsname
    \endgroup
  \fi
}
\newhelp\EMsimple{Press RETURN to continue.}

% Be sure we're in horizontal mode when doing a tie, since we make space
% equivalent to this in @example-like environments. Otherwise, a space
% at the beginning of a line will start with \penalty -- and
% since \penalty is valid in vertical mode, we'd end up putting the
% penalty on the vertical list instead of in the new paragraph.
{%catcode`@ = 11
  % Avoid using \@M directly, because that causes trouble
  % if the definition is written into an index file.
  \global\let\tiepenalty = \@M
  \gdef\tie{\leavevmode\penalty\tiepenalty\ }%
%}

% @: forces normal size whitespace following.
def\{:\spacefactor=1000}

% @* forces a line break.
def\*{\unskip\hfil\break\hbox{}}\ignorespaces
% @/ allows a line break.
\let\allowbreak\
% @. is an end-of-sentence period.
\def\.{.\spacefactor=\endofsentencespacefactor\space}
% @! is an end-of-sentence bang.
\def!{!\spacefactor=\endofsentencespacefactor\space}
% @? is an end-of-sentence query.
\def?{?\spacefactor=\endofsentencespacefactor\space}
% @frenchspacing on|off says whether to put extra space after punctuation.
% \def\onword{on}
% \def\offword{off}
% \parseargdef\frenchspacing{%
% \def\temp{#1}%
% \ifx\temp\onword \plainfrenchspacing
% \else\ifx\temp\offword \plainnonfrenchspacing
% \else
% \errhelp = \EMsimple
% \errmessage{Unknown @frenchspacing option \textasciitilde\temp', must be on|off}%
% \fi
% \fi}
%
% @w prevents a word break. Without the \leavevmode, @w at the
% beginning of a paragraph, when TeX is still in vertical mode, would
% produce a whole line of output instead of starting the paragraph.
% \def\w#1{\leavevmode\hbox{#1}}
%
% @group ... @end group forces ... to be all on one page, by enclosing
% it in a TeX vbox. We use \vtop instead of \vbox to construct the box
% to keep its height that of a normal line. According to the rules for
% \topskip (p.114 of the TeXbook), the glue inserted is
% \max (\topskip - \ht (first item), 0). If that height is large,
% therefore, no glue is inserted, and the space between the headline and
% the text is small, which looks bad.
%
% Another complication is that the group might be very large. This can
% cause the glue on the previous page to be unduly stretched, because it
% does not have much material. In this case, it's better to add an
% explicit \vfill so that the extra space is at the bottom. The
% threshold for doing this is if the group is more than \vfilllimit
% percent of a page (\vfilllimit can be changed inside of @tex).
\newbox\groupbox
\def\vfilllimit{0.7}
%
\envdef\group{%
  \ifnum\catcode`\^^M=\active\else
    \errhelp = \groupinvalidhelp
    \errmessage[@group invalid in context where filling is enabled]%
  \fi
  \startsavinginserts
%
  \setbox\groupbox = \vtop\bgroup
    % Do @comment since we are called inside an environment such as
    % @example, where each end-of-line in the input causes an
    % end-of-line in the output. We don't want the end-of-line after
    % the `@group' to put extra space in the output. Since @group
    % should appear on a line by itself (according to the Texinfo
    % manual), we don't worry about eating any user text.
    \comment
  }
%
  % The \vtop produces a box with normal height and large depth; thus, TeX puts
  % \baselineskip glue before it, and (when the next line of text is done)
  % \lineskip glue after it. Thus, space below is not quite equal to space
  % above. But it's pretty close.
  \def\Egroup{%
    % To get correct interline space between the last line of the group
    % and the first line afterwards, we have to propagate \prevdepth.
    \endgraf % Not \par, as it may have been set to \lisppar.
    \global\dimen1 = \prevdepth
    \egroup           % End the \vtop.
    % \dimen0 is the vertical size of the group's box.
    \dimen0 = \ht\groupbox \advance\dimen0 by \dp\groupbox
    % \dimen2 is how much space is left on the page (more or less).
    \dimen2 = \pageheight \advance\dimen2 by \pagetotal
    % if the group doesn't fit on the current page, and it's a big big
    % group, force a page break.
    \ifdim \dimen0 > \dimen2
      \ifdim \pagetotal < \vfilllimit\pageheight
        \page
      \fi
    \fi
  \box\groupbox
  \prevdepth = \dimen1
  \checkinserts
}
%
% TeX puts in an \ escap echar (i.e., `@') at the beginning of the help
% message, so this ends up printing `@ group can only ...'.
\newhelp\groupinvalidhelp{%
group can only be used in environments such as @example,^^J%
where each line of input produces a line of output.)
%
@need space-in-mils
@need forces a page break if there is not space-in-mils remaining.

\newdimen\mil \mil=0.001in

\parseargdef\need{%
% Ensure vertical mode, so we don't make a big box in the middle of a
% paragraph.
\par
%
% If the @need value is less than one line space, it's useless.
\dimen0 = #1\mil
\dimen2 = \ht\strutbox
\advance\dimen2 by \dp\strutbox
\ifdim\dimen0 > \dimen2
%
% Do a \strut just to make the height of this box be normal, so the
% normal leading is inserted relative to the preceding line.
% And a page break here is fine.
\vtop to #1\mil{\strut}\vfil%
%
% TeX does not even consider page breaks if a penalty added to the
% main vertical list is 10000 or more. But in order to see if the
% empty box we just added fits on the page, we must make it consider
% page breaks. On the other hand, we don't want to actually break the
% page after the empty box. So we use a penalty of 9999.
%
% There is an extremely small chance that TeX will actually break the
% page at this \penalty, if there are no other feasible breakpoints in
% sight. (If the user is using lots of big @group commands, which
% almost-but-not-quite fill up a page, TeX will have a hard time doing
% good page breaking, for example.) However, I could not construct an
% example where a page broke at this \penalty; if it happens in a real
% document, then we can reconsider our strategy.
\penalty9999%
%
% Back up by the size of the box, whether we did a page break or not.
\kern -#1\mil
%
% Do not allow a page break right after this kern.
\nobreak
\fi
}
% @br  forces paragraph break (and is undocumentated).

\let\br = \par

% @page forces the start of a new page.
% \def\page{\par\vfill\supereject}

% @exdent text....
% outputs text on separate line in roman font, starting at standard page margin

% This records the amount of indent in the innermost environment.
% That's how much `\exdent should take out.
\newskip\exdentamount

% This defn is used inside fill environments such as @defun.
\parseargdef\exdent{\hfil\break\hbox{\kern -\exdentamount{\rm#1}}\hfil\break}

% This defn is used inside nofill environments such as @example.
\parseargdef\nofill\exdent{{\advance \leftskip by -\exdentamount
\leftline{\hskip\leftskip{\rm#1}}}}

% @inmargin{WHICH}{TEXT} puts TEXT in the WHICH margin next to the current
% paragraph. For more general purposes, use the `margin insertion
% class. WHICH is `l' or `r'. Not documented, written for gawk manual.
% \newskip\inmarginspacing \inmarginspacing=1cm
\def\strutdepth\dp\strutbox
% \doinmargin#1#2{\strut\vadjust{\nobreak\kern-\strutdepth\vtop to \strutdepth{\baselineskip=\strutdepth\vss\ifx#1l\llap{\ignorespaces #2\hskip\inmarginspacing}\else\rlap{\hskip\hsize \hskip\inmarginspacing \ignorespaces #2}\fi\null}}}
\def\inleftmargin\doinmargin l
\def\inrightmargin\doinmargin r

\def\doinmargin1#2{\strut\vadjust{\nobreak\kern-\strutdepth\vtop to \strutdepth{\baselineskip=\strutdepth\vss\ifx#1l\llap{\ignorespaces \hskip\inmarginspacing \ignorespaces #2\hskip\inmarginspacing}\else\rlap{\hskip\hsize \hskip\inmarginspacing \ignorespaces #2}\fi\null}}}
\def\unleftmargin{\doinmargin l}
\def\unrightmargin{\doinmargin r}
\def\inmargin#1\finish{
\par\setbox0 = \hbox\ignorespaces\lefttext
\ifdim\wd0 > 0pt
\def\lefttext{#1}% have both texts
\def\righttext{#2}%
\else
\def\lefttext{#1}% have only one text
\def\righttext{#1}%
\fi
\%}
\ifodd\pageno
\def\temp{\inrightmargin\righttext}% odd page -> outside is right margin
\else
\def\temp{\inleftmargin\lefttext}%
\fi
\temp
}

\def\|{\vadjust{\llap{\vrule height\baselineskip width1pt}}}

% @| inserts a changebar to the left of the current line. It should
% surround any changed text. This approach does *not* work if the
% change spans more than two lines of output. To handle that, we would
% have adopt a much more difficult approach (putting marks into the main
% vertical list for the beginning and end of each change). This command
% is not documented, not supported, and doesn't work.
% \def\|
% \vadjust can only be used in horizontal mode.
\leavevmode
% Append this vertical mode material after the current line in the output.
\vadjust{
% We want to insert a rule with the height and depth of the current
% leading; that is exactly what \strutbox is supposed to record.
\vskip-\baselineskip
% \vadjust-items are inserted at the left edge of the type. So
% the \lap here moves out into the left-hand margin.
\llap{
% For a thicker or thinner bar, change the `1pt'.
\vrule height\baselineskip width1pt
%}
\def\popthisfilestack{\errthisfilestackempty}
\def\errthisfilestackempty{\errmessage{Internal error: \the stack of filenames is empty.}}
%
\def\thisfile{ }
%
% @center line
% outputs that line, centered.
%
\parseargdef\center{ %
  \ifhmode
    \let\centersub\centerH
  \else
    \let\centersub\centerV
  \fi
  \centersub{\hfil \ignorespaces#1\unskip \hfil} %
  \let\centersub\relax % don't let the definition persist, just in case
}
\def\centerH#1{{ %
  \hfil\break
  \advance\hsize by -\leftskip
  \advance\hsize by -\rightskip
  \line{#1} \break
}}

% The idea here is the same as in \startdefun, \cartouche, etc.: if
% @center is the first thing after a section heading, we need to wipe
% out the negative parskip inserted by \sectionheading, but still
% prevent a page break here.
\newcount\centerpenalty
\def\centerV#1{ %
  \centerpenalty = \lastpenalty
  \ifnum\centerpenalty>10000 \vskip\parskip \fi
  \ifnum\centerpenalty>9999 \penalty\centerpenalty \fi
  \line{\kern\leftskip #1\kern\rightskip} %
}

% @sp n outputs n lines of vertical space
%
\parseargdef\sp{\vskip #1\baselineskip}

% @comment ...line which is ignored...
% @c is the same as @comment
% @ignore ... @end ignore is another way to write a comment
%
\def\comment{\begingroup \catcode`\^^M=\other%
\catcode`@=\other \catcode`\{=\other \catcode`\}=\other% 
\commentxxx}
{\catcode`\^^M=\other \gdef\commentxxx\#1\^^M{\endgroup} }
%
\def\c=\comment

% @paragraphindent NCHARS
% We'll use ems for NCHARS, close enough.
% NCHARS can also be the word `asis' or `none'.
% We cannot feasibly implement @paragraphindent asis, though.
% \def\asisword[asis] % no translation, these are keywords
\def\noneword{none}
%
\parseargdef\paragraphindent{%
\def\temp{#1}%
\ifx\temp\asisword
\else
\ifx\temp\noneword
\defaultparindent = 0pt
\else
\defaultparindent = #1em
\fi
\fi
\parindent = \defaultparindent
}

% @exampleindent NCHARS
% We'll use ems for NCHARS like @paragraphindent.
% It seems @exampleindent asis isn't necessary, but
% I preserve it to make it similar to @paragraphindent.
\parseargdef\exampleindent{%
\def\temp{#1}%
\ifx\temp\asisword
\else
\ifx\temp\noneword
\lispnarrowing = 0pt
\else
\lispnarrowing = #1em
\fi
\fi
}

% @firstparagraphindent WORD
% If WORD is `none', then suppress indentation of the first paragraph
% after a section heading. If WORD is `insert', then do indent at such
% paragraphs.
%
\def\suppressfirstparagraphindent{\dosuppressfirstparagraphindent}
\def\insertword{insert}
%
\parseargdef\firstparagraphindent{%
  \def\temp{#1}%
  \ifx\temp\noneword
    \let\suppressfirstparagraphindent = \dosuppressfirstparagraphindent
  \else\ifx\temp\insertword
    \let\suppressfirstparagraphindent = \relax
  \else
    \errhelp = \EMsimple
    \errmessage{Unknown \firstparagraphindent option `\temp'}%
  \fi
%}
%
% Here is how we actually suppress indentation. Redefine \everypar to
% \kern backwards by \parindent, and then reset itself to empty.
%
% We also make \indent itself not actually do anything until the next
% paragraph.
%
\gdef\dosuppressfirstparagraphindent{%
  \gdef\indent{%
    \restorefirstparagraphindent
    \indent
  }%
  \gdef\noindent{%
    \restorefirstparagraphindent
    \noindent
  }%
  \global\everypar = {%
    \kern -\parindent
    \restorefirstparagraphindent
  }%
}%

\gdef\restorefirstparagraphindent{%
  \global \let \indent = \ptexindent
  \global \let \noindent = \ptexnoindent
  \global \everypar = { }%
}
% @refill is a no-op.
\let\refill=\relax

% If working on a large document in chapters, it is convenient to
% be able to disable indexing, cross-referencing, and contents, for test runs.
% This is done with @novalidate (before @setfilename).
% \newif\iflinks \linkstrue % by default we want the aux files.
\let\novalidate = \linksfalse

% @setfilename is done at the beginning of every texinfo file.
% So open here the files we need to have open while reading the input.
% This makes it possible to make a .fmt file for texinfo.
\def\setfilename{%
  \fixbackslash % Turn off hack to swallow `\input texinfo'.
  \iflinks
    \tryauxfile
    % Open the new aux file. TeX will close it automatically at exit.
    \immediate\openout\auxfile=\jobname.aux
    % \openindices needs to do some work in any case.
    \openindices
    \let\setfilename=\comment % Ignore extra @setfilename cmds.
  %}
  % If texinfo.cnf is present on the system, read it.
  % Useful for site-wide @afourpaper, etc.
  \openin 1 texinfo.cnf
  % If eof 1 `else `input texinfo.cnf`fi
  \ifeof 1 \else `input texinfo.cnf`fi
  \closein 1
%
  \comment % Ignore the actual filename.
}  

% Called from \setfilename.
%
\def\openindices{%
  \newindex{cp}%
  \newindex{fn}%
  \newcodeindex{pr}%
  \newcodeindex{tp}%
  \newcodeindex{ky}%
  \newcodeindex{pg}%
}

% @bye.
\outer\def\bye{\pagealignmacro\tracingstats=1\ptexend}

\message{pdf,}
\newcount\tempnum
\newcount\lnkcount
\newtoks\filename
\newcount\filenamelength
\newcount\pgn
\newtoks\toksA
\newtoks\toksB
\newtoks\toksC
\newtoks\toksD
\newbox\boxA
\newcount\countA
\newif\ifpdf
\newif\ifpdfmakepagedest

% when pdftex is run in dvi mode, \pdfoutput is defined (so \pdfoutput=1
% can be set). So we test for \relax and 0 as well as being undefined.
\ifx\pdfoutput\thisisundefined
  \else
  \ifx\pdfoutput\relax
    \else
      \ifcase\pdfoutput
        \else
          \pdftrue
          \fi
        \fi
      \fi
  \fi
\fi

% PDF uses PostScript string constants for the names of xref targets,
% for display in the outlines, and in other places. Thus, we have to
% double any backslashes. Otherwise, a name like "node" will be
% interpreted as a newline (\n), followed by o, d, e. Not good.
%
% See http://www.ntg.nl/pipermail/ntg-pdftex/2004-July/000654.html and
% related messages. The final outcome is that it is up to the TeX user
% to double the backslashes and otherwise make the string valid, so
% that's what we do. pdftex 1.30.0 (ca.2005) introduced a primitive to
% do this reliably, so we use it.

% #1 is a control sequence in which to do the replacements,
% which we \xdef.
\def\txiescapepdf#1{
  \ifx\pdfescapestring\thisisundefined
    % No primitive available; should we give a warning or log?
    % Many times it won't matter.
    \else
      % The expandable \pdfescapestring primitive escapes parentheses,
      % backslashes, and other special chars.
\def\#1{\pdfescapestring{#1}}% 
}\fi
\}
\newhelp\noplimagehelp{Texinfo supports .png, .jpg, .jpeg, and .pdf images with PDF output, and none of those formats could be found. (.eps cannot be supported due to the design of the PDF format; use regular TeX (DVI output) for that.)}
\ifpdf
%
% Color manipulation macros based on pdfcolor.tex,
% except using rgb instead of cmyk; the latter is said to render as a
% very dark gray on-screen and a very dark halftone in print, instead
% of actual black.
\def\rgbDarkRed{0.50 0.09 0.12}
\def\rgbBlack{0 0 0}
%
% k sets the color for filling (usual text, etc.);
% K sets the color for stroking (thin rules, e.g., normal _'s).
\def\pdfsetcolor#1{\pdfliteral{#1 rg #1 RG}}%
%
% Set color, and create a mark which defines \thiscolor accordingly,
% so that \makeheadline knows which color to restore.
\def\setcolor#1{%
\xdef\lastcolordefs{\gdef\noexpand\thiscolor{#1}}%
\domark
\pdfsetcolor{#1}%
}
%
\def\maincolor{\rgbBlack}
\pdfsetcolor{\maincolor}
\edef\thiscolor{\maincolor}
\def\lastcolordefs{ }
%
\def\makefootline{%
\baselineskip24pt
\line{\pdfsetcolor{\maincolor}\the\footline}%
}
%
\def\makeheadline{%
\vbox to 0pt{%
\vskip-22.5pt
\line{\vbox to8.5pt{}}%
% Extract \thiscolor definition from the marks.
\getcolormarks
% Typeset the headline with \maincolor, then restore the color.
\else
\immediate\pdfximage
\fi
\ifdim \wd0 >0pt width \pdfimagewidth \fi
\ifdim \wd2 >0pt height \pdfimageheight \fi
\ifnum\pdftexversion<13
  #1.\pdfimgext
\else
  {#1.\pdfimgext}%
\fi
\ifnum\pdftexversion < 14 \else
\pdfrefximage \pdflastximage
\fi}
%
def\pdfmkdest#1{{% 
  % We have to set dummies so commands such as @code, and characters 
  % such as \, aren't expanded when present in a section title.
  \indexnofonts
  \turnoffactive
  \makevalueexpandable
  \def\pdfdestname{#1}%
  \txiescapepdf\pdfdestname
  \safewhatsit{\pdfdest name{\pdfdestname} xyz}%
  }}%
%
% used to mark target names; must be expandable.
def\pdfmkpgn#1{#1}
%
% by default, use a color that is dark enough to print on paper as 
% nearly black, but still distinguishable for online viewing.
def\urlcolor{\rgbDarkRed}
def\linkcolor{\rgbDarkRed}
def\endlink{\setcolor{\maincolor}\pdfendlink}
%
% Adding outlines to PDF; macros for calculating structure of outlines 
% come from Petr Olsak
def\expnumber#1{\expandafter\ifx\csname#1\endcsname\relax 0% 
  \else \csname#1\endcsname \fi}
def\advancenumber#1{\tempnum=\expnumber{#1}\relax 
  \advance\tempnum by 1 
  \expandafter\xdef\csname#1\endcsname{\the\tempnum} }
%
% #1 is the section text, which is what will be displayed in the 
% #2 is the pdf expression for the number of subentries (or empty, for subsubsections). #3 is the node text, 
% which might be empty if this toc entry had no corresponding node. 
% #4 is the page number
\def\appsubsecentry\numsubsecentry
\def\appsubsubsecentry\numsubsubsecentry
\def\unnchapentry\numchapentry
\def\unnsecentry\numsecentry
\def\unnsubsecentry\numsubsecentry
\def\unnsubsubsecentry\numsubsubsecentry
\readdatafile{toc}

% Read toc second time, this time actually producing the outlines.
% The `-` means take the \expnumber as the absolute number of
% subentries, which we calculated on our first read of the .toc above.
%
% We use the node names as the destinations.
\def\numchapentry##1##2##3##4{%\dopdfoutline{##1}{count-\expnumber{chap##2}}{##3}{##4}}%
\def\numsecentry##1##2##3##4{%\dopdfoutline{##1}{count-\expnumber{sec##2}}{##3}{##4}}%
\def\numsubsecentry##1##2##3##4{%\dopdfoutline{##1}{count-\expnumber{subsec##2}}{##3}{##4}}%
\def\numsubsubsecentry##1##2##3##4{% count is always zero\dopdfoutline{##1}{}{##3}{##4}}%

% PDF outlines are displayed using system fonts, instead of
% document fonts. Therefore we cannot use special characters,
% since the encoding is unknown. For example, the eogonek from
% Latin 2 (0xea) gets translated to a | character. Info from
% Staszek Wawrykiewicz, 19 Jan 2004 04:09:24 +0100.
%
% TODO this right, we have to translate 8-bit characters to
% their "best" equivalent, based on the \documentencoding. Too
% much work for too little return. Just use the ASCII equivalents
% we use for the index sort strings.
%
\indexnofonts
\setupdatafile
%
% We can have normal brace characters in the PDF outlines, unlike
% Texinfo index files. So set that up.
\def\{\lbracecharliteral%
\def\}\rbracecharliteral%
\catcode`\=\active \otherbackslash
\input \tocreadfilename
\endgroup
%
{\catcode`\|=1 \catcode`\|=2
\catcode`\|=\other \catcode`\|=\other
\gdef\bracecharliteral[]\%
\gdef\bracecharliteral[]\%
}
\else\ifx\first\adn\else\ifx\first\adn5 \else\ifx\first\adn6 \else
\ifnum0=\countA\else\makelink\fi
\ifx\first.\let\next=\done\else
\let\next=\maketoks
\addtoks{\toksB}{\the\toksD}
\ifx\first,\addtoks{\toksB}{space}\fi
\fi
\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi
\next}
\def\makelink{\addtoks{\toksB}{\noexpand\pdflink{\the\toksC}}\toksC={}\global\countA=0}
\def\pdflink#1{\startlink attr{/Border [0 0 0]} goto name{\pdfmkpgn{#1}}\setcolor{\linkcolor}#1\endlink}
\def\done{\edef\st{\global\noexpand\toksA={\the\toksB}}\st}
\else
% non-pdf mode
\let\pdfmkdest = \gobble
\let\pdfurl = \gobble
\let\endlink = \relax
\let\setcolor = \gobble
\let\pdfsetcolor = \gobble
\let\pdfmakeoutlines = \relax
\fi  % \ifx\pdfoutput
\message{fonts,}
% Change the current font style to #1, remembering it in \curfontstyle.
% For now, we do not accumulate font styles: @b{@i{foo}} prints foo in % italics, not bold italics.
%
\def\setfontstyle#1{\def\curfontstyle{#1}% not as a control sequence, because we are \edef\d.
\csname ten#1\endcsname  % change the current font
}

% Select #1 fonts with the current style.
%
\def\selectfonts#1{\csname #1fonts\endcsname \csname\curfontstyle\endcsname % change the current font
}
\def\rm{\fam=0 \setfontstyle{rm }}
\def\it{\fam=\itfam \setfontstyle{it}}
\def\sl{\fam=\slfam \setfontstyle{sl}}
\def\bf{\fam=\bffam \setfontstyle{bf}}\def\bfstylename{bf}
\def\tt{\fam=\ttfam \setfontstyle{tt}}
% Unfortunately, we have to override this for titles and the like, since
% in those cases "rm" is bold. Sigh.
\def\rmisbold{\rm\def\curfontstyle{bf}}

% Texinfo sort of supports the sans serif font style, which plain TeX does not.
% So we set up a \sf.
\newfam\sffam
\def\sf{\fam=\sffam \setfontstyle{sf}}
\let\li = \sf % Sometimes we call it \li, not \sf.

% We don't need math for this font style.
\def\ttsl{\setfontstyle{ttsl}}

% Set the baselineskip to #1, and the lineskip and strut size
% correspondingly. There is no deep meaning behind these magic numbers
% used as factors; they just match (closely enough) what Knuth defined.
%
\def\lineskipfactor{.08333}
\def\strubaselineskipfactor{.70833}
\def\strubaselineskipfactor{.29167}
%
% can get a sort of poor man's double spacing by redefining this.
\def\baselineskipfactor{1}
%
\newdimen\textleading
\def\setleading#1{%
  \dimen0 = #1\relax
  \normalbaselineskip = \baselinefactor\dimen0
  \normallineskip = \lineskipfactor\normalbaselineskip
  \normalbaselineskip
  \setbox\strutbox =\hbox{%
    \vrule width0pt height\strudubaselineskipfactor\baselineskip
    depth \strubaselineskipfactor \baselineskip
  }%
  }
}

% PDF CMaps. See also LaTeX's t1.cmap.
%
% do nothing with this by default.
\expandafter{let\csname cmapOT1\endcsname\gobble}
\expandafter{let\csname cmapOT1\endcsname\gobble}
\expandafter{let\csname cmapOT1\endcsname\gobble}

% if we are producing pdf, and we have \pdffontattr, then define cmaps.
% (pdffontattr was introduced many years ago, but people still run
% older pdftex's; it's easy to conditionalize, so we do.)
\def\sfshape{ss}
\def\sbshape{ss}
\def\scshape{csc}
\def\scbshape{csc}

% Definitions for a main text size of 11pt. (The default in Texinfo.)
%\def\definetextfontsizexi{%
% Text fonts (11.2pt, magstep1).
%\def\textnominalsize{11pt}
%\edef\mainmagstep{\magstephalf}
%\setfont\textrm{\rmshape{10}{\mainmagstep}{OT1}}
%\setfont\texttt{\ttshape{10}{\mainmagstep}{OT1TT}}
%\setfont\textbf{\bfshape{10}{\mainmagstep}{OT1}}
%\setfont\textit{\itshape{10}{\mainmagstep}{OT1IT}}
%\setfont\textsl{\slshape{10}{\mainmagstep}{OT1}}
%\setfont\textsf{\sfshape{10}{\mainmagstep}{OT1}}
%\setfont\textsc{\scshape{10}{\mainmagstep}{OT1}}
%\setfont\textttsl{\ttslshape{10}{\mainmagstep}{OT1TT}}
%\font\texti=cmmi10 scaled \mainmagstep
%\font\textsy=cmsy10 scaled \mainmagstep
%\def\textecsize{1095}

% A few fonts for @defun names and args.
\setfont\defbf{\bfshape{10}{\magstep1}{OT1}}
\setfont\deftt{\ttshape{10}{\magstep1}{OT1TT}}
\setfont\defttsl{\ttslshape{10}{\magstep1}{OT1TT}}
\def\df{\let\tentt=\deftt \let\tenbf = \defbf \let\tenttsl=\defttsl \bf}

% Fonts for indices, footnotes, small examples (9pt).
\def\smallnominalsize{9pt}
\setfont\smallrm{\rmshape{9}{1000}{OT1}}
\setfont\smalltt{\ttshape{9}{1000}{OT1TT}}
\setfont\smallbf{\bfshape{10}{900}{OT1}}
\setfont\smallit{\itshape{9}{1000}{OT1IT}}
\setfont\smallsl{\slshape{9}{1000}{OT1}}
\setfont\smallsf{\sfshape{9}{1000}{OT1}}
\setfont\smallsc{\scshape{10}{900}{OT1}}
\setfont\smallttsl{\ttslshape{10}{900}{OT1TT}}
\font\smalli=cmmi9
\font\smallsy=cmsy9
\def\smallecsiz{0900}

% Fonts for small examples (8pt).
\def\smallernominalsize{8pt}
\setfont\smallerrm{\rmshape{8}{1000}{OT1}}
\setfont\smallertt{\ttshape{8}{1000}{OT1TT}}
\setfont\smallerbf{\bfshape{10}{800}{OT1}}
% Reduced fonts for @acro in text (9pt).
def\reducednominalsizex{9pt}
\setfont\reducedrm\rmshape{9}{900}{OT1}
\setfont\reducedtt\ttshape{9}{900}{OT1TT}
\setfont\reducedbf\bfshape{9}{900}{OT1}
\setfont\reducedit\itshape{9}{900}{OT1IT}
\setfont\reducedsl\slshape{9}{900}{OT1}
\setfont\reducedsf\sfshape{9}{900}{OT1}
\setfont\reducedsc\scshape{10}{900}{OT1}
\setfont\reducedsls\slshape{10}{900}{OT1TT}
\font\reducedi=cmmi9
\font\reducedsy=cmsy9
\def\reducedescsize{0900}
\divide\parskip by 2  % reduce space between paragraphs
\textleading = 12pt   % line spacing for 10pt CM
\textfonts            % reset the current fonts
\rm
}% end of 10pt text font size definitions, \definetextfontsizex

% We provide the user-level command
% @fonttextsize 10
% (or 11) to redefine the text font size. pt is assumed.
%
def\xichar{11}
def\xchar{10}
def\xcharpt{10pt}
%
\parseargdef\fonttextsize{%
def\textsizearg{#1}%
%\wlog{doing @fonttextsize \textsizearg}%
%
% Set \globaldefs so that documents can use this inside @tex, since
% makeinfo 4.8 does not support it, but we need it nonetheless.
%
\begingroup \globaldefs=1
\ifx\textsizearg\xchar \definetextfontsizex
\else \ifx\textsizearg\xichar \definetextfontsizexi
\else
  \errhelp=\EMsimple
  \errmessage[@fonttextsize only supports `10' or `11', not `\textsizearg']
  \ifi\fi
\endgroup
In order for the font changes to affect most math symbols and letters, we have to define the `\textfont` of the standard families. Since `\texinfo` doesn't allow for producing subscripts and superscripts except in the main text, we don't bother to reset `\scriptfont` and `\scriptscriptfont` (which would also require loading a lot more fonts).

\def\resetmathfonts{%
  \textfont0=\tenrm \textfont1=\teni \textfont2=\tensy
  \textfont\itfam=\tenit \textfont\slfam=\tensl \textfont\bffam=\tenbf
  \textfont\ttfam=\tentt \textfont\sffam=\tensf
}%

The font-changing commands redefine the meanings of `\tenSTYLE`, instead of just `\STYLE`. We do this because `\STYLE` needs to also set the current `\fam` for math mode. Our `\STYLE` (e.g., `\rm`) commands hardwire `\tenSTYLE` to set the current font.

Each font-changing command also sets the names `\lsize` (one size lower) and `\lllsize` (three sizes lower). These relative commands are used in the LaTeX logo and acronyms.

This all needs generalizing, badly.

\def\textfonts{%
  \let\tenrm=\textrm \let\tenit=\textit \let\tensl=\textsl
  \let\tenbf=\textbf \let\tentt=\texttt \let\smallcaps=\textsc
  \let\tensf=\textsf \let\teni=\texti \let\tensy=\textsy
  \let\tenttsl=\textttsl
  \def\curfontsize{text}\%
  \def\lsize{reduced}\def\lllsize{smaller}\%
  \resetmathfonts \setleading{\textleading}\}
\def\titlefonts{%
  \let\tenrm=\titlerm \let\tenit=\titleit \let\tensl=\titlesl
  \let\tenbf=\titlebf \let\tentt=\titlett \let\smallcaps=\titlesc
  \let\tensf=\titlesf \let\teni=\titlei \let\tensy=\titlesy
  \let\tenttsl=\titlettsl
  \def\curfontsize{title}\%
  \def\lsize{chap}\def\lllsize{subsec}\%
  \resetmathfonts \setleading{27pt}\}
\def\titlefont#1{{\titlefonts\rmisbold #1}}
\def\chapfonts{%
  \let\tenrm=\chaprm \let\tenit=\chapit \let\tensl=\chapsl
  \let\tenbf=\chapbf \let\tentt=\chaptt \let\smallcaps=\chapsc
  \let\tensf=\chapsf \let\teni=\chapi \let\tensy=\chapsy
  \let\tenttsl=\chapttsl
\setfont{shortconts}{slshape}{12}{1000}{OT1}
\setfont{shortconttt}{ttshape}{12}{1000}{OT1TT}

% Define these just so they can be easily changed for other fonts.
defangleleft{$\langle$}
defangleright{$\rangle$}

% Set the fonts to use with the @small... environments.
def\smallexamplefonts = \smallfonts

% About $\smallexamplefonts$. If we use \smallfonts (9pt), @smallexample
% can fit this many characters:
%  8.5x11=86  smallbook=72  a4=90  a5=69
% If we use \scriptfonts (8pt), then we can fit this many characters:
%  8.5x11=90+ smallbook=80  a4=90+  a5=77
% For me, subjectively, the few extra characters that fit aren't worth
% the additional smallness of 8pt. So I'm making the default 9pt.
%
% By the way, for comparison, here's what fits with @example (10pt):
%  8.5x11=71 smallbook=60  a4=75  a5=58
% --karl, 24jan03.

% Set up the default fonts, so we can use them for creating boxes.
% \definetextfontsizexi

\message{markup,}

% Check if we are currently using a typewriter font. Since all the
% Computer Modern typewriter fonts have zero interword stretch (and
% shrink), and it is reasonable to expect all typewriter fonts to have
% this property, we can check that font parameter.
% \def\ifmonospace{\ifdim\fontdimen3\font=0pt }

% Markup style infrastructure. \defmarkuptylesetup\INITMACRO will
% define and register \INITMACRO to be called on markup style changes.
% \INITMACRO can check \currentmarkuptyle for the innermost
% style and the set of \ifmarkuptyle switches for all styles
% currently in effect.
% \newif\ifmarkuptylevar
% \newif\ifmarkuptylesamp
% \newif\ifmarkuptylekey
% \newif\ifmarkuptylefile \ifmarkuptylefile == \ifmarkuptylesamp.
% \newif\ifmarkuptyleoption \ifmarkuptyleoption == \ifmarkuptylesamp.
% \newif\ifmarkuptylecode
% \newif\ifmarkuptylekbd
% Allow an option to not use regular directed right quote/apostrophe
% (char 0x27), but instead the undirected quote from cmtt (char 0x0d).
% The undirected quote is ugly, so don't make it the default, but it
% works for pasting with more pdf viewers (at least evince), the
% lilypond developers report. xpdf does work with the regular 0x27.
%
\def\codequoteright{% 
\expandafter\ifx\csname SETtxicodequoteundirected\endcsname\relax 
\expandafter\ifx\csname SETcodequoteundirected\endcsname\relax 
'\else \char'15 \fi 
\else \char'15 \fi 
}\%

% and a similar option for the left quote char vs. a grave accent.
% Modern fonts display ASCII 0x60 as a grave accent, so some people like
% the code environments to do likewise.
%
\def\codequoteleft{% 
\expandafter\ifx\csname SETtxicodequotebacktick\endcsname\relax 
\expandafter\ifx\csname SETcodequotebacktick\endcsname\relax 
'\else \char'22 \fi 
\else \char'22 \fi 
}\%

% Commands to set the quote options.
%
\parseargdef\codequoteundirected{ %
\def\temp[#1]{% 
\if\temp\onword 
\expandafter\let\csname SETtxicodequoteundirected\endcsname = t% 
\else\if\temp\offword 
\expandafter\let\csname SETtxicodequoteundirected\endcsname = \relax 
\else
\errhelp = \EMsimple 
\errmessage{Unknown @codequoteundirected value `\temp', must be on|off}% 
\fi\fi 
}
%
\parseargdef\codequotebacktick{% 
\def\temp[#1]{% 
\if\temp\onword 
\expandafter\let\csname SETtxicodequotebacktick\endcsname = t% 
\else\if\temp\offword 
\expandafter\let\csname SETtxicodequotebacktick\endcsname = \relax 
\else
\errhelp = \EMsimple 
\errmessage{Unknown @codequotebacktick value `\temp', must be on|off}% 
\fi\fi 
}
%
% [Knuth] pp. 380,381,391, disable Spanish ligatures ?` and !` of \tt font.
\def\noligaturesquoteleft{\relax\lq}
%
% Count depth in font-changes, for error checks
\newcount\fontdepth \fontdepth=0
%
% Font commands.
%
% #1 is the font command (\sl or \it), #2 is the text to slant.
% If we are in a monospaced environment, however, 1) always use \ttsl,
% and 2) do not add an italic correction.
\def\dosmartslant#1#2{% 
\if\usingtt 
{{\ttsl #2}\let\next=\relax}% 
{\def\next{{#1#2}\futurelet\next\smartitaliccorrection}}}% 
\else
\errhelp = \EMsimple 
\errmessage{Unknown @smartslant value `\temp', must be on|off}% 
\fi 
}
\def\smartslanted{\dosmartslant{\sl}}
\def\smartitalic{\dosmartslant{\it}}
%
% Output an italic correction unless \next (presumed to be the following
\% character) is such as not to need one.
def\smartitaliccorrection{\
  \ifx\next,\
  \else\ifx\next-%\
  \else\ifx\next.\
  \else\ptexslash\
  \fi\fi\fi
  \aftersmartic
}
\% Unconditional use \ttsl, and no ic. \texttt{\texttt{def}} is set to this for defuns.
def\ttslanted#1{{\ttsl #1}}
\def\cite#1{{\sl #1}\futurelet\next\smartitaliccorrection}
\def\aftersmartic{}
def\var#1{\
  \let\saveaftersmartic = \aftersmartic
  \def\aftersmartic{\null\let\aftersmartic=\saveaftersmartic}\
  \smartslanted{#1}
}
def\i=\smartitalic
def\slanted=\smartslanted
def\dfn=\smartslanted
def\emph=\smartitalic
def\r#1{{\rm #1}}              % roman font
def\sc#1{{\smallcaps#1}}       % smallcaps font
def\ii#1{{\it #1}}             % italic font
\def\b#1{{\bf #1}}
def\strong=\b
\def\sansserif#1{{\sf #1}}
def\sansserif#1{{\sf #1}}
\% Explicit font changes: \texttt{\texttt{r}}, \texttt{\texttt{sc}}, undocumented \texttt{\texttt{ii}}.
\def\vr#1[{}{\vm #1}]{}       % roman font
\def\vsc#1[{}{\smallcaps#1}]{} % smallcaps font
\def\vii#1[{}{\it #1}]{}      % italic font
\% \texttt{\texttt{b}}, explicit bold. Also \texttt{\texttt{strong}}.
def\bf#1[{}{\bf #1}]
def\strong=\b
\% \texttt{\texttt{sansserif}}, explicit sans.
def\sf#1[{}{\sf #1}]
\% We can’t just use \texttt{\texttt{hyphenpenalty}}, because that only has effect at
\% the end of a paragraph. \texttt{\texttt{restorehyphenation}} at the end of the
\% group within which \texttt{\texttt{hyphenpenalty}} is presumably called.
def\nohyphenation{\hyphenchar\font = -1 \aftergroup\restorehyphenation}
def\restorehyphenation{\hyphenchar\font = -1}
% Set sfcode to normal for the chars that usually have another value.
% Can't use plain's \frenchspacing because it uses the `\x notation, and
% sometimes \x has an active definition that messes things up.
%
\catcode`@=11
\def\plainfrenchspacing{%
  \sfcode\. =@m \sfcode? =@m \sfcode! =@m
  \sfcode: =@m \sfcode; =@m \sfcode, =@m
  \def\endofsentencespacefactor{1000} % for . and friends
}
\def\plainnonfrenchspacing{%
  \sfcode\3000\sfcode\?3000\sfcode\!3000
  \sfcode\:2000\sfcode;1500\sfcode,1250
  \def\endofsentencespacefactor{3000} % for . and friends
}
\catcode`@=other
\def\endofsentencespacefactor{3000} % default
%
% @t, explicit typewriter.
\def\tt#1{%
  {\tt \rawbackslash \plainfrenchspacing #1}%
  \null
}
%
% @samp.
\defsamp#1{{\setupmarkupstyle{samp}\lq\ttclose{#1}\rq\null}}
%
% @indicateurl is @samp, that is, with quotes.
\def\indicateurl@samp
%
% @code (and similar) prints in typewriter, but with spaces the same
% size as normal in the surrounding text, without hyphenation, etc.
% This is a subroutine for that.
\def\ttclose#1{%
 %
  % Change normal interword space to be same as for the current font.
  \spaceskip = \fontdimen2\font
 %
  % Switch to typewriter.
  \tt
 %
  % But `\ ' produces the large typewriter interword space.
  \def\ {\spaceskip = 0pt{ } }%
 %
  % Turn off hyphenation.
  \nohyphenation
  %
  \rawbackslash

\plainfrenchspacing

\null \% reset spacefactor to 1000

\%
\%
% We *must* turn on hyphenation at `-' and `_' in @code.
% Otherwise, it is too hard to avoid overfull hboxes
% in the Emacs manual, the Library manual, etc.
%
% Unfortunately, TeX uses one parameter (\hyphenchar) to control
% both hyphenation at - and hyphenation within words.
% We must therefore turn them both off (\tclose does that)
% and arrange explicitly to hyphenate at a dash.
% -- rms.
%
\catcode\-=\active \catcode\_\active
\catcode\'\active \catcode\`\active
\global\let\'=\rq \global\let\`\=\lq \% default definitions
%
\global\def\code{\begingroup
% The following should really be moved into setupmarkupstyle handlers.
\catcode\dashChar\active \catcode\underChar\active
\ifallowcodebreaks
\let\-\codedash
\let\_\codeunder
\else
\let\-\normaldash
\let\_\realunder
\fi
\codex}
%
\def\codex #1{\tclose{#1}\endgroup}
%
\def\normaldash{-}
\def\codedash{-\discretionary{}{}{}}
\def\codeunder{\% this is all so @math{ @code{var_name}+1} can work. In math mode, _
% is "active" (mathcode"8000) and \normalunderscore (or \char95, etc.)
% will therefore expand the active definition of _, which is us
% (inside @code that is), therefore an endless loop.
\ifusingtt{\ifmmode
\mathchar"075F \% class 0=ordinary, family 7=ttfam, pos 0x5F=_.
\else\normalunderscore \fi
\discretionary{}{}{}}%
\% An additional complication: the above will allow breaks after, e.g.,
\% each of the four underscores in \texttt{\_typeof\_}. This is bad.
\% @allowcodebreaks provides a document-level way to turn breaking at -
\% and \_ on and off.
\%
\newif\ifallowcodebreaks \allowcodebreakstrue

\def\keywordtrue{true}
\def\keywordfalse{false}

\def\parseargdefallowscodebreaks\defallowscodebreakstrue\defallowscodebreaksfalse
\% For \texttt{@command}, \texttt{@env}, \texttt{@file}, \texttt{@option} quotes seem unnecessary,
\% so use \texttt{\code} rather than \texttt{\samp}.
\let\command=\code
\let\env=\code
\let\file=\code
\let\option=\code

\% @uref (abbreviation for `\urlref') takes an optional (comma-separated)
\% second argument specifying the text to display and an optional third
\% arg as text to display instead of (rather than in addition to) the url
\% itself. First (mandatory) arg is the url.
\% (This \texttt{\urefnobreak} definition isn't used now, leaving it for a while
\% for comparison.)
\def\urefnobreak#1\dourefnb#1,,,\finish
\def\dourefnb#1,#2,#3,#4\finish{\begingroup
\unsepspaces
\pdfurl{#1}\
\setbox0 = \hbox{\ignorespaces #3}\
\ifdim\wd0 > 0pt
\unhbox0 % third arg given, show only that
\else
\setbox0 = \hbox{\ignorespaces #2}\
\ifdim\wd0 > 0pt
}
% This \urefbreak definition is the active one.
defurefbreak{|be\ncatcodes \doure\nbreak}
defdoure\nbreak#1{|ure\nbreak\nfinish #1,...,\finish}
def\urefbreak\nfinish#1,#2,#3,#4\finish{% doesn’t work in @example
\nse\nspaces
pdfurl[#1]{
setbox0 = \hbox{\ignorespaces #3}%
\nwd0 > 0pt
\nbox0 % third arg given, show only that
else
\nbox0 = \hbox{\ignorespaces #2}%
\nwd0 > 0pt
\nbox0 % second arg given, show it
else
\nbox0\nbei\ncatcodes \dou\nspace \nse\nspaces
pdfurl[#1]{
setbox0 = \hbox{\ignorespaces #3}%
\nwd0 > 0pt
\nbox0 % third arg given, show only that
else
\nbox0 = \hbox{\ignorespaces #2}%
\nwd0 > 0pt
\nbox0 % second arg given, show it
else
\nbox0 % only url given, so show it
\nbox0 % only url given, so show it
\nbox0
\nendlink
\nendgroup
% Allow line breaks around only a few characters (only).
defure\n\catcode\nampChar=\active \catcode\ndotChar=\active
\catcode\nhashChar=\active \catcode\nquestChar=\active
\catcode\slashChar=\active
}{
defure\ncatcodes
% global\ndefure\ncode{|b\necat\n}
\setupmarkupstyle{\cod\ne}
% By default, they are just regular characters.
\global\def\&\{\normalamp\}
\global\def.\{\normaldot\}
\global\def#\{\normalhash\}
\global\def?\{\normalquest\}
\global\def/\{\normalslash\}
}

% we put a little stretch before and after the breakable chars, to help
% line breaking of long url’s. The unequal skips make look better in
% cmtt at least, especially for dots.
\def\urefprestretch\{\urefprebreak \hskip0pt plus.13em \}
\def\urefpoststretch\{\urefpostbreak \hskip0pt plus.1em \}

\def\urefcodeamp\{\urefprestretch \&\urefpoststretch\}
\def\urefcodedot\{\urefprestretch .\urefpoststretch\}
\def\urefcodehash\{\urefprestretch \#\urefpoststretch\}
\def\urefcodequest\{\urefprestretch ?\urefpoststretch\}
\def\urefcodeslash\{\futurelet\next\urefcodeslashfinish\}
{
\catcode`\/=\active
\global\def\urefcodeslashfinish\{ %
  \urefprestretch \slashChar
  % Allow line break only after the final / in a sequence of
  % slashes, to avoid line break between the slashes in http://.
  \ifx\next/\else \urefpoststretch \fi
}

% One more complication: by default we’ll break after the special
% characters, but some people like to break before the special chars, so
% allow that.  Also allow no breaking at all, for manual control.
%
\parseargdef\urefbreakstyle\{%
  \def\txiarg\{#1\}%
  \ifx\txiarg\wordnone
    \def\urefprebreak\{\nobreak\}\def\urefpostbreak\{\nobreak\}
  \else\ifx\txiarg\wordbefore
    \def\urefprebreak\{\allowbreak\}\def\urefpostbreak\{\nobreak\}
  \else\ifx\txiarg\wordafter
    \def\urefprebreak\{\nobreak\}\def\urefpostbreak\{\allowbreak\}
  \else\ifx\txiarg\wordbetween
    \def\urefprebreak\{\allowbreak\}\def\urefpostbreak\{\allowbreak\}
  \fi\fi\fi\fi\fi\fi
  %
Open Source Used In SD-WAN 19.3.0
% Default is `distinct'.
\kbdinputstyle distinct

% @kbd is like @code, except that if the argument is just one @key command,
% then @kbd has no effect.
\def\kbd#1{{\def\look{#1}\expandafter\kbdsub\look??\par}}
\def\xkey{\key}
\def\kbdsub#1#2#3\par{\def\one{#1}\def\three{#3}\def\threex{??}%
  \ifx\one\xkey\ifx\threex\three \key{#2}\else{\tclose{\kbdfont\setupmarkupstyle{kbd}\look}}\fi\else{\tclose{\kbdfont\setupmarkupstyle{kbd}\look}}\fi}

% definition of @key that produces a lozenge. Doesn't adjust to text size.
%\setfont\keyrm\rmshape{8}{1000}{OT1}
%\font\keysy= cmsy9
%\def\key#1{{\setupmarkupstyle{key}\nohyphenation\ifmonospace\else\tt\fi#1}\null}
% @clicksequence{File @click{} Open ...}
\def\clicksequence#1{\begingroup #1\endgroup}
% @clickstyle @arrow (by default)
\parseargdef\clickstyle{\def\click{#1}}\def\click{\arrow}
\def\click#1\arrow

% Typeset a dimension, e.g., `in' or `pt'. The only reason for the
% argument is to make the input look right: @dmn{pt} instead of @dmn[]pt.
%
\def\dmn#1{\thinspace #1}

% @l was never documented to mean ``switch to the Lisp font'',
% and it is not used as such in any manual I can find. We need it for
% Polish suppressed-l. --karl, 22sep96.
%\def\l#1{{\li #1}\null}

% @acronym for "FBI", "NATO", and the like.
% We print this one point size smaller, since it's intended for
% all-uppercase.
%
\def\acronym#1{\doacronym #1,,\finish}
\def\doacronym#1,#2,#3\finish{%
{\selectfonts\lsize #1}%
\def\temp{#2}%
\ifx\temp\empty \else
\space ({\unsepspaces \ignorespaces \temp \unskip})%
\fi
\null \% reset \spacefactor=1000
}

% @abbr for "Comput. J." and the like.
% No font change, but don't do end-of-sentence spacing.
%
\def\abbr#1{\doabbr #1,,\finish}
\def\doabbr#1,#2,#3\finish{%
{\plainfrenchspacing #1}%
\def\temp{#2}%
\ifx\temp\empty \else
\space ({\unsepspaces \ignorespaces \temp \unskip})%
\fi
\null \% reset \spacefactor=1000
}

% @asis just yields its argument. Used with @table, for example.
%
\def\asis#1{#1}

% @math outputs its argument in math mode.
%
% One complication: _ usually means subscripts, but it could also mean
% an actual _ character, as in @math{@var{some_variable} + 1}. So make
% _ active, and distinguish by seeing if the current family is \slfam,
% which is what @var uses.
{\catcode`\_ = \active
Another complication: we want \ (and @\) to output a math (or tt) \.
% FYI, plain.tex uses \ as a temporary control sequence (for no
% particular reason), but this is not advertised and we don't care.
%
% The \mathchar is class=0=ordinary, family=7=ttfam, position=5C=\.
\def\mathbackslash{\ifnum\fam=\ttfam \mathchar"075C \else\backslash \fi}
%
\def\math{%
\tex\mathunderscore
\let\ = \mathbackslash
\mathactive
% make the texinfo accent commands work in math mode
\let\^=\ptexhat
\let\<=\ptexless
\let\>=\ptexgtr
\let\-=\ptexquoteright
\let\+=\ptexquoteright
\let\^=\ptexhat
\let\<=\ptexless
\let\>=\ptexgtr
\let\-=\ptexquoteright
\let\+=\ptexquoteright
}$\finishmath$
}%
\def\finishmath#1{#1$\endgroup$}  % Close the group opened by \tex.
%
% Some active characters (such as <) are spaced differently in math.
% We have to reset their definitions in case the @math was an argument
% to a command which sets the catcodes (such as @item or @section).
%
{\catcode`^ = \active
\catcode`< = \active
\catcode`> = \active
\catcode`+ = \active
\catcode`- = \active
\gdef\mathactive{%
\let^ = \ptexhat
\let< = \ptexless
\let> = \ptexgtr
\let+ = \ptexplus
\let' = \ptexquoteright
}
\% ctrl is no longer a Texinfo command, but leave this definition for fun.
\def\ctrl #1{\tt \backslash \hat}\#1}

\% @inlinefmt{FMTNAME,PROCESSED-TEXT} and @inlineraw{FMTNAME,RAW-TEXT}.
\% Ignore unless FMTNAME == tex; then it is like @iftex and @tex,
\% except specified as a normal braced arg, so no newlines to worry about.
\%
\def\outfmtname{tex}
\%
\long\def\inlinefmt#1{\doinlinefmt #1,\finish}
\long\def\doinlinefmt#1,#2,\finish{\%
  \def\inlinefmtname{#1}\%
  \ifx\inlinefmtname\outfmtname \ignorespaces #2\fi
}\}
\% For raw, must switch into @tex before parsing the argument, to avoid
\% setting catcodes prematurely.  Doing it this way means that, for
\% example, @inlineraw{html, foo\{bar\}} gets a parse error instead of being
\% ignored.  But this isn't important because if people want a literal
\% *right* brace they would have to use a command anyway, so they may as
\% well use a command to get a left brace too.  We could re-use the
\% delimiter character idea from \verb, but it seems like overkill.
\%
\long\def\inlineraw{\tex \doinlineraw}
\long\def\doinlineraw#1{\doinlinerawtwo #1,\finish}
\def\doinlinerawtwo#1,#2,\finish{\%
  \def\inlinerawname{#1}\%
  \ifx\inlinerawname\outfmtname \ignorespaces #2\fi
  \endgroup % close group opened by \tex.
  }

\message{glyphs,}
\%
\% and logos.
\%
\% @@ prints an @, as does @atchar{}.  
\def\@\{\char64 \}
\let\@\char64
\let\at\char64
\%
\% @ [ ] all generate brace characters.  
\% Unless we're in typewriter, use \ecfont because the CM text fonts do 
\% not have braces, and we don't want to switch into math.  
\def\mylbrace\{\ifmonospace\else\ecfont\fi \char123}
\def\myrbrace\{\ifmonospace\else\ecfont\fi \char125}
\let\lbrace=\mylbrace 
\let\rbrace=\myrbrace 
\begingroup
% Definitions to produce \{ and \} commands for indices, 
% and @{ and @} for the aux/toc files.
\catcode`\{ = \other \catcode`\} = \other
\catcode`\[ = 1 \catcode`\] = 2
\catcode`\! = 0 \catcode`\= \other
!gdef!lbracecmd
\{\[
!gdef!rbracecmd\[\}
!gdef!lbraceatcmd[@\[
!gdef!rbraceatcmd[@\}
!endgroup

% @comma{ } to avoid , parsing problems.
\let\comma=\

% Accents: @, @dotaccent @ringaccent @ubaraccent @udotaccent
% Others are defined by plain TeX: @` @' @" @^ @~ @= @u @v @H.
\let\, = \ptexc
\let\dotaccent = \ptexdot
\def\ringaccent#1{{\accent23 #1}}
\let\tieaccent = \ptext
\let\ubaraccent = \ptexb
\let\udotaccent = \d

% Other special characters: @questiondown @exclamdown @ordf @ordm
% Plain TeX defines: @AA @AE @O @OE @L (plus lowercase versions) @ss.
\def\questiondown{\?
\def\exclamdown{\!`
\def\ordf{\leavevmode\raise1ex\hbox{\selectfonts\lllsize \underbar{a}}}
\def\ordm{\leavevmode\raise1ex\hbox{\selectfonts\lllsize \underbar{o}}}
% Dotless i and dotless j, used for accents.
\def\imacro{i}
\def\jmacro{j}
\def\dotless#1{\
\def\temp{#1}\
\ifx\temp\imacro \ifmmode\imath \else\ptexi \fi\
\else\ifx\temp\jmacro \ifmmode\jmath \else\j \fi\
\else\errmessage{@dotless can be used only with i or j}\
\fi\fi}

% The \TeX{} logo, as in plain, but resetting the spacing so that a
% period following counts as ending a sentence. (Idea found in latex.)
% .
\edef\TeX{\TeX \spacefactor=1000 }

% @LaTeX{} logo. Not quite the same results as the definition in % latex.ltx, since we use a different font for the raised A; it's most
% convenient for us to use an explicitly smaller font, rather than using
% the \scriptstyle font (since we don't reset \scriptstyle and
% \scriptscriptstyle).
%
% \def\LaTeX{L\kern-.36em
\setbox0=\hbox{T}\
\vbox to \ht0{\hbox{
\ifx\textnominalsize\xwordpt
% for 10pt running text, \lllsize (8pt) is too small for the A in LaTeX.
% Revert to plain's \scriptsize, which is 7pt.
\count255=\the\fam $\fam\count255 \scriptstyle A$%
\else%
% For 11pt, we can use our \lllsize.
\selectfonts\lllsize A%
\fi%
}}%
\kern-.15em
\TeX
}

% Some math mode symbols.
\def\bullet{$\ptexbullet$}
\def\geq{\ifmmode \ge\else $\ge$\fi}
\def\leq{\ifmmode \le\else $\le$\fi}
\def\minus{\ifmmode -\else $-$\fi}
% @dots{} outputs an ellipsis using the current font.
% We do .5em per period so that it has the same spacing in the cm
% typewriter fonts as three actual period characters; on the other hand,
% in other typewriter fonts three periods are wider than 1.5em. So do
% whichever is larger.
%
% \def\dots[ %
% \leavevmode
% \setbox0=\hbox{...}% get width of three periods
% \ifdim\wd0 > 1.5em
% \dimen0 = \wd0
% \else
% \dimen0 = 1.5em
% \fi
% \hbox to \dimen0{%
% \hskip 0pt plus.25fil
% .\hskip 0pt plus1fil
% .\hskip 0pt plus1fil
% .\hskip 0pt plus.5fil
%
% @enddots{} is an end-of-sentence ellipsis.
% 
\def\enddots{}
\dots
\spacefactor=endofsentencespacefactor
}

% @point{}, @result{}, @expansion{}, @print{}, @equiv{}.
% Since these characters are used in examples, they should be an even number of
% \tt widths. Each \tt character is 1en, so two makes it 1em.
% 
\def\point{$\star$}
\def\arrow{\leavevmode\raise.05ex\hbox to 1em{$\rightarrow$}}
\def\result{\leavevmode\raise.05ex\hbox to 1em{$\Rightarrow$}}
\def\expansion{\hbox to 1em{$\mapsto$}}
\def\print{\lower.1ex\hbox to 1em{$\dashv$}}
\def\equiv{\hbox to 1em{$\equiv$}}

% The @error{} command.
% Adapted from the TeXbook's \boxit.
% 
\newbox\errorbox
%
{\tentt \global\dimen0 = 3em}% Width of the box.
\dimen2 = .55pt % Thickness of rules
% The text. (`r' is open on the right, `e' somewhat less so on the left.)
\setbox0 = \hbox{\kern-.75pt \reducedsf \putworderror\kern-1.5pt}
\setbox\errorbox=\hbox to \dimen0{\hfil}
\hsize = \dimen0 \advance\hsize by -5.8pt % Space to left+right.
\advance\hsize by -2\dimen2 % Rules.
\hbox{%
 \hrule height\dimen2
 \hbox{\vrule width\dimen2 \kern3pt} % Space to left of text.
 \vtop{\kern2.4pt \box0 \kern2.4pt}\% Space above/below.
 \kern3pt\hrule width\dimen2)% Space to right.
 \hrule height\dimen2}
 \hfil}
%
\def\error{\leavevmode\lower.7ex\copy\errorbox}
%
% @pounds{} is a sterling sign, which Knuth put in the CM italic font.
% 
\def\pounds{{\it\$}}
% @euro{} comes from a separate font, depending on the current style.
% We use the free feym* fonts from the eurosym package by Henrik
% Theilinger, which support regular, slanted, bold and bold slanted (and
% "outlined" (blackboard board, sort of) versions, which we don't need).
% It is available from http://www.ctan.org/tex-archive/fonts/eurosym.
%
% Although only regular is the truly official Euro symbol, we ignore
% that. The Euro is designed to be slightly taller than the regular
% font height.
%
% feymr - regular
% feymo - slanted
% feybr - bold
% feybo - bold slanted
%
% There is no good (free) typewriter version, to my knowledge.
% A feymr10 euro is ~7.3pt wide, while a normal cmtt10 char is ~5.25pt wide.
% Hmm.
%
% Also doesn't work in math. Do we need to do math with euro symbols?
% Hope not.
%
% \def\euro{"\eurofont e}
% \def\eurofont{%
% We set the font at each command, rather than predefining it in
% \textfonts and the other font-switching commands, so that
% installations which never need the symbol don't have to have the
% font installed.
%%
% There is only one designed size (nominal 10pt), so we always scale
% that to the current nominal size.
%
% By the way, simply using "at 1em" works for cmr10 and the like, but
% does not work for cmbx10 and other extended/shrunken fonts.
%
% \def\eurosize{\csname\curfontsize nominalsize\endcsname}%
% \if\curfontstyle\bfstyle\name
% \font\thiseurofont = \fusingit{feybo10}{feybr10} at \eurosize
% \else
% \font\thiseurofont = \fusingit{feymo10}{feymr10} at \eurosize
% \fi
% \thiseurofont
}
% Glyphs from the EC fonts. We don’t use \let for the aliases, because
% sometimes we redefine the original macro, and the alias should reflect
% the redefinition.
%
% Use LaTeX names for the Icelandic letters.
\def\DH{{\ecfont \char"D0}} % Eth
\def\dh{{\ecfont \char"F0}} % eth
\def\TH{{\ecfont \char"DE}} % Thorn
\def\th{{\ecfont \char"FE}} % thorn
%
\def\guillemetleft{{\ecfont \char"13}}
\def\guillemotleft{\guillemetleft}
\def\guillemetright{{\ecfont \char"14}}
\def\guillemotright{\guillemetright}
\def\guilsinglleft{{\ecfont \char"0E}}
\def\guilsinglright{{\ecfont \char"0F}}
\def\quotedblbase{{\ecfont \char"12}}
\def\quotesinglbase{{\ecfont \char"0D}}
%
% This positioning is not perfect (see the ogonek LaTeX package), but
% we have the precomposed glyphs for the most common cases. We put the
% tests to use those glyphs in the single \ogonek macro so we have fewer
% dummy definitions to worry about for index entries, etc.
%
% ogonek is also used with other letters in Lithuanian (IOU), but using
% the precomposed glyphs for those is not so easy since they aren’t in
% the same EC font.
\def\ogonek#1{\%  
  \def\temp{#1}  
  \ifx\temp\macrocharA\Aogonek  
  \else  
    \ifx\temp\macrochara\aogonek  
    \else  
      \ifx\temp\macrocharE\Eogonek  
      \else  
        \ifx\temp\macrochare\eogonek  
        \else  
          \ecfont \setbox0=\hbox{#1}  
          \ifdim\ht0=1ex\accent"0C #1\%  
          \else  
            \ooalign{\unhbox0\crcr\hidewidth\char"0C\hidewidth}\%  
            \fi  
            \fi  
            \fi  
            \fi  
          \fi  
          \fi  
          \fi  
        \fi  
        \fi  
        \fi  
      \fi  
      \fi  
      \fi  
    \fi  
    \fi  
    \fi  
  \fi  
  \fi  
  \fi  
}\Aogonek{\ecfont \char"81}\def\macrocharA{A}
\def\aogonek{\ecfont \char"A1}\def\macrochara{a}
\def\Eogonek{\ecfont \char"86}\def\macrocharE{E}
\def\eogonek{\ecfont \char"A6}\def\macrochare{e}
%
% Use the ec* fonts (cm-super in outline format) for non-CM glyphs.
\def\ecfont{\
% We can't distinguish serif/sans and italic/slanted, but this\
% is used for crude hacks anyway (like adding French and German\
% quotes to documents typeset with CM, where we lose kerning), so\
% hopefully nobody will notice/care.
\edef\ecsize{\csname\curfontsize ecsize\endcsname}\
\edef\nominalsize{\csname\curfontsize nominalsize\endcsname}\
\ifmonospace\
% typewriter:
\font\thisecfont = ectt\ecsize \space at \nominalsize
\else\
\if\curfontstyle\bfstylename\
% bold:
\font\thisecfont = ecb\ifusingit{i}{x}\ecsize \space at \nominalsize
\else\
% regular:
\font\thisecfont = ec\ifusingit{ti}{rm}\ecsize \space at \nominalsize
\fi\
\fi\
\thisecfont}
}

% @registeredsymbol - R in a circle. The font for the R should really
% be smaller yet, but llsize is the best we can do for now.
% Adapted from the plain.tex definition of \copyright.
%
\def\registeredsymbol{%
$^{{\ooalign{\hfil\raise.07ex\hbox{\selectfonts llsize R}\
\hfil\crcr\Orb}}}%$
}

% Quotes.
\chardef\quotedblleft="5C
\chardef\quotedblright=`\"}

% @textdegree - the normal degrees sign.
%
\def\textdegree{\(^{\circ}\)}

% Laurent Siebenmann reports \Orb undefined with:
% Textures 1.7.7 (preloaded format=plain 93.10.14) (68K) 16 APR 2004 02:38
% so we'll define it if necessary.
%
\ifx\Orb\thisisundefined
\def\Orb{\mathhexbox20D}
\fi

% Quotes.
\chardef\quoteleft="5C
\chardef\quoteright=`\"
\chardef\quotationright=`\'

\message{page headings,}
\newskip\titlepagetopglue \titlepagetopglue = 1.5in
\newskip\titlepagebottomglue \titlepagebottomglue = 2pc

% First the title page. Must do \settitle before \titlepage.
\newif\ifseenauthor
\newif\iffinishedtitlepage

% Do an implicit \setcontents or \setshortcontents after \end titlepage if the
% user says \setcontentsaftertitlepage or \setshortcontentsaftertitlepage.
\newif\ifsetcontentsaftertitlepage
\let\setcontentsaftertitlepage = \setcontentsaftertitlepagetrue
\newif\ifsetshortcontentsaftertitlepage
\let\setshortcontentsaftertitlepage = \setshortcontentsaftertitlepagetrue

\parseargdef\shorttitlepage{%
\begingroup \hbox{} \vskip 1.5in \chaprm \centerline{#1}\
\endgroup \page \hbox{} \page}
\envdef\titlepage{%
% Open one extra group, as we want to close it in the middle of \Etitlepage.
\begingroup
\parindent=0pt \textfonts
% Leave some space at the very top of the page.
\vglue\titlepagetopglue
% No rule at page bottom unless we print one at the top with \title.
\finishedtitlepagetrue
%
% Most title "pages" are actually two pages long, with space
% at the top of the second. We don't want the ragged left on the second.
\let\oldpage = \page
\def\page{%
\iffinishedtitlepage\else
\finish\titlepage
\fi
\let\page = \oldpage
\page
\null
}%
}

\def\Etitlepage{%
\iffinishedtitlepage\else
% Macros to be used within @titlepage:
\let\subtitlerm=\tenrm
\def\subtitlefont{\subtitlerm \normalbaselineskip = 13pt \normalbaselines}

\parseargdef\title[ %
  \checkenv\titlepage
  \vbox{\titlefonts \raggedtitlesettings \par}%
  % print a rule at the page bottom also.
  \finishedtitlepagefalse
  \vskip4pt \hrule height 4pt width \hsize \vskip4pt
  }%

\parseargdef\subtitle[ %
  \checkenv\titlepage
  {\subtitlefont \rightline{#1}}%
  }

% @author should come last, but may come many times.
% It can also be used inside @quotation.
%
\parseargdef\author[ %
  \def\temp{\quotation}%
  \ifx\thisenv\temp
    \def\quotationauthor{#1}% printed in \Equotation.
  \else
    \checkenv\titlepage
    \ifseenauthor\else \vskip 0pt plus 1fill\fi
    {\secfonts\rmisbold \leftline{#1}}%
  \fi
  ]%

% Set up page headings and footings.
\let\thispage=\folio

\newtoks\evenheadline    % headline on even pages
\newtoks\oddheadline     % headline on odd pages
\newtoks\evenfootline    % footline on even pages
\newtoks\oddfootline     % footline on odd pages

% Now make TeX use those variables
\headline={\textfonts\rm \ifodd\pageno \the\oddheadline
            \else \the\evenheadline \fi}
\footline={\textfonts\rm \ifodd\pageno \the\oddfootline
            \else \the\evenfootline \fi}\HEADINGShook
\let\HEADINGShook=\relax
% Commands to set those variables.
% For example, this is what \@headings on does
% \@evenheading \@thistitle|\@thispage|\@thischapter
% \@oddheading \@thischapter|\@thispage|\@thistitle
% \@evenfooting \@thisfile]
% \@oddfooting ||\@thisfile

\def\evenheading{\parsearg\evenheadingxxx}
\def\evenheadingxxx #1\{\evenheadingyyy #1\|\|\|\|\finish}
\def\evenheadingyyy #1\|#2\|#3\|#4\finish{%
  \global\evenheadline={\rlap{\centerline{#2}}\line{#1\hfil#3}}}

\def\oddheading{\parsearg\oddheadingxxx}
\def\oddheadingxxx #1\{\oddheadingyyy #1\|\|\|\|\finish}
\def\oddheadingyyy #1\|#2\|#3\|#4\finish{%
  \global\oddheadline={\rlap{\centerline{#2}}\line{#1\hfil#3}}}

\pararg\def\everyheading{\oddheadingxxx{#1}\evenheadingxxx{#1}}%

\def\evenfooting{\parsearg\evenfootingxxx}
\def\evenfootingxxx #1\{\evenfootingyyy #1\|\|\|\|\finish}
\def\evenfootingyyy #1\|#2\|#3\|#4\finish{%
  \global\evenfootline={\rlap{\centerline{#2}}\line{#1\hfil#3}}}

\def\oddfooting{\parsearg\oddfootingxxx}
\def\oddfootingxxx #1\{\oddfootingyyy #1\|\|\|\|\finish}
\def\oddfootingyyy #1\|#2\|#3\|#4\finish{%
  \global\oddfootline = \rlap{\centerline{#2}}\line{#1\hfil#3}}%
%
% Leave some space for the footline.  Hopefully ok to assume
% \@evenfooting will not be used by itself.
\global\advance\pageheight by -12pt
\global\advance\vsize by -12pt

\pararg\def\everyfooting{\oddfootingxxx{#1}\evenfootingxxx{#1}}

% \@evenheadingmarks top \thischapter <- chapter at the top of a page
% \@evenheadingmarks bottom \thischapter <- chapter at the bottom of a page
%
% The same set of arguments for:
%
% \@oddheadingmarks
% \@evenfootingmarks
% \@oddfootingmarks
% \@everyheadingmarks
% @everyfootingmarks
\def\evenheadingmarks{\headingmarks{even}{heading}}
\def\oddheadingmarks{\headingmarks{odd}{heading}}
\def\evenfootingmarks{\headingmarks{even}{footing}}
\def\oddfootingmarks{\headingmarks{odd}{footing}}
\def\everyheadingmarks#1 {\headingmarks{even}{heading}{#1}}
\def\everyfootingmarks#1 {\headingmarks{even}{footing}{#1}}
% #1 = even/odd, #2 = heading/footing, #3 = top/bottom.
\everyheadingmarks bottom
\everyfootingmarks bottom

% @headings double       turns headings on for double-sided printing.
% @headings single       turns headings on for single-sided printing.
% @headings off          turns them off.
% @headings on           same as @headings double, retained for compatibility.
% @headings after        turns on double-sided headings after this page.
% @headings doubleafter  turns on double-sided headings after this page.
% @headings singleafter  turns on single-sided headings after this page.
% By default, they are off at the start of a document,
% and turned `on' after @end titlepage.
\def\headings #1 {\csname HEADINGS#1\endcsname}
\def\headingsoff{\% non-global headings elimination
  \evenheadline={\hfil}\evenfootline={\hfil}\%
  \oddheadline={\hfil}\oddfootline={\hfil}\%
}
\def\HEADINGSoff{\% global setting
  \HEADINGSoff \% it's the default
  \% When we turn headings on, set the page number to 1.
  \% For double-sided printing, put current file name in lower left corner,
  \% chapter name on inside top of right hand pages, document
  \% title on inside top of left hand pages, and page numbers on outside top
  \% edge of all pages.
  \def\HEADINGSdouble{\%
    \global\pageno=1
    \global\evenfootline={\hfil}
    \global\oddfootline={\hfil}
}
\global\evenheadline={\line{\folio\hfil\thistitle}}
\global\oddheadline={\line{\thischapter\hfil\folio}}
\global\let\contentsalignmacro = \chapoddpage
\let\contentsalignmacro = \chappager

% For single-sided printing, chapter title goes across top left of page,
% page number on top right.
\def\HEADINGSsingle{%
\global\pageno=1
\global\evenfootline={\hfil}
\global\oddfootline={\hfil}
\global\evenheadline={\line{\folio\hfil\thistitle}}
\global\oddheadline={\line{\thischapter\hfil\folio}}
\global\let\contentsalignmacro = \chapoddpage
}
\def\HEADINGSdouble\HEADINGSdoublex{
\global\evenfootline={\hfil}
\global\oddfootline={\hfil}
\global\evenheadline={\line{\folio\hfil\thistitle}}
\global\oddheadline={\line{\thischapter\hfil\folio}}
\global\let\contentsalignmacro = \chapoddpage
}
\def\HEADINGSafter\HEADINGSdoublex{
\let\HEADINGShook=\HEADINGSdoublex
\def\HEADINGSdoubleafter={\HEADINGSdoublex}
\def\HEADINGSafter={\HEADINGSdoubleafter}
\def\HEADINGSsingleafter=\HEADINGSsinglex
\def\HEADINGSsinglex={
\global\evenfootline={\hfil}
\global\oddfootline={\hfil}
\global\evenheadline={\line{\folio\hfil\thistitle}}
\global\oddheadline={\line{\thischapter\hfil\folio}}
\global\let\contentsalignmacro = \chappager
}

% Subroutines used in generating headings
% This produces Day Month Year style of output.
% Only define if not already defined, in case a txi-??tex file has set
% up a different format (e.g., txi-cs.tex does this).
% For single-sided printing, chapter title goes across top left of page,
% page number on top right.
\ifx\today\thisisundefined
\def\today{%
\number\day\space
\ifcase\month
\or\putwordMJan\or\putwordMFeb\or\putwordMMar\or\putwordMApr
\or\putwordMMay\or\putwordMJun\or\putwordMJul\or\putwordMAug
\or\putwordMSep\or\putwordMOct\or\putwordMNov\or\putwordMDec
\fi
\fi
\fi
% @settitle line... specifies the title of the document, for headings.
% It generates no output of its own.
\def\thistitle\empty
\def\settitle\parsearg{\gdef\thistitle}

\message{tables,}
% Tables -- \table, \ftable, \vtable, \item(x).

% default indentation of table text
\newdimen\tableindent \tableindent=.8in
% default indentation of \itemize and \enumerate text
\newdimen\itemindent  \itemindent=.3in
% margin between end of table item and start of table text.
\newdimen\itemmargin  \itemmargin=.1in

% used internally for \itemindent minus \itemmargin
\newdimen\itemmax

% Note \table, \ftable, and \vtable define \item, \itemx, etc., with
% these defs.
% They also define \itemindex
% to index the item name in whatever manner is desired (perhaps none).
\newif\ifitemxneedsnegativevskip
\def\itemxpar\par\ifitemxneedsnegativevskip\nobreak\vskip-\parskip\nobreak\fi
\def\internalBitem\smallbreak \parsearg{\itemzzz}
\def\internalBitemx{\itemxpar \parsearg{\itemzzz}}
\def\itemzzz #1{\begingroup %
  \advance\hsize by -\rightskip
  \advance\hsize by -\tableindent
  \setbox0=\hbox{\itemindicate{#1}}% 
  \itemindex{#1}% 
  \nobreak % This prevents a break before \itemx.
  %
  % If the item text does not fit in the space we have, put it on a line
  % by itself, and do not allow a page break either before or after that
  % line. We do not start a paragraph here because then if the next
  % command is, e.g., \kindex, the whatsit would get put into the
  % horizontal list on a line by itself, resulting in extra blank space.
  \ifdim \wd0>\itemmax
<table>
<thead>
<tr>
<th>Item Index</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item Index</td>
<td>Code</td>
</tr>
</tbody>
</table>

This code snippet defines several LaTeX macros for handling tables, such as `tablecheck`, `ftable`, `vtable`, and related commands. These macros are used to set up the environment for creating tables in LaTeX documents. The code includes conditional checks to determine the appropriate table setup based on the environment in which they are used.
\let\itemize\enumerate
\let\enumerate\itemize

% This is the counter used by @enumerate, which is really @itemize
\newcount \itemno
\edef\itemize{\parsearg\doitemize}
\edef\doitemize#1{  \\
\aboveenvbreak
\itemmax=\itemindent
\advance\itemmax by -\itemmargin
\advance\leftskip by \itemindent
\exdentamount=\itemindent
\parindent=0pt
\parskip=\smallskipamount
\ifdim\parskip=0pt \parskip=2pt \fi
\ifx\itemcontents\empty\def\itemcontents{\bullet}\fi
% Try typesetting the item mark that if the document erroneously says
% something like @itemize @samp (intending @table), there's an error
% right away at the @itemize. It's not the best error message in the
% world, but it's better than leaving it to the @item. This means if
% the user wants an empty mark, they have to say @w{} not just @w.
\def\itemizeitem{  \\
\advance\itemno by 1 \% for enumerations
\let\par=\endgraf \smallbreak\% reasonable place to break
\%  \\
\% If the document has an @itemize directly after a section title, a
\% \nobreak will be last on the list, and \sectionheading will have
\% done a \vskip-\parskip. In that case, we don't want to zero
\% \parskip, or the item text will crash with the heading. On the
\% other hand, when there is normal text preceding the item (as there
\% usually is), we do want to zero \parskip, or there would be too much
\% space. In that case, we won't have a \nobreak before. At least
\% that's the theory.
\ifnum\lastpenalty<10000 \parskip=0in \fi
\setbox0 = \hbox{\itemcontents}  \\
\edef\item=\itemizeitem
}
\noindent
% \itemcontents \kern\itemmargin
% \wadjust{\penalty 1200}\ not good to break after first line of item.
\flushcr
%
% \splitoff TOKENS\endmark defines \first to be the first token in
% TOKENS, and \rest to be the remainder.
%
\def\splitoff#1#2\endmark{\def\first{#1}\def\rest{#2}}%

% Allow an optional argument of an uppercase letter, lowercase letter,
% or number, to specify the first label in the enumerated list. No
% argument is the same as `1'.
%
\envparseargdef\enumerate{\enumeratey #1  \endenumeratey}
\def\enumeratey #1 #2\endenumeratey{%
% If we were given no argument, pretend we were given `1'.
\def\thearg{#1}%
\ifx\thearg\empty \def\thearg{1}\fi
%
% Detect if the argument is a single token. If so, it might be a
% letter. Otherwise, the only valid thing it can be is a number.
% (We will always have one token, because of the test we just made.
% This is a good thing, since \splitoff doesn't work given nothing at
% all -- the first parameter is undelimited.)
\expandafter\splitoff\thearg\endmark
\ifx\rest\empty
% Only one token in the argument. It could still be anything.
% A ``lowercase letter'' is one whose \lccode is nonzero.
% An ``uppercase letter'' is one whose \lccode is both nonzero, and
% not equal to itself.
% Otherwise, we assume it's a number.
%
% We need the \relax at the end of the \ifnum lines to stop TeX from
% continuing to look for a <number>.
%
% \ifnum\lccode\expandafter`\thearg=0\relax
% \numericenumerate % a number (we hope)
% \else
% It's a letter.
% \ifnum\lccode\expandafter`\thearg=\expandafter`\thearg\relax
% \lowercaseenumerate % lowercase letter
% \else
% \uppercaseenumerate % uppercase letter
% \fi
% \fi

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\else
% Multiple tokens in the argument. We hope it's a number.
\numericenumerate
\fi

% An \enumerate whose labels are integers. The starting integer is
% given in \thearg.
%
\def\numericenumerate{%
  \itemno = \thearg
  \startenumeration{\the\itemno}%
}

% The starting (lowercase) letter is in \thearg.
\def\lowercaseenumerate{%
  \itemno = \expandafter`\thearg
  \startenumeration{%
    % Be sure we're not beyond the end of the alphabet.
    \ifnum\itemno=0
      \errmessage{No more lowercase letters in \enumerate; get a bigger
      alphabet}%
      \fi
     \char\lccode\itemno%
  }%
}

% The starting (uppercase) letter is in \thearg.
\def\uppercaseenumerate{%
  \itemno = \expandafter`\thearg
  \startenumeration{%
    % Be sure we're not beyond the end of the alphabet.
    \ifnum\itemno=0
      \errmessage{No more uppercase letters in \enumerate; get a bigger
      alphabet}%
      \fi
     \char\uccode\itemno%
  }%
}

% Call \doitemize, adding a period to the first argument and supplying the
% common last two arguments. Also subtract one from the initial value in
% \itemno, since \item increments \itemno.
%
\def\startenumeration#1{%
  \advance\itemno by -1
  \doitemize{#1.}
  \flushcr
}
% @alphaenumerate and @capsenumerate are abbreviations for giving an arg
% to @enumerate.
%
\def\alphaenumerate{\enumerate{a}}
\def\capsenumerate{\enumerate{A}}
\def\Ealphaenumerate{\Eenumerate}
\def\Ecapsenumerate{\Eenumerate}

% @multitable macros
% Amy Hendrickson, 8/18/94, 3/6/96
%
% @multitable ... @end multitable will make as many columns as desired.
% Contents of each column will wrap at width given in preamble. Width
% can be specified either with sample text given in a template line,
% or in percent of \hsize, the current width of text on page.
%
% Table can continue over pages but will only break between lines.
%
% To make preamble:
%
% Either define widths of columns in terms of percent of \hsize:
% @multitable @columnfractions .25 .3 .45
% @item ... 
%
% Numbers following @columnfractions are the percent of the total
% current hsize to be used for each column. You may use as many
% columns as desired.
%
% Or use a template:
% @multitable {Column 1 template} {Column 2 template} {Column 3 template}
% @item ... 
% using the widest term desired in each column.
%
% Each new table line starts with @item, each subsequent new column
% starts with @tab. Empty columns may be produced by supplying @tab's
% with nothing between them for as many times as empty columns are needed,
% ie, @tab@tab@tab will produce two empty columns.
%
% @item, @tab do not need to be on their own lines, but it will not hurt
% if they are.
%
% Sample multitable:
%
% @multitable {Column 1 template} {Column 2 template} {Column 3 template}
% @item first col stuff @tab second col stuff @tab third col
\item first col stuff
\item second col stuff
\item third col
\item first col stuff @tab second col stuff
\item Many paragraphs of text may be used in any column.
% They will wrap at the width determined by the template.
\item@tab@tab This will be in third column.
\endmultitable

% Default dimensions may be reset by user.
% @multitableparskip is vertical space between paragraphs in table.
% @multitableparindent is paragraph indent in table.
% @multitablecolmargin is horizontal space to be left between columns.
% @multitablelinespace is space to leave between table items, baseline
to baseline.
% 0pt means it depends on current normal line spacing.
%
\newskip\multitableparskip
\newskip\multitableparindent
\newdimen\multitablecolspace
\newskip\multitablelinespace
\multitableparskip=0pt
\multitableparindent=6pt
\multitablecolspace=12pt
\multitablelinespace=0pt

% Macros used to set up halign preamble:
%
\let\endsetuptable\relax
\def\xendsetuptable{\endsetuptable}
\let\columnfractions\relax
\newif\ifsetpercent
% #1 is the @columnfraction, usually a decimal number like .5, but might
% be just 1. We just use it, whatever it is.
%
\def\pickupwholefraction#1 {%
\global\advance\colcount by 1
\expandafter\def\csname col\the\colcount\endcsname{#1\hsize}%
\setuptable
}%

\newcount\colcount
\def\setuptable#1{\%  
\def\firstarg{#1}\%  
\ifx\firstarg\xendsetuptable  
\let\go = \relax  
\else  
\ifx\firstarg\xcolumnfractions  
\global\setpercenttrue  
\else  
\ifsetpercent  
\let\go\pickupwholefraction  
\else  
\global\advance\colcount by 1  
\setbox0=\hbox{#1\unskip\space}% Add a normal word space as a separator; typically that is always in the input, anyway.  
\expandafter\xdef\csname col\the\colcount\endcsname{\the\wd0}\%  
\fi  
\fi  
\fi  
\ifx\go\pickupwholefraction  
\% Put the argument back for the \pickupwholefraction call, so we'll always have a period there to be parsed.  
\def\go{\pickupwholefraction#1}\%  
\else  
\let\go=\setuptable  
\fi  
\fi  
}  
\% multitable-only commands.  
\%  
\% @headitem starts a heading row, which we typeset in bold.  
\% Assignments have to be global since we are inside the implicit group of an alignment entry.  \everycr resets \everytab so we don't have to undo it ourselves.  
\def\headitemfont{\bf}\% for people to use in the template row; not changeable  
\def\headitem{\checkenv\multitable\headitemfont\\}  
\def\checkenv\multitable\crcr\global\everytab={\bf}% can't use \headitemfont since the parsing differs  
\the\everytab \% for the first item  
}%  
\%  
\% A \tab used to include \hskip1sp.  But then the space in a template line is not enough.  That is bad.  So let's go back to just `&' until we again encounter the problem the 1sp was intended to solve.  
\%--karl, nathan@acm.org, 20apr99  
\def\tab{\checkenv\multitable &\the\everytab}\%
% @multitable ... @end multitable definitions:
%
\newtoks\everytab  % insert after every tab.
%
\envdef\multitable{  
\vskip\parskip
\startsavinginserts
%
% @item within a multitable starts a normal row.
% We use \def instead of \let so that if one of the multitable entries
% contains an @itemize, we don't choke on the \item (seen as \crcr aka
% \endtemplate) expanding \doitemize.
\def\item{\crcr}%
%
\tolerance=9500
\hbadness=9500
\settmtblespacing
\parskip=\multitableparskip
\parindent=\multitableparindent
\overfullrule=0pt
\global\colcount=0
%
\everycr = {  
\noalign{\global\everytab={}}%
\global\colcount=0 % Reset the column counter.
% Check for saved footnotes, etc.
\checkinserts
% Keeps underfull box messages off when table breaks over pages.
%\filbreak
% Maybe so, but it also creates really weird page breaks when the
% table breaks over pages. Wouldn't \vfil be better? Wait until the
% problem manifests itself, so it can be fixed for real --karl.
}%
}%
%
\par\closearg\domultitable

% To parse everything between @multitable and @item:
\setupptbles#1 \endsetupptble
%
% This preamble sets up a generic column definition, which will
% be used as many times as user calls for columns.
% \vtop will set a single line and will also let text wrap and
% continue for many paragraphs if desired.
\halign{\bgroup &\%
\global\advance\colcount by 1
% Use the current \colcount to find the correct column width:
% \hsize=\expandafter\csname col\the\colcount\endcsname
%
% In order to keep entries from bumping into each other
% we will add a \leftskip of \multitablecolspace to all columns after
% the first one.
%
% If a template has been used, we will add \multitablecolspace
% to the width of each template entry.
%
% If the user has set preamble in terms of percent of \hsize we will
% use that dimension as the width of the column, and the \leftskip
% will keep entries from bumping into each other. Table will start at
% left margin and final column will justify at right margin.
%
% Make sure we don't inherit \rightskip from the outer environment.
% \rightskip=0pt
% \ifnum\colcount=1
% The first column will be indented with the surrounding text.
% \advance\hsize by\leftskip
% \else
% \ifsetpercent \else
% If user has not set preamble in terms of percent of \hsize we will
% advance \hsize by \multitablecolspace.
% \advance\hsize by \multitablecolspace
% \fi
% In either case we will make \leftskip=\multitablecolspace:
% \leftskip=\multitablecolspace
% \fi
% Ignoring space at the beginning and end avoids an occasional spurious
% blank line, when TeX decides to break the line at the space before the
% box from the multistrut, so the strut ends up on a line by itself.
% For example:
% @multitable @columnfractions .11 .89
% @item @code{#}
% @tab Legal holiday which is valid in major parts of the whole country.
% Is automatically provided with highlighting sequences respectively
% marking characters.
% \noindent\ignorespaces###\unskip\multistrut
\crcr
\def\Emultitable{\%
\crcr
\egroup % end the \halign
\global\setpercentfalse
}
\def\setmultitablespacing{\%
\def\multistrut{\strut}% just use the standard line spacing
%
% Compute \multitablelinespace (if not defined by user) for use in
% \multitableparskip calculation. We used define \multistrut based on
% this, but (ironically) that caused the spacing to be off.
% See bug-texinfo report from Werner Lemberg, 31 Oct 2004 12:52:20 +0100.
\ifdim\multitablelinespace=0pt
\setbox0=vbox{X} \global\multitablelinespace=\the\baselineskip
\global\advance\multitablelinespace by-\ht0
\fi
%
% Test to see if parskip is larger than space between lines of
% table. If not, do nothing.
%        If so, set to same dimension as multitablelinespace.
\ifdim\multitableparskip>\multitablelinespace
\global\multitableparskip=\multitablelinespace
\global\advance\multitableparskip-7pt % to keep parskip somewhat smaller
% than skip between lines in the table.
\fi%
\ifdim\multitableparskip=0pt
\global\multitableparskip=\multitablelinespace
\global\advance\multitableparskip-7pt % to keep parskip somewhat smaller
% than skip between lines in the table.
\fi}

\message{conditionals,}

% @iftex, @ifnotdocbook, @ifnothtml, @ifnotinfo, @ifnotplaintext,
% @ifnotxml always succeed. They currently do nothing; we don't
% attempt to check whether the conditionals are properly nested. But we
% have to remember that they are conditionals, so that @end doesn't
% attempt to close an environment group.
%
\def\makecond#1{\%
\expandafter\let\csname #1\endcsname = \relax
\expandafter\let\csname iscond.#1\endcsname = 1
}
\makecond{iftex}
\makecond{ifnotdocbook}
\makecond{ifnothtml}
\makecond{ifnotinfo}
\makecond{ifnotplaintext}
\makecond{ifnotxml}

% Ignore @ignore, @ifhtml, @ifinfo, and the like.
%
\def\direntry{\doignore{direntry}}
\def\documentdescription{\doignore{documentdescription}}
\def\docbook{\doignore{docbook}}
\def\html{\doignore{html}}
\def\ifdocbook{\doignore{ifdocbook}}
\def\ifhtml{\doignore{ifhtml}}
\def\ifinfo{\doignore{ifinfo}}
\def\ifnottex{\doignore{ifnottex}}
\def\ifplaintext{\doignore{ifplaintext}}
\def\ifxml{\doignore{ifxml}}
\def\ignore{\doignore{ignore}}
\def\menu{\doignore{menu}}
\def\xml{\doignore{xml}}

% Ignore text until a line `@end #1', keeping track of nested conditionals.
%
% A count to remember the depth of nesting.
\newcount\doignorecount

\def\doignore#1{\begingroup
% Scan in `verbatim' mode:
\obeylines
\catcode`@ = \other
\catcode`{ = \other
\catcode`\} = \other
%
% Make sure that spaces turn into tokens that match what \doignoretext wants.
\spaceisspace
%
% Count number of #1's that we've seen.
\doignorecount = 0
%
% Swallow text until we reach the matching `@end #1'.
\dodoignore{#1} %
}

% \catcode`_=11 % We want to use \_STOP_ which cannot appear in texinfo source.
\obeylines %
%
\gdef\dodoignore#1{%
% #1 contains the command name as a string, e.g., `ifinfo'.
%
% Define a command to find the next `@end #1'.
\long\def\doignoretext#1^{\^M}@end #1{% \doignoretextyyyy#1^{\^M}@#1\_STOP_} %
%
% And this command to find another #1 command, at the beginning of a
% line. (Otherwise, we would consider a line `@c @ifset', for
\long\def\doignoretextyy#1\STOP\{\doignoreyyy{#1}\STOP\}%
% example, to count as an @ifset for nesting.)
\long\def\doignoreyyy##1\STOP{\doignoreyyy{##2}\STOP}%
% And now expand that command.
\doignoretext ^^M%
}
%

\def\doignoreyyy#1{%
  \def\temp{#1}%
  \ifx\temp\empty% Nothing found.
    \let\next\doignoretextzzz
  \else% Found a nested condition, ...
    \let\next\doignoretextyyy%
    \advance\doignorecount by 1
    \let\next\doignoretext% ..., look for another.
  \fi
  \next #1% the token \_STOP_ is present just after this macro.
%
  \def\doignoretextzzz#1{%
    \ifnum\doignorecount = 0% We have just found the outermost @end.
      \let\next\enddoignore
    \else% Still inside a nested condition.
      \let\next\doignoretext% Look for the next @end.
    \fi
    \next
%
  }%
%
% Finish off ignored text.
{ \obeylines%
  % Ignore anything after the last `@end #1'; this matters in verbatim
  % environments, where otherwise the newline after an ignored conditional
  % would result in a blank line in the output.
  \gdef\enddoignore#1^^M{\endgroup\ignorespaces}%
}
%
% @set VAR sets the variable VAR to an empty value.
% @set VAR REST-OF-LINE sets VAR to the value REST-OF-LINE.
%
% Since we want to separate VAR from REST-OF-LINE (which might be
% empty), we can't just use \parsearg; we have to insert a space of our
% own to delimit the rest of the line, and then take it out again if we
% didn't need it.
% We rely on the fact that \parsearg sets \catcode`\=10.
%
\parseargdef\set{\setyyy#1 \endsetyyy}
\def\setyyy#1 #2\endsetyyy{% 
  \makevalueexpandable
  \def\temp{#2}%
  \edef\next{\gdef\makecsname{SET#1}}%
  \ifx\temp\empty
    \next{}%
  \else
    \setzzz#2\endsetzzz
  \fi
}%
%
% Remove the trailing space \setxxx inserted.
\def\setzzz#1 \endsetzzz{\next{#1}}
%
% @clear VAR clears (i.e., unsets) the variable VAR.
%
\parseargdef\clear{% 
  \makevalueexpandable
  \global\expandafter\let\csname SET#1\endcsname=\relax
}%
%
% @value{foo} gets the text saved in variable foo.
\def\value{\begingroup\makevalueexpandable\valuexxx}
\def\valuexxx#1{\expandablevalue{#1}\endgroup}
{
  \catcode`- = \active \catcode`_ = \active
  \gdef\makevalueexpandable{\let\value = \expandablevalue
    \% We don't want these characters active, ...
    \catcode`\-=\other \catcode`\_=\other
    \% ..., but we might end up with active ones in the argument if
    \% we're called from @code, as @code{\@value{foo-bar_}}, though.
    \% So let them to their normal equivalents.
    \let\normaldash \let\normalunderscore
  }
}%
%
% We have this subroutine so that we can handle at least some @value's
% properly in indexes (we call \makevalueexpandable in \indexdummies).
% The command has to be fully expandable (if the variable is set), since
% the result winds up in the index file. This means that if the
\def\expandablevalue#1{\% 
\expandafter\ifx\csname SET#1\endcsname\relax 
  \{[No value for `\#1']\}\%
\message{Variable `\#1', used in @value, is not set.}\%
\else 
\csname SET#1\endcsname 
\fi
}

% @ifset VAR ... @end ifset reads the `...' iff VAR has been defined 
% with @set.
% 
% To get special treatment of `@end ifset,' call \makecond and the redefine.
% 
\makecond{ifset} 
\def@ifset{\parsearg{\doifset{\let\next=\ifsetfail}}} 
\def@doifset#1#2{\% 
\makevalueexpandable 
\let\next=\empty 
\expandafter\ifx\csname SET#2\endcsname\relax 
  #1\% If not set, redefine \next.
\fi 
\expandafter}
\next
\}
\def@ifsetfail{\doignore@ifset}

% @ifclear VAR ... @end executes the `...' iff VAR has never been 
% defined with @set, or has been undefined with @clear.
% 
% The `\else' inside the `\doifset' parameter is a trick to reuse the 
% above code: if the variable is not set, do nothing, if it is set, 
% then redefine \next to \ifclearfail.
% 
\makecond{ifclear} 
\def@ifclear{\parsearg{\doifset{\else \let\next=\ifclearfail}}} 
\def@ifclearfail{\doignore@ifclear}

% @ifcommandisdefined CMD ... @end executes the `...' if CMD (written 
% without the @) is in fact defined. We can only feasibly check at the 
% TeX level, so something like `mathcode' is going to be considered 
% defined even though it is not a Texinfo command.
%
\makecond{ifcommanddefined}
\def\ifcommanddefined{\parsearg{\doifcmddefined{\let\next=\ifcmddefinedfail}}}
%\def\doifcmddefined#1#2{{%  
\makevalueexpandable  
\let\next=\empty  
\expandafter\if\csname #2\endcsname\relax  
#1% If not defined, \let\next as above.  
\fi  
\expandafter  
}\next}
\def\ifcmddefinedfail{\doignore{ifcommanddefined}}
% @ifcommandnotdefined CMD ... handled similar to @ifclear above.
\makecond{ifcommandnotdefined}
\def\ifcommandnotdefined{\parsearg{\doifcmddefined{\else \let\next=\ifcmdnotdefinedfail}}} \def\ifcmdnotdefinedfail{\doignore{ifcommandnotdefined}}
% Set the `txicommandconditionals' variable, so documents have a way to  
% test if the @ifcommand...defined conditionals are available.
\set txicommandconditionals
% @dircategory CATEGORY  -- specify a category of the dir file  
% which this file should belong to. Ignore this in TeX.
\let\dircategory=\comment
% @defininfoenclose.  
\let\definfoenclose=\comment
\message{indexing,}
% Index generation facilities
% Define \newwrite to be identical to plain tex's \newwrite  
% except not \outer, so it can be used within macros and \if's.  
\edef\newwrite{\makecsname{ptexnewwrite}}
% \newindex {foo} defines an index named foo.  
% It automatically defines \fooindex such that  
% \fooindex ...rest of line... puts an entry in the index foo.  
% It also defines \fooindxfile to be the number of the output channel for  
% the file that accumulates this index. The file's extension is foo.  
% The name of an index should be no more than 2 characters long  
% for the sake of vms.  
% \def\newindex#1{%
\iflinks\expandafter\newwrite\csname#1indfile\endcsname \openout\csname#1indfile\endcsname \jobname.#1 \% Open the file \fi\expandafter\xdef\csname#1index\endcsname{% \% Define @#1index \noexpand\doindex{#1}}\}

\% @\defindex foo == \newindex{foo} \%
\def\defindex{\parsearg\newindex}

\% Define @\defcodeindex, like @\defindex except put all entries in @code. \%
\def\defcodeindex{\parsearg\newcodeindex}

\% \def\newcodeindex#1{% \iftlinks\expandafter\newwrite\csname#1indfile\endcsname \openout\csname#1indfile\endcsname \jobname.#1 \fi\expandafter\xdef\csname#1index\endcsname{% \noexpand\docodeindex{#1}}%}

\% @\synindex foo bar makes index foo feed into index bar. \%
\% Do this instead of @\defindex foo if you don't want it as a separate index. \%
\% @\syncodeindex foo bar similar, but put all entries made for index foo \% inside @code. \%
\def\synindex#1 #2\% \def\syncodeindex#1 #2\{\dosynindex\doindex{#1}{#2}\}
\dosynindex\doindex{#1}{#2}

\% #1 is \doindex or \docodeindex, #2 the index getting redefined (foo), \% #3 the target index (bar). \%
\def\dosynindex#1#2#3{% \% Only do \closeout if we haven't already done it, else we'll end up \% closing the target index. \expandafter\ifx\csname doneynindex#2\endcsname \relax \expandafter\let\csname doneynindex#2\endcsname = 1 \fi \expandafter\let\expandafter=\csname#1indfile\endcsname
\expandafter\let\csname#2indfile\endcsname=\temp
% redefine \fooindex:
\expandafter\xdef\csname#2index\endcsname{\noexpand#1{#3}}%
}

% Define \doindex, the driver for all \fooindex macros.
% Argument #1 is generated by the calling \fooindex macro,
% and it is "foo", the name of the index.

% \doindex just uses \parsearg; it calls \doind for the actual work.
% This is because \doind is more useful to call from other macros.

% There is also \dosubind {index} {topic} {subtopic}
% which makes an entry in a two-level index such as the operation index.

\def\doindex#1{\edef\indexname{#1}\parsearg\singleindexer}
\def\singleindexer #1{\doind{\indexname}{#1}}

% like the previous two, but they put @code around the argument.
\def\docodeindex#1{\edef\indexname{#1}\parsearg\singlecodeindexer}
\def\singlecodeindexer #1{\doind{\indexname}{\code{#1}}}

% Take care of Texinfo commands that can appear in an index entry.
% Since there are some commands we want to expand, and others we don't,
% we have to laboriously prevent expansion for those that we don't.
%
\def\indexdummies{%
\escapechar = `\    % use backslash in output files.
\def@[@@]% change to @@ when we switch to @ as escape char in index files.
\def\{\tt\char123}%
\def\}@\tt\char125}%
%
% Need these unexpandable (because we define \tt as a dummy)
% definitions when @ { or @ } appear in index entry text. Also, more
% complicated, when \text is in effect and \{ is a \delimiter again.
% We can't use \lbracecmd and \rbracecmd because texindex assumes
% braces and backslashes are used only as delimiters. Perhaps we
% should define @lbrace and @rbrace commands a la @comma.
\def\{{\tt\char123}}%
\def\}}{\tt\char125}}
%
% I don't entirely understand this, but when an index entry is
% generated from a macro call, the \endinput which \scanmacro inserts
% causes processing to be prematurely terminated. This is,
% apparently, because \indexsorttmp is fully expanded, and \endinput
% is an expandable command. The redefinition below makes \endinput
% disappear altogether for that purpose -- although logging shows that
% processing continues to some further point. On the other hand, it
% seems \endinput does not hurt in the printed index arg, since that
% is still getting written without apparent harm.
%
% Sample source (mac-idx3.tex, reported by Graham Percival to
% help-texinfo, 22may06):
% @macro funindex {WORD}
% @findex xyz
% @end macro
% ...
% @funindex commtest
%
% The above is not enough to reproduce the bug, but it gives the flavor.
%
% Sample whatsit resulting:
%.@write3\entry{xyz}{@folio }{@code {xyz@endinput}}}
%
% So:
\let@endinput = \empty
%
% Do the redefinitions.
\commondummies
}

% For the aux and toc files, @ is the escape character. So we want to
% redefine everything using @ as the escape character (instead of
% \realbackslash, still used for index files). When everything uses @,
% this will be simpler.
%
\def\atdummies{%
\def\@ [@ @]%
\def\ [@ ]%
\let\{ = \braceatcmd
\let\} = \braceatcmd
%
% Do the redefinitions.
\commondummies
\otherbackslash
}

% Called from \indexdummies and \atdummies.
%
\def\commondummies{%
%
% \definedummyword defines \#1 as \string\#1\space, thus effectively
% preventing its expansion. This is used only for control words,
% not control letters, because the \space would be incorrect for
% control characters, but is needed to separate the control word
% from whatever follows.
%
% For control letters, we have \definedummyletter, which omits the
% space.
%
% These can be used both for control words that take an argument and
% those that do not.  If it is followed by \{arg\} in the input, then
% that will dutifully get written to the index (or wherever).
%
\def\definedummyword##1\def##1\{\string##1\space\}\
\def\definedummyletter##1\def##1\{\string##1\}\
\let\definedummyaccent\definedummyletter
%
\commondummiesnofonts
%
\definedummyletter\_\%
\definedummyletter\-\%
%
% Non-English letters.
\definedummyword\AA
\definedummyword\AE
\definedummyword\DH
\definedummyword\L
\definedummyword\O
\definedummyword\OE
\definedummyword\TH
\definedummyword\aa
\definedummyword\ae
\definedummyword\dh
\definedummyword\exclamdown
\definedummyword\i
\definedummyword\o
\definedummyword\oe
\definedummyword\ordf
\definedummyword\ordm
\definedummyword\questiondown
\definedummyword\ss
\definedummyword\th
%
% Although these internal commands shouldn't show up, sometimes they do.
\definedummyword\bf
\definedummyword\gtr
\definedummyword\hat
\definedummyword\less
\definedummyword\sf
\definedummyword\sl
\definedummyword\tclose
\definedummyword\tt
%
\definedummyword\LaTeX
\TeX

% Assorted special characters.
\arrow
\bullet
\comma
\copyright
\registered
\dots
\enddots
\entrybreak
\equiv
\error
\euro
\expansion
\geq
\guillemetleft
\guillemetright
\guilsinglleft
\guilsinglright
\lbrace
\leq
\minus
\ogonek
\pounds
\point
\print
\quotedblbase
\quotedblleft
\quotedblright
\quoteleft
\quoteright
\quotesinglbase
\rbrace
\result
\textdegree

% We want to disable all macros so that they are not expanded by \write.
\macrolist
%
\normalturnoffactive
%
% Handle some cases of @value -- where it does not contain any
% (non-fully-expandable) commands.
\makevalueexpandable
}
% \indexnofonts is used when outputting the strings to sort the index
% by, and when constructing control sequence names. It eliminates all
% control sequences and just writes whatever the best ASCII sort string
% would be for a given command (usually its argument).
%
def\indexnofonts{%
% Accent commands should become @asis.
def\definedummyaccent##1{%let##1@asis}%
% We can just ignore other control letters.
def\definedummyletter##1{%let##1empty}%
% All control words become @asis by default; overrides below.
\let\definedummyword\definedummyaccent
%
\commondummiesnofonts
%
% Don't no-op \tt, since it isn't a user-level command
% and is used in the definitions of the active chars like <, >, |, etc.
% Likewise with the other plain tex font commands.
%\let\tt=\asis
%
def\{)%
def\[@)%
def\_[\normalunderscore]%
def\-{)% @- shouldn't affect sorting
%
% Unfortunately, texindex is not prepared to handle braces in the
% content at all. So for index sorting, we map @ { and @} to strings
\% starting with ], since that ASCII character is between ASCII { and }.
\def\{ \{a\}%
\def\bracechar{\{a}%
\%
\def\} \{b\}%
\def\bracechar{\{b}%
\%
\% Non-English letters.
\def\AA\{AA}%
\def\AE\{AE}%
\def\DH\{DZZ}%
\def\L\{L}%
\def\OE\{OE}%
\def\O\{O}%
\def\TH\{ZZZ}%
\def\aa\{aa}%
\def\ae\{ae}%
\def\dh\{dzz}%
\def\exclamdown\{!}%
\def\l\{1}%
\def\oe\{oe}%
\def\ordf\{a}%
\def\ordm\{o}%
\def\o\{o}%
\def\questiondown\{?}%
\def\ss\{ss}%
\def\th\{zzz}%
\%
\def\LaTeX\{LaTeX}%
\def\TeX\{TeX}%
\%
\% Assorted special characters.
\% (The following \{ \} will end up in the sort string, but that's ok.)
\def\arrow\{->}%
\def\bullet\{bullet}%
\def\comma\{,}%
\def\copyright\{copyright}%
\def\dots\{...}%
\def\enddots\{...}%
\def\equiv\{==}%
\def\error\{error}%
\def\euro\{euro}%
\def\expansion\{==>}%
\def\geq\{>=}%
\def\guillemetleft\{<}%
\def\guillemeteright\{>}%
\def\guilsinglleft\{<}%
\def\guilsinglright\{>}%
\def\leq{\leq}%
\def\minus{-}%
\def\point{.}%
\def\pounds{pounds}%
\def\print{-|}%
\def\quotedblbase{"}%
\def\quotedblleft{"}%
\def\quotedblright{"}%
\def\quoteleft{'}%
\def\quoteright{'}%
\def\quotesinglbase{,}%
\def\registeredsymbol{R}%
\def\result{\Rightarrow}%
\def\textdegree{o}%

\expandafter\ifx\csname SETtxiindexlquoteignore\endcsname\relax
\else \indexlquoteignore \fi

% We need to get rid of all macros, leaving only the arguments (if present).
% Of course this is not nearly correct, but it is the best we can do for now.
% makeinfo does not expand macros in the argument to @deffn, which ends up
% writing an index entry, and texindex isn't prepared for an index sort entry
% that starts with \.
%
% Since macro invocations are followed by braces, we can just redefine them
% to take a single TeX argument. The case of a macro invocation that
% goes to end-of-line is not handled.
%
\macrolist
%
% Undocumented (for FSFS 2nd ed.): @set txiindexlquoteignore makes us
% ignore left quotes in the sort term.
{\catcode`\=\active
\gdef\indexlquoteignore{\let`=\empty}}

\let\indexbackslash=0 % overridden during \printindex.
\let\SETmarginindex=\relax % put index entries in margin (undocumented)?

% Most index entries go through here, but \doind is the general case.
% #1 is the index name, #2 is the entry text.
\def\doind#1#2{\doind#1#2{\dosubind{#1}{#2}}}

% Workhorse for all \fooindexes.
% #1 is name of index, #2 is stuff to put there, #3 is subentry --
% empty if called from \doind, as we usually are (the main exception
% is with most defuns, which call us directly).
%
\def\dosubind{\#1\#2\#3{\%
\iflinks
\% Store the main index entry text (including the third arg).
\toks0 = \{#2\}%
\% If third arg is present, precede it with a space.
\def\thirdarg{\#3}%
\ifx\thirdarg\empty \else
\toks0 = \expandafter{\the\toks0 \space \#3}%
\fi
\% \def\writeto{\csname#1indfile\endcsname}%
\% \safewhatsit\dosubindwrite
}\%
\fi
}

% Write the entry in \toks0 to the index file:
% \def\dosubindwrite{\%
\% Put the index entry in the margin if desired.
\ifx\SETmarginindex\relax\else
\insert\margin{\hbox{\vrule height8pt depth3pt width0pt \the\toks0}}\%
\fi
%
% Remember, we are within a group.
\indexdummies % Must do this here, since \bf, etc expand at this stage
\def\backslashcurfont{\indexbackslash}% \indexbackslash isn't defined now
% so it will be output as is; and it will print as backslash.
%
% Process the index entry with all font commands turned off, to
% get the string to sort by.
{\indexnofonts
\edef\temp{\the\toks0}% need full expansion
\xdef\indexxsorttmp{\temp}%
}\%
%
% Set up the complete index entry, with both the sort key and
% the original text, including any font commands.  We write
% three arguments to \entry to the .?? file (four in the
% subentry case), texindex reduces to two when writing the .??s
% sorted result.
\edef\temp{\%
\write\writeto{\%
\string\entry{\indexxsorttmp}{\noexpand\folio}{\the\toks0} }%}
\temp
% Take care of unwanted page breaks/skips around a whatsit:
%
% If a skip is the last thing on the list now, preserve it
% by backing up by \lastskip, doing the \write, then inserting
% the skip again. Otherwise, the whatsit generated by the
% \write or \pdfdest will make \lastskip zero. The result is that
% sequences like this:
% @end defun
% @tindex whatever
% @defun ...
% will have extra space inserted, because the \medbreak in the
% start of the @defun won't see the skip inserted by the @end of
% the previous defun.
%
% But don't do any of this if we're not in vertical mode. We
% don't want to do a \vskip and prematurely end a paragraph.
%
% Avoid page breaks due to these extra skips, too.
%
% But wait, there is a catch there:
% We'll have to check whether \lastskip is zero skip. \ifdim is not
% sufficient for this purpose, as it ignores stretch and shrink parts
% of the skip. The only way seems to be to check the textual
% representation of the skip.
%
% The following is almost like \def\zeroskipmacro{0.0pt} except that
% the `p'' and `t'' characters have catcode `other', not 11 (letter).
%
\edef\zeroskipmacro{\expandafter\the\csname z@skip\endcsname}

\newskip\whatsitskip
\newcount\whatsitpenalty
%
% ..., ready, GO:
%
\def\safewhatsit#1{\ifhmode
  #1%
\else
  \lastskip and \lastpenalty cannot both be nonzero simultaneously.
  \whatsitskip = \lastskip
  \edef\lastskipmacro{\the\lastskip}\%
  \whatsitpenalty = \lastpenalty
\%
% If \lastskip is nonzero, that means the last item was a
% skip. And since a skip is discardable, that means this
% -whatsitskip glue we're inserting is preceded by a
\% non-discardable item, therefore it is not a potential
\% breakpoint, therefore no \nobreak needed.
\ifx\lastskipmacro\zeroskipmacro
\else
\vskip-\whatsitskip
\fi
\%
#1%
%
\ifx\lastskipmacro\zeroskipmacro
\% If \lastskip was zero, perhaps the last item was a penalty, and
\% perhaps it was >=10000, e.g., a \nobreak.  In that case, we want
\% to re-insert the same penalty (values >10000 are used for various
\% signals); since we just inserted a non-discardable item, any
\% following glue (such as a \parskip) would be a breakpoint.  For example:
\%   @deffn deffn-whatever
\%   @vindex index-whatever
\% Description.
\% would allow a break between the index-whatever whatsit
\% and the "Description." paragraph.
\ifnum\whatsitpenalty>9999 \penalty\whatsitpenalty \fi
\else
\% On the other hand, if we had a nonzero \lastskip,
\% this make-up glue would be preceded by a non-discardable item
\% (the whatsit from the \write), so we must insert a \nobreak.
\nobreak\vskip\whatsitskip
\fi
\fi}

\% The index entry written in the file actually looks like
\% \entry {sortstring} {page} {topic}
\% or
\% \entry {sortstring} {page} {topic} {subtopic}
\% The texindex program reads in these files and writes files
\% containing these kinds of lines:
\% \initial {c}
\% before the first topic whose initial is c
\% \entry {topic} {pagelist}
\% for a topic that is used without subtopics
\% \primary {topic}
\% for the beginning of a topic that is used with subtopics
\% \secondary {subtopic} {pagelist}
\% for each subtopic.

\% Define the user-accessible indexing commands
\% @findex, @vindex, @kindex, @cindex.
\def\findex \{\fnindex\}
\def\kindex {\kyindex}
\def\cindex {\cpindex}
\def\vindex {\vrindex}
\def\tindex {\tpindex}
\def\pindex {\pgindex}

\def\cindexsub {\begingroup\obeylines\cindexsub}
{\obeylines %
\gdef\cindexsub "#1" #2^^M{\endgroup %
\dosubind{cp}{#2}{#1}}}

% Define the macros used in formatting output of the sorted index material.

% @printindex causes a particular index (the ??s file) to get printed.
% It does not print any chapter heading (usually an @unnumbered).
% \parseargdef\printindex{\begingroup
\dobreak \chapheadingskip{10000}%
%
\smallfonts \rm
\tolerance = 9500
\plainfrenchspacing
\everypar = {}% don't want the \kern\parindent from indentation suppression.
%
% See if the index file exists and is nonempty.
% Change catcode of @ here so that if the index file contains
% \initial { @ }
% as its first line, TeX doesn't complain about mismatched braces
% (because it thinks @} is a control sequence).
\catcode`@ = 11
\openin 1 \jobname.#1s
\ifeof 1 % \enddoublecolumns gets confused if there is no text in the index,
% and it loses the chapter title and the aux file entries for the
% index. The easiest way to prevent this problem is to make sure
% there is some text.
\putwordIndexNonexistent
\else
%
% If the index file exists but is empty, then \openin leaves \ifeof
% false. We have to make TeX try to read something from the file, so
% it can discover if there is anything in it.
\read 1 to \temp
\ifeof 1
\putwordIndexIsEmpty
\else
% Index files are almost Texinfo source, but we use \ as the escape
% character. It would be better to use @, but that's too big a change
% to make right now.
\def\indexbackslash{\backslash\curfont}%
\catcode`\ = 0
\escapechar = `\n
\begin{doublecolumns}
\input \jobname.#1s
\end{doublecolumns}

\fi
\fi
\closein 1
\endgroup}

% These macros are used by the sorted index file itself.
% Change them to control the appearance of the index.

% simple initial definitions
\def\initial#1{{%
% Some minor font changes for the special characters.
\let\tentt=\sectt \let\tt=\sectt \let\sf=\sectt
%
% Remove any glue we may have, we'll be inserting our own.
\removelastskip
%
% We like breaks before the index initials, so insert a bonus.
\nobreak
\vskip 0pt plus 3\baselineskip
\penalty 0
\vskip 0pt plus -3\baselineskip
%
% Typeset the initial.  Making this add up to a whole number of
% baselineskips increases the chance of the dots lining up from column
% to column.  It still won't often be perfect, because of the stretch
% we need before each entry, but it's better.
%
% No shrink because it confuses \balancecolumns.
\vskip 1.67\baselineskip plus .5\baselineskip
\leftline{\secbf #1}%
% Do our best not to break after the initial.
\nobreak
\vskip .33\baselineskip plus .1\baselineskip
}

% \entry typesets a paragraph consisting of the text (#1), dot leaders, and
% then page number (#2) flushed to the right margin.  It is used for index
% and table of contents entries.  The paragraph is indented by \leftskip.
%
% A straightforward implementation would start like this:
%\def\entry#1#2{...
% But this freezes the catcodes in the argument, and can cause problems to
% @code, which sets - active. This problem was fixed by a kludge---
% `"` was active throughout whole index, but this isn't really right.
% The right solution is to prevent \entry from swallowing the whole text.
% --kasal, 21nov03
\def\entry{%
\begingroup
%
% Start a new paragraph if necessary, so our assignments below can't
% affect previous text.
\par
%
% Do not fill out the last line with white space.
\parfillskip = 0in
%
% No extra space above this paragraph.
\parskip = 0in
%
% Do not prefer a separate line ending with a hyphen to fewer lines.
\finalhyphendemerits = 0
%
% \hangindent is only relevant when the entry text and page number
% don't both fit on one line. In that case, bob suggests starting the
% dots pretty far over on the line. Unfortunately, a large
% indentation looks wrong when the entry text itself is broken across
% lines. So we use a small indentation and put up with long leaders.
%
% \hangafter is reset to 1 (which is the value we want) at the start
% of each paragraph, so we need not do anything with that.
\hangindent = 2em
%
% When the entry text needs to be broken, just fill out the first line
% with blank space.
\rightskip = 0pt plus1fil
%
% A bit of stretch before each entry for the benefit of balancing
% columns.
\vskip 0pt plus1pt
%
% When reading the text of entry, convert explicit line breaks
% from @* into spaces. The user might give these in long section
% titles, for instance.
\def*[@unskip\space\ignorespaces]%
\def\entrybreak{\hfil\break}%
%
% Swallow the left brace of the text (first parameter):
\afterassignment\doentry
\let\temp =
\hangindent=1in
\hangafter=1
\noindent\hskip\secondaryindent\hbox{#1}\indexdotfill
\ifpdf
\pdfgettoks#2.\the\toksA % The page number ends the paragraph.
\else
#2
\fi
\par
}
}

% Define two-column mode, which we use to typeset indexes.
% Adapted from the TeXbook, page 416, which is to say,
% the manmac.tex format used to print the TeXbook itself.
\catcode`@=11

\newbox\partialpage
\newdimen\doublecolumnhsize

\edef\begindoublecolumns{\begingroup % ended by \enddoublecolumns
% Grab any single-column material above us.
\output = { %
  % Here is a possibility not foreseen in manmac: if we accumulate a
  % whole lot of material, we might end up calling this \output
  % routine twice in a row (see the doublecol-lose test, which is
  % essentially a couple of indexes with @setchapternewpage off). In
  % that case we just ship out what is in \partialpage with the normal
  % output routine. Generally, \partialpage will be empty when this
  % runs and this will be a no-op. See the indexspread.tex test case.
  \ifvoid\partialpage \else
    \onepageout{\pagecontents\partialpage} %
  \fi
  %
  \global\setbox\partialpage = \vbox{ %
    % Unvbox the main output page.
    \unvbox\PAGE
    \kern-\topskip \kern\baselineskip
  } %
} %
\eject % run that output routine to set \partialpage
%
% Use the double-column output routine for subsequent pages.
\output = {\doublecolumnout} %
%
% Change the page size parameters. We could do this once outside this
% routine, in each of @smallbook, @afourpaper, and the default 8.5x11
% format, but then we repeat the same computation. Repeating a couple
% of assignments once per index is clearly meaningless for the
% execution time, so we may as well do it in one place.
%
% First we halve the line length, less a little for the gutter between
% the columns. We compute the gutter based on the line length, so it
% changes automatically with the paper format. The magic constant
% below is chosen so that the gutter has the same value (well, +<1pt)
% as it did when we hard-coded it.
%
% We put the result in a separate register, \doublecolumnhsize, so we
% can restore it in \pagesofar, after \hsize itself has (potentially)
% been clobbered.
%
\doublecolumnhsize = \hsize
\advance\doublecolumnhsize by -.04154\hsize
\divide\doublecolumnhsize by 2
\hsize = \doublecolumnhsize
%
% Double the \vsize as well. (We don't need a separate register here,
% since nobody clobbers \vsize.)
\vsize = 2\vsize
}

% The double-column output routine for all double-column pages except
% the last.
%
\def\doublecolumnout{%
\splittopskip=\topskip \splitmaxdepth=\maxdepth
% Get the available space for the double columns -- the normal
% (undoubled) page height minus any material left over from the
% previous page.
\dimen@ = \vsize
\divide\dimen@ by 2
\advance\dimen@ by -\ht\partialpage
%
% box0 will be the left-hand column, box2 the right.
\setbox0=\vsplit255 to\dimen@ \setbox2=\vsplit255 to\dimen@
\onepageout\pagesofar
\unvbox255
\penalty\outputpenalty
}

% Re-output the contents of the output page -- any previous material,
% followed by the two boxes we just split, in box0 and box2.
\def\pagesofar{%
\unvbox\partialpage
%
\hsize = \doublecolumnhsize
\def\enddoublecolumns{% 
% The following penalty ensures that the page builder is exercised 
% _before_ we change the output routine. This is necessary in the 
% following situation: 
%
% The last section of the index consists only of a single entry. 
% Before this section, \pagetotal is less than \pagegoal, so no 
% break occurs before the last section starts. However, the last 
% section, consisting of \initial and the single \entry, does not 
% fit on the page and has to be broken off. Without the following 
% penalty the page builder will not be exercised until \eject 
% below, and by that time we'll already have changed the output 
% routine to the \balancecolumns version, so the next-to-last 
% double-column page will be processed with \balancecolumns, which 
% is wrong: The two columns will go to the main vertical list, with 
% the broken-off section in the recent contributions. As soon as 
% the output routine finishes, TeX starts reconsidering the page 
% break. The two columns and the broken-off section both fit on the 
% page, because the two columns now take up only half of the page 
% goal. When TeX sees \eject from below which follows the final 
% section, it invokes the new output routine that we've set after 
% \balancecolumns below; \onepageout will try to fit the two columns 
% and the final section into the vbox of \pageheight (see 
% \pagebody), causing an overfull box. 
%
% Note that glue won't work here, because glue does not exercise the 
% page builder, unlike penalties (see The TeXbook, pp. 280-281). 
\penalty0
%
\output = {% 
% Split the last of the double-column material. Leave it on the 
% current page, no automatic page break. 
\balancecolumns 
%
% If we end up splitting too much material for the current page, 
% though, there will be another page break right after this \output 
% invocation ends. Having called \balancecolumns once, we do not 
% want to call it again. Therefore, reset \output to its normal 
% definition right away. (We hope \balancecolumns will never be 
% called on to balance too much material, but if it is, this makes 
% the output somewhat more palatable.) 
\global\output = {\onepageout{\pagecontents\PAGE}}
} %
\\eject
% started in \begindoublecolumns
\%
% \pagegoal was set to the doubled \vsize above, since we restarted
% the current page. We're now back to normal single-column
% typesetting, so reset \pagegoal to the normal \vsize (after the
% \endgroup where \vsize got restored).
\pagegoal = \vsize
%
% Called at the end of the double column material.
\def\balancecolumns{%
\setbox0 = \vbox{\unvbox255}% like \box255 but more efficient, see p.120.
\dimen@ = \ht0
\advance\dimen@ by \topskip
\divide\dimen@ by 2 % target to split to
%debug\message (final 2-column material height=\the\ht0, target=\the\dimen@.)%
\splittopskip = \topskip
% Loop until we get a decent breakpoint.
{%
\vbadness = 10000
\loop
\global\setbox3 = \copy0
\global\setbox1 = \vsplit3 to \dimen@
\ifdim\ht3>\dimen@
\global\advance\dimen@ by 1pt
\repeat
}%
%debug\message {split to \the\dimen@, column heights: \the\ht1, \the\ht3.}%
\setbox0=\vbox to\dimen@ {\unvbox1}%
\setbox2=\vbox to\dimen@ {\unvbox3}%
%
%pagesofar
%
%}
\catcode`@ = \other

\message{sectioning,}
% Chapters, sections, etc.

% Let's start with @part.
\outer\parseargdef\part{\partzzz{#1}}
\def\partzzz#1{%
\chapoddpage
\null
\vskip.3\vsize % move it down on the page a bit
\begingroup


% unnumberedno is an oxymoron. But we count the unnumbered
% sections so that we can refer to them unambiguously in the pdf
% outlines by their "section number". We avoid collisions with chapter
% numbers by starting them at 10000. (If a document ever has 10000
% chapters, we're in trouble anyway, I'm sure.)
\newcount\unnumberedno \unnumberedno = 10000
\newcount\chapno
\newcount\secno \secno=0
\newcount\subsecno \subsecno=0
\newcount\subsubsecno \subsubsecno=0

% This counter is funny since it counts through charcodes of letters A, B, ...
\newcount\appendixno \appendixno = \@%
%
% \def\appendixletter{\char\the\appendixno}
% We do the following ugly conditional instead of the above simple
% construct for the sake of pdftex, which needs the actual
% letter in the expansion, not just typeset.
%
\def\appendixletter{%
\ifnum\appendixno=`A A% \else\ifnum\appendixno=`B B% \else\ifnum\appendixno=`C C% \else\ifnum\appendixno=`D D% \else\ifnum\appendixno=`E E% \else\ifnum\appendixno=`F F% \else\ifnum\appendixno=`G G% \else\ifnum\appendixno=`H H% \else\ifnum\appendixno=`I I% \else\ifnum\appendixno=`J J% \else\ifnum\appendixno=`K K% \else\ifnum\appendixno=`L L% \else\ifnum\appendixno=`M M% \else\ifnum\appendixno=`N N% \else\ifnum\appendixno=`O O% \else\ifnum\appendixno=`P P% \else\ifnum\appendixno=`Q Q% \else\ifnum\appendixno=`R R% \else\ifnum\appendixno=`S S% \else\ifnum\appendixno=`T T%
\else\ifnum\appendixno=`U U%
\else\ifnum\appendixno=`V V%
\else\ifnum\appendixno=`W W%
\else\ifnum\appendixno=`X X%
\else\ifnum\appendixno=`Y Y%
\else\ifnum\appendixno=`Z Z%
% The \the is necessary, despite appearances, because \appendixletter is
% expanded while writing the .toc file. \char\appendixno is not
% expandable, thus it is written literally, thus all appendixes come out
% with the same letter (or @) in the toc without it.
\else\char\the\appendixno
\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi
\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi\fi}

% Each @chapter defines these (using marks) as the number+name, number
% and name of the chapter. Page headings and footings can use
% these. @section does likewise.
\def\thischapter{}\def\thischapternum{}\def\thischaptername{}
\def\thissection{}\def\thissectionnum{}\def\thissectionname{}
\newcount\absseclevel % used to calculate proper heading level
\newcount\secbase\secbase=0 % @raisesections/@lowersections modify this count

% @raisesections: treat @section as chapter, @subsection as section, etc.
\def\raisesections{\global\advance\secbase by -1}
\let\up=\raisesections % original Bfox name

% @lowersections: treat @chapter as section, @section as subsection, etc.
\def\lowersections{\global\advance\secbase by 1}
\let\down=\lowersections % original Bfox name

% we only have subsub.
\chardef\maxseclevel = 3
%
% A numbered section within an unnumbered changes to unnumbered too.
% To achieve this, remember the "biggest" unnum. sec. we are currently in:
\chardef\unnlevel = \maxseclevel
%
% Trace whether the current chapter is an appendix or not:
% \chapheadtype is "N" or "A", unnumbered chapters are ignored.
\def\chapheadtype{N}

% Choose a heading macro
% #1 is heading type
% #2 is heading level
% #3 is text for heading
\def\genhead#1#2#3{% 
% Compute the abs. sec. level:
\absseclevel=#2
\advance\absseclevel by \secbase
% Make sure \absseclevel doesn’t fall outside the range:
\ifnum \absseclevel < 0
\absseclevel = 0
\else
\ifnum \absseclevel > 3
\absseclevel = 3
\fi
\fi
% The heading type:
\def\headtype{#1}%
\if \headtype U%
\ifnum \absseclevel < \unnlevel
\chardef\unnlevel = \absseclevel
\fi
\else
% Check for appendix sections:
\ifnum \absseclevel = 0
\edef\chapheadtype{\headtype}%
\else
\if \headtype A\if \chapheadtype N%
\errmessage{@appendix... within a non-appendix chapter}%
\fi\fi
\fi
% Check for numbered within unnumbered:
\ifnum \absseclevel > \unnlevel
\def\headtype{U}%
\else
\chardef\unnlevel = 3
\fi
\fi
% Now print the heading:
\if \headtype U%
\ifcase\absseclevel
\unnumberedd{#3}%
\or \unnumbereds{#3}%
\or \unnumberedss{#3}%
\fi
\else
\if \headtype A%
\ifcase\absseclevel
\appendix{#3}%
\fi
\or \appendixsectionzzz{#3}%
\or \appendixsubseczzz{#3}%
\or \appendixsubsubseczzz{#3}%
\fi
\else
\ifcase\absseclevel
\chapterzzz{#3}%
\or \seczzz{#3}%
\or \numberedsubseczzz{#3}%
\or \numberedsubsubseczzz{#3}%
\fi
\fi
\fi
\suppressfirstparagraphindent
}

% an interface:
\def\numhead{\genhead N}
\def\apphead{\genhead A}
\def\unnmhead{\genhead U}

% @chapter, @appendix, @unnumbered. Increment top-level counter, reset
% all lower-level sectioning counters to zero.
%
% Also set \chaplevelprefix, which we prepend to @float sequence numbers
% (e.g., figures), q.v. By default (before any chapter), that is empty.
\let\chaplevelprefix = \empty
%
\outer\parseargdef\chapter{\numhead0{#1}} % normally numhead0 calls chapterzzz
\def\chapterzzz#1{%
% section resetting is \global in case the chapter is in a group, such
% as an @include file.
\global\secno=0 \global\subsecno=0 \global\subsubsecno=0
\global\advance\chapno by 1
%
% Used for @float.
\gdef\chaplevelprefix{\the\chapno.}%
\resetallfloatnos
%
% \putwordChapter can contain complex things in translations.
\toks0=\expandafter{\putwordChapter}%
\message{\the\toks0 \space \the\chapno}%
%
% Write the actual heading.
\chapmacro{#1}{Ynumbered}{\the\chapno}%
%
% So @section and the like are numbered underneath this chapter.
\global\let@section = \numberedsec
\global\let\section = \unnumberedsec
\global\let\subsection = \unnumberedsubsec
\global\let\subsubsection = \unnumberedsubsubsec
}

% @centerchap is like @unnumbered, but the heading is centered.
\outer\parseargdef\centerchap{%
% Well, we could do the following in a group, but that would break
% an assumption that \chapmacro is called at the outermost level.
% Thus we are safer this way:--kasal, 24feb04
\let\centerparametersmaybe = \centerparameters
\unnmhead0{#1}%
\let\centerparametersmaybe = \relax
}

% @top is like @unnumbered.
\let\top\unnumbered

% Sections.
%
\outer\parseargdef\numberedsec{\numhead1{#1}} % normally calls seczzz
\def\seczzz#1{% 
\global\subsecno=0 \global\subsubsecno=0 \global\advance\secno by 1
\sectionheading{#1}{sec}{Ynumbered}{\the\chapno.\the\secno}%
}
%
% normally calls appendixsectionzzzz:
\outer\parseargdef\appendixsection{\apphead1{#1}}
\def\appendixsectionzzzz#1{% 
\global\subsecno=0 \global\subsubsecno=0 \global\advance\secno by 1
\sectionheading{#1}{sec}{Yappendix}{\appendixletter.\the\secno}%
}
\let\appendixsec\appendixsection
%
% normally calls unnumberedseczzzz:
\outer\parseargdef\unnumberedsec{\unnmhead1{#1}}
\def\unnumberedseczzzz#1{% 
\global\subsecno=0 \global\subsubsecno=0 \global\advance\secno by 1
\sectionheading{#1}{sec}{Ynothing}{\the\unnumberedno.\the\secno}%
}

% Subsections.
%
% normally calls numberedsubseczzzz:
\outer\parseargdef\numberedsubsec{\numhead2{#1}}
\def\numberedsubseczzzz#1{% 
\global\subsubsecno=0 \global\advance\subsecno by 1
These macros control what the section commands do, according
% to what kind of chapter we are in (ordinary, appendix, or unnumbered).
% Define them by default for a numbered chapter.
\let\section = \numberedsec
\let\subsection = \numberedsubsec
\let\subsubsection = \numberedsubsubsec

% Define @majorheading, @heading and @subheading

\def\majorheading{%
  \advance\chapheadingskip by 10pt \chapbreak %
  \parsearg\chapheadingzzz
}

\def\chapheading{% \chapbreak \parsearg\chapheadingzzz
  \chapheadingzzz#1{%
    \vbox{\chapfonts \raggedtitlesettings #1\par}%
    \nobreak\bigskip \nobreak
    \suppressfirstparagraphindent
  }
}

% @heading, @subheading, @subsubheading.
\parseargdef\heading{\sectionheading{#1}{sec}{Yomitfromtoc}{}}
\parseargdef\subheading{\sectionheading{#1}{subsec}{Yomitfromtoc}{}}
\parseargdef\subsubheading{\sectionheading{#1}{subsubsec}{Yomitfromtoc}{}}

% These macros generate a chapter, section, etc. heading only
% (including whitespace, linebreaking, etc. around it),
% given all the information in convenient, parsed form.

% Args are the skip and penalty (usually negative)
\def\dobreak#1#2{\par\ifdim\lastskip<#1\removelastskip\penalty#2\vskip#1\fi}

% Parameter controlling skip before chapter headings (if needed)
\newskip\chapheadingskip

% Define plain chapter starts, and page on/off switching for it.
\def\chapbreak{\dobreak \chapheadingskip {-4000}}
\def\chappager{\par\vfill\supereject}
% Because \domark is called before \chapoddpage, the filler page will
% get the headings for the next chapter, which is wrong. But we don't
% care -- we just disable all headings on the filler page.
\def\chapoddpage{%
  \chappager
  \fodd\pageno \else
    \begingroup
      \headingsoff
      \null
}
\chappager
\endgroup
\fi
}

\def\setchapternewpage #1 {\csname CHAPPAG#1\endcsname}

\def\CHAPPAGoff{\%
\global\let\contentsalignmacro = \chappager
\global\let\pchapsepmacro=\chapbreak
\global\let\pagealignmacro=\chappager}

\def\CHAPPAGon{\%
\global\let\contentsalignmacro = \chappager
\global\let\pchapsepmacro=\chappager
\global\let\pagealignmacro=\chappager
\global\def\HEADINGSon{\HEADINGSsingle}}

\def\CHAPPAGodd{\%
\global\let\contentsalignmacro = \chapoddpage
\global\let\pchapsepmacro=\chapoddpage
\global\let\pagealignmacro=\chapoddpage
\global\def\HEADINGSon{\HEADINGSdouble}}

\CHAPPAGon
%
% Chapter opening.
%
% #1 is the text, #2 is the section type (Ynumbered, Ynothing, 
% Yappendix, Yomitfromtoc), #3 the chapter number.
%
% To test against our argument.
\def\Ynothingkeyword{Ynothing}
\def\Yomitfromtockeyword{Yomitfromtoc}
\def\Yappendixkeyword{Yappendix}
%
\def\chapmacro#1#2#3{\%
% Insert the first mark before the heading break (see notes for \domark).
\let\prevchapterdefs=\lastchapterdefs
\let\prevsectiondefs=\lastsectiondefs
\gdef\lastsectiondefs{\gdef\thissectionname{} \gdef\thissectionnum{} \}%
% \gdef\thissection{}}%
%
% #2}
% \ifx\emptytype\Ynothingkeyword
% \gdef\lastchapterdefs{\gdef\thischaptername{#1} \gdef\thischapternum{}}%
% \gdef\thischapter{}}%
% \else\ifx\emptytype\Yomitfromtockeyword
% \else
% \fi
% \fi
% \fi
%
% number, and don't print the unnumbered "number".
\ifx\emptyp\Ynothingkeyword
\setbox0 = \hbox{}\% contents like unnumbered, but no toc entry
\def\toctype{unnchap}\%
\else\ifx\emptyp\Yomitfromtockeyword
\setbox0 = \hbox{}% contents like unnumbered, but no toc entry
\def\toctype{omit}%
\else\ifx\emptyp\Yappendixkeyword
\setbox0 = \hbox\{\putwordAppendix{} #3\enspace}\%
\def\toctype{app}\%
\else
\setbox0 = \hbox\{#3\enspace}\%
\def\toctype{numchap}\%
\fi\fi\fi
\%
% Write the toc entry for this chapter.  Must come before the
% \donoderef, because we include the current node name in the toc
% entry, and \donoderef resets it to empty.
\writetocentry\{\toctype\}\{#1\}\{#3\}\%
%
% For pdftex, we have to write out the node definition (aka, make
% the pdfdest) after any page break, but before the actual text has
% been typeset.  If the destination for the pdf outline is after the
% text, then jumping from the outline may wind up with the text not
% being visible, for instance under high magnification.
\donoderef\{\#2\}\%
%
% Typeset the actual heading.
\nobreak \% Avoid page breaks at the interline glue.
\hbox\{\raggedtitlesettings \hangindent=\wd0 \centerparametersmaybe
\unhbox0 \#1\par\%
\}%
\nobreak\bigskip \% no page break after a chapter title
\nobreak
%
% @centerchap -- centered and unnumbered.
\let\centerparametersmaybe = \relax
\def\centerparameters\{\%
\advance\rightskip by 3\rightskip
\leftskip = \rightskip
\parfillskip = 0pt
\}
%
% I don't think this chapter style is supported any more, so I'm not
% updating it with the new noderef stuff.  We'll see.  --karl, 11aug03.
%
% Switch to the right set of fonts.
\csname #2fonts\endcsname \rmisbold
%
\def\sectionlevel{#2}%
\def\temptype{#3}%
%
% Insert first mark before the heading break (see notes for \domark).
\let\prevsectiondefs=\lastsectiondefs
\ifx\temptype\Ynothingkeyword
\ifx\sectionlevel\seckeyword
\gdef\lastsectiondefs{\gdef\thissectionname{#1}\gdef\thissectionnum{}%}
\gdef\thissection{\thissectionname}%
\else
% Don't redefine \thissection.
\else\ifx\temptype\Yomitfromtockeyword
\else\ifx\sectionlevel\Yappendixkeyword
\else
\let\prevsectiondefs=\lastsectiondefs
\gdef\lastsectiondefs{\gdef\thissectionname{#1}\gdef\thissectionnum{#4}}%
% \noexpand\putwordSection avoids expanding indigestible
% commands in some of the translations.
\gdef\noexpand\thissection{\noexpand\putwordSection{}\noexpand\thissectionnum:}
\gdef\noexpand\thissectionname{\noexpand\thissectionnum}%
\fi
\else
% Go into vertical mode. Usually we'll already be there, but we
% don't want the following whatsit to end up in a preceding paragraph
% if the document didn't happen to have a blank line.
\par
\par

% Output the mark. Pass it through \safewhatsit, to take care of
% the preceding space.
\safewhatsit\domark
%
% Insert space above the heading.
\csname #2headingbreak\endcsname
%
% Now the second mark, after the heading break. No break points
% between here and the heading.
\let\prevsectiondefs=\lastsectiondefs
\domark
%
% Only insert the space after the number if we have a section number.
\ifx\emptypreamble\Ynothingkeyword
 \setbox0 = \hbox{}%
 \def\toctype{unn}%
 \gdef\lastsection{#1}%
\else\ifx\emptypreamble\Yomitfromtockeyword
 % for @headings -- no section number, don't include in toc,%
 % and don't redefine \lastsection.
 \setbox0 = \hbox{}%
 \def\toctype{omit}%
 \let\sectionlevel=\empty
\else\ifx\emptypreamble\Yappendixkeyword
 \setbox0 = \hbox{#4\enspace}%
 \def\toctype{app}%
 \gdef\lastsection{#1}%
\else
 \setbox0 = \hbox{#4\enspace}%
 \def\toctype{num}%
 \gdef\lastsection{#1}%
\fi\fi\fi
%
% Write the toc entry (before \donoderef). See comments in \chapmacro.
\writetocentry{\toctype\sectionlevel}{#1}{#4}%
%
% Write the node reference (= pdf destination for pdftex).
% Again, see comments in \chapmacro.
\donoderef{#3}%
%
% Interline glue will be inserted when the vbox is completed.
% That glue will be a valid breakpoint for the page, since it'll be
% preceded by a whatsit (usually from the \donoderef, or from the
% \writetocentry if there was no node). We don't want to allow that
% break, since then the whatsits could end up on page n while the
% section is on page n+1, thus toc/etc. are wrong. Debian bug 276000.
\nobreak
%
\message{toc,}
% Table of contents.
\newwrite\tocfile

% Write an entry to the toc file, opening it if necessary.
% Called from @chapter, etc.
%
% Example usage: \writetocentry{sec}{Section Name}{\the\chapno.\the\secno}
% We append the current node name (if any) and page number as additional
% arguments for the \{chap,sec,...\}entry macros which will eventually
% read this. The node name is used in the pdf outlines as the
% destination to jump to.
%
% We open the .toc file for writing here instead of at @setfilename (or
% any other fixed time) so that @contents can be anywhere in the document.
% But if #1 is `omit', then we don't do anything. This is used for the
% table of contents chapter openings themselves.
%
\newif\iftocfileopened
\def\omitkeyword{omit} %
% \def\writetocentry#1#2#3{%
\edef\writetoctype{#1}%
\if\writetoctype\omitkeyword\else
\iftocfileopened\else
\immediate\openout\tocfile = \jobname.toc
\global\tocfileopenedtrue
\fi
% \flinks
{\atdummies
\edef\temp{%
\write\tocfile{@#1entry{#2}{#3}{\lastnode}{\noexpand\folio}}}%
\temp%
}%
% \fi
% \fi
%
% Tell \shipout to create a pdf destination on each page, if we're
% writing pdf. These are used in the table of contents. We can't
% just write one on every page because the title pages are numbered
% 1 and 2 (the page numbers aren't printed), and so are the first
% two pages of the document. Thus, we'd have two destinations named
% `1', and two named `2'.
%\pdf\global\pdfmakepagedesttrue \fi
%
% These characters do not print properly in the Computer Modern roman
% fonts, so we must take special care. This is more or less redundant
% with the Texinfo input format setup at the end of this file.
%
% \def\activecatcodes{%
% \catcode`\"=active
% \catcode`\$=active
% \catcode`\<=active
% \catcode`\>=active
% \catcode`\\=active
% \catcode`\^=active
% \catcode`\_=active
% \catcode`\|=active
% \catcode`\~=active
%
% Read the toc file, which is essentially Texinfo input.
% \def\readtocfile{%
\setupdatafile

\activecatcodes
\input \tocreadfilename
{
\newskip\contentsrightmargin \contentsrightmargin=1in
\newcount\savepageno \savepageno = \pageno
\newcount\lastnegativepageno \lastnegativepageno = -1

% Prepare to read what we've written to \tocfile.
%
\def\startcontents#1{%
% If @setchapternewpage on, and @headings double, the contents should
% start on an odd page, unlike chapters. Thus, we maintain
% \contentsalignmacro in parallel with \pagealignmacro.
% From: Torbjorn Granlund <tege@matematik.su.se>
\contentsalignmacro
\immediate\closeout\tocfile
%
% Don't need to put `Contents' or `Short Contents' in the headline.
% It is abundantly clear what they are.
\chapmacro{#1}{}{Yomitfromtoc}{}}%
%
% \savepageno = \pageno
\begingroup % Set up to handle contents files properly.
\raggedbottom % Worry more about breakpoints than the bottom.
\advance\hsize by -\contentsrightmargin % Don't use the full line length.
%
% Roman numerals for page numbers.
\ifnum \pageno>0 \global\pageno = \lastnegativepageno \fi
}

% redefined for the two-volume lispref. We always output on
% \jobname.toc even if this is redefined.
%
\def\tocreadfilename{\jobname.toc}
%
% Normal (long) toc.
%
\def\contents{%
\startcontents{\putwordTOC}{%\openin 1 \tocreadfilename\space
\ifeof 1 \else
\readtocfile
\fi
\wfill\eject
\contentsalignmacro \% in case @setchapternewpage odd is in effect
\ifeof 1 \else
\pdfmakeoutlines
% This space should be enough, since a single number is .5em, and the
% widest letter (M) is 1em, at least in the Computer Modern fonts.
% But use \hss just in case.
% (This space doesn't include the extra space that gets added after
% the label; that gets put in by \shortchapentry above.)
%
% We'd like to right-justify chapter numbers, but that looks strange
% with appendix letters. And right-justifying numbers and
% left-justifying letters looks strange when there is less than 10
% chapters. Have to read the whole toc once to know how many chapters
% there are before deciding ...
\hbox to 1em{#1\hss}%

% These macros generate individual entries in the table of contents.
% The first argument is the chapter or section name.
% The last argument is the page number.
% The arguments in between are the chapter number, section number, ...

% Parts, in the main contents. Replace the part number, which doesn't
% exist, with an empty box. Let's hope all the numbers have the same width.
% Also ignore the page number, which is conventionally not printed.
\def\numeralbox{\setbox0=\hbox{8}\hbox to \wd0{\hfil}}
\def\partentry#1#2#3#4{\dochapentry{\numeralbox\labelspace#1}{}{}}
%
% Parts, in the short toc.
\def\shortpartentry#1#2#3#4{\penalty-300
\vskip.5\baselineskip plus.15\baselineskip minus.1\baselineskip
\shortchapentry{{\bf #1}}{\numeralbox}{}}%

% Chapters, in the main contents.
\def\numchapentry#1#2#3#4{\dochapentry{#2\labelspace#1}{#4}}
%
% Chapters, in the short toc.
% See comments in \dochapentry re \vbox and related settings.
\def\shortchapentry#1#2#3#4{\tocentry{{\shortchaplabel{#2}\labelspace #1}{\doshortpageno\bgroup#4\egroup}}%
}

% Appendices, in the main contents.
% Need the word Appendix, and a fixed-size box.
% We use M since it's probably the widest letter.
\setbox0=\hbox{putwordAppendix{ } M}%
\hbox to \wd0{\putwordAppendix{ } #1\hss}
\let\b=\ptexb
\let\bullet=\ptexbullet
\let\c=\ptexc
\let\,=\ptexcomma
\let\.=\ptexdot
\let\dots=\ptexdots
\let\equiv=\ptexequiv
\let\!=\ptexexclam
\let\i=\ptexi
\let\indent=\ptexindent
\let\noindent=\ptexnoindent
\let\{=\ptexlbrace
\let+=\tabalign
\let\}=\ptexrbrace
\let\/=\ptexslash
\let\*=\ptexstar
\let\t=\ptext
\expandafter \let\csname top\endcsname=\ptextop  % outer
\let\frenchspacing=\plainfrenchspacing
% \def\enddots{\mathinner{\ldots\ldots\ldots\ldots}}%
% \def\endldots{\relax\ifmmode\endldots\else$\mathsurround=0pt \endldots\,$\fi}%
\def\@{@}%
}% There is no need to define \Etex.

% Define @lisp ... @end lisp.
% @lisp environment forms a group so it can rebind things,
% including the definition of @end lisp (which normally is erroneous).

% Amount to narrow the margins by for @lisp.
\newskip\lispnarrowing \lispnarrowing=0.4in
% This is the definition that ^^M gets inside @lisp, @example, and other
% such environments. \null is better than a space, since it doesn't
% have any width.
\def\lisppar{\null\endgraf}
% This space is always present above and below environments.
\newskip\envskipamount \envskipamount = 0pt
% Make spacing and below environment symmetrical. We use \parskip here
% to help in doing that, since in @example-like environments \parskip
% is reset to zero; thus the \afterenvbreak inserts no space -- but the
% start of the next paragraph will insert \parskip.
%  
% \def\aboveenvbreak{{%
% \sectionheading, q.v.
\ifeqnum \lastpenalty=10000 \else
\advance \envskipamount by \parskip
\endgraf
\fi
\ifdim \lastskip<\envskipamount
\removelastskip
% it's not a good place to break if the last penalty was \nobreak
% or better ...
\ifeqnum \lastpenalty<10000 \penalty-50 \fi
\vskip \envskipamount
\fi
}}
\let \afterenvbreak = \aboveenvbreak

% \nonarrowing is a flag. If "set", @lisp etc don't narrow margins; it will
% also clear it, so that its embedded environments do the narrowing again.
\let \nonarrowing = \relax

% @cartouche ... @end cartouche: draw rectangle w/rounded corners around
% environment contents.
\font \circle = lcircle10
\newdimen \circthick
\newdimen \cartouter \newdimen \cartinner
\newskip \normbskip \newskip \normpskip \newskip \normlskip
\circthick = \fontdimen 8 \circle
%\def \ct {{\circle \char'013 \hskip -6pt}}% 6pt from pl file: 1/2charwidth
\def \ct {{\circle \char'010}}
\def \cb {{\circle \char'012 \hskip -6pt}}
\def \cb {{\circle \char'011}}
\def \carttop {\hbox to \cartouter {\hskip \lskip \ctl \leaders \hrule height \circthick \hfil \ctr \hskip \rskip}}
\def \cartbot {\hbox to \cartouter {\hskip \lskip \cbl \leaders \hrule height \circthick \hfil \cbr \hskip \rskip}}
%
\envdef \cartouche { %
\ifnotmode \par \fi % can't be in the midst of a paragraph.
\startsavinginserts
\lskip = \leftskip \rskip = \rightskip
\leftskip = 0pt \rightskip = 0pt % we want these *outside*.
\cartinner = \hspace \advance \cartinner by \lskip
\advance \cartinner by \rskip
}
\cartouter=\hsize
\advance\cartouter by 18.4pt% allow for 3pt kers on either
% side, and for 6pt waste from
% each corner char, and rule thickness
\normbskip=\baselineskip \normpskip=\parskip \normlskip=\lineskip
% Flag to tell \lisp, etc., not to narrow margin.
\def\nonarrowing = t%
%
% If this cartouche directly follows a sectioning command, we need the
% \parskip glue (backspaced over by default) or the cartouche can
% collide with the section heading.
\ifnum\lastpenalty>10000 \vskip\parskip \penalty\lastpenalty\fi
%
\vbox\bgroup
\baselineskip=0pt\parskip=0pt\lineskip=0pt
\carttop
\hbox\bgroup
\hskip\lskip
\vrule\kern3pt
\vbox\bgroup
\kern3pt
\hsize=\cartinner
\baselineskip=\normbskip
\lineskip=\normlskip
\parskip=\normpskip
\vskip -\parskip
\comment % For explanation, see the end of def\group.
\egroup
\kern3pt
\hskip\rskip
\egroup
\cartbot
\egroup
\checkinserts
}
\def\Ecartouche{\%}
\ifhmode\par\fi
\kern3pt
\egroup
\kern3pt\vrule
\hrule\kern3pt
\egroup
\cartbot
\egroup
\checkinserts
}
%
% This macro is called at the beginning of all the @example variants,
% inside a group.
\newdimen\nonfillparindent
\def\nonfillstart {\%
\aboveenvbreak
\hfuzz = 12pt % Don't be fussy
\sepspaces % Make spaces be word-separators rather than space tokens.
\let\par = \lisppar % don't ignore blank lines
\obeylines % each line of input is a line of output
\parskip = 0pt
% Turn off paragraph indentation but redefine \indent to emulate
% the normal \indent.
\nonfillparindent=\parindent
\parindent = 0pt
\let\indent=\nonfillindent
%
\emergencystretch = 0pt % don't try to avoid overfull boxes
\ifx\nonarrowing\relax
  \advance \leftskip by \lispnarrowing
  \exdentamount=\lispnarrowing
\else
  \let\nonarrowing = \relax
\fi
\let\indent=\nof illexdent
\}
\begingroup
\obeyspaces
% We want to swallow spaces (but not other tokens) after the fake
% @indent in our nonfill-environments, where spaces are normally
% active and set to @tie, resulting in them not being ignored after
% @indent.
\gdef\nonfillindent{\futurelet\temp\nonfillindentcheck}\%
\gdef\nonfillindentcheck{%
\ifx\temp \%
  \expandafter\nonfillindentgobble%
\else%
  \leavevmode\nonfillindentbox%
\fi%
}%
\endgroup
\def\nonfillindentgobble#1{\nonfillindent}
\def\nonfillindentbox{\hbox to \nonfillparindent{\hss}}

% If you want all examples etc. small: @set dispenvsize small.
% If you want even small examples the full size: @set dispenvsize nosmall.
% This affects the following displayed environments:
% @example, @display, @format, @lisp
%
defsmallword{small}
defnosmallword{nosmall}
def\SETdispenvsize{relax}
def\setnormaldispenv{%
\ifx\SETdispenvsize\smallword
% end paragraph for sake of leading, in case document has no blank
% line. This is redundant with what happens in \aboveenvbreak, but
% we need to do it before changing the fonts, and it's inconvenient
% to change the fonts afterward.
\ifnum \lastpenalty=10000 \else \endgraf \fi
\smallexamplefonts \rm
\fi
}\def\setsmalldispenv{%
\ifx\SETdispenvsizer\nosmallword
\else
\ifnum \lastpenalty=10000 \else \endgraf \fi
\smallexamplefonts \rm
\fi
}
\def\makedispenvdef#1#2{%
\expandafter\envdef\csname#1\endcsname \setnormaldispenv #2\%
\expandafter\envdef\csname small#1\endcsname \setsmalldispenv #2\%
\expandafter\let\csname E#1\endcsname \afterenvbreak
\expandafter\let\csname Esmall#1\endcsname \afterenvbreak
}\expandafter\let\csname E\endcsname \afterenvbreak

% We often define two environments, @foo and @smallfoo.
% Let's do it in one command. #1 is the env name, #2 the definition.
\def\makedispenvdef#1#2#3{%
\makedispenvdef{#1}{#3}{%\%
\makedispenvdef{#1}{#3}\%
\makedispenvdef{#2}{#3}\%
\}
%\%\%
% @lisp: indented, narrowed, typewriter font;
% @example: same as @lisp.
% @smallexample and @smalllisp: use smaller fonts.
% Originally contributed by Pavel@xerox.
%\%
\maketwodispenvdef{lisp}{example}{%\%
\nonfillstart
\tt\setupmarkupstyle{example}\%
\let\kbdfont = \kbdexamplefont % Allow @kbd to do something special.
\gobble % eat return
}\%
% @display/@smalldisplay: same as @lisp except keep current font.
%\%
\maketwodispenvdef{display}{%\%
\nonfillstart
\gobble
}
% @format/@smallformat: same as @display except don't narrow margins.
%
\n\make\envdef{format}{%\let\nonarrowing = t%\nonfillstart\gobble }

% @flushleft: same as @format, but doesn't obey \SETdispenvsize.
\\envdef\flushleft{%\let\nonarrowing = t%\nonfillstart\gobble \let\Eflushleft = \afterenvbreak
%
% @flushright.
%
\\envdef\flushright{%\let\nonarrowing = t%\nonfillstart\advance\leftskip by 0pt plus 1fill\relax \gobble \let\Eflushright = \afterenvbreak
%
% @raggedright does more-or-less normal line breaking but no right
% justification. From plain.tex.
\\envdef\raggedright{%\rightskip0pt plus2em \spaceskip.3333em \xspaceskip.5em\relax \let\Eraggedright\par
%
% \raggedleft has an internal \parindent. From plain.tex.
\\envdef\raggedleft{%\parindent=0pt \leftskip0pt plus2em \spaceskip.3333em \xspaceskip.5em \parfillskip=0pt \hbadness=10000 % Last line will usually be underfull, so turn off
% badness reporting.
% \let\Eraggedleft\par
%
% \raggedcenter uses \parindent, \leftskip and \rightskip. From plain.tex.
\\envdef\raggedcenter{%\parindent=0pt \rightskip0pt plus1em \leftskip0pt plus1em \spaceskip.3333em \xspaceskip.5em \parfillskip=0pt \hbadness=10000 % Last line will usually be underfull, so turn off
% badness reporting.
%
% @cartouche defines \nonarrowing to inhibit narrowing at next level down.
\ifx\nonarrowing\relax
\advance\leftskip by \lispnarrowing
\exdentamount = \lispnarrowing
\else
\let\nonarrowing = \relax
\fi
}
% Keep a nonzero parskip for the environment, since we're doing normal filling.
%
\def\Eindentedblock{%
\par
{\parskip=0pt \afterenvbreak}%
}
\def\Esmallindentedblock{\Eindentedblock}

% LaTeX-like @verbatim...@end verbatim and @verb{<char>...<char>}
% If we want to allow any <char> as delimiter,
% we need the curly braces so that makeinfo sees the @verb command, eg:
% `@verbx...x' would look like the '@verbx' command. --janneke@gnu.org
%
%
% [Knuth] p.344; only we need to do the other characters Texinfo sets
% active too. Otherwise, they get lost as the first character on a
% verbatim line.
\def\dospecials{%
\do\ \do\\\do\{\do\}\do\$\do\&%
\do\#\do\^\do\^^K\do\_\do\^^A\do\%\do\~%
\do\<\do\>\do\|\do\@\do+\do\"%
% Don't do the quotes -- if we do, @set txicodequoteundirected and
% @set txicodequotebacktick will not have effect on @verb and
% @verbatim, and ?` and !` ligatures won't get disabled.
%\do\`\do\'%
}
%
% [Knuth] p. 380
\def\uncatcodespecials{%
\def\do##1{\catcode`##1=\other}\dospecials}
%
% Setup for the @verb command.
%
% Eight spaces for a tab
\begingroup
\catcode`\^^I=\active

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\gdef\tabeightspaces{\catcode\^^I=\active\def\^^I{\ \ \ \ \ \ \ \ }}
\endgroup
%
\def\setupverb{%
\tt % easiest (and conventionally used) font for verbatim
\def\par{\leavevmode\endgraf}%
\setupmarkupstyle{verb}%
\tabeightspaces
% Respect line breaks,
% print special symbols as themselves, and
% make each space count
% must do in this order:
\obeylines \uncatcodespecials \sepspaces
}
%
% Setup for the @verbatim environment
%
% Real tab expansion.
\newdimen\tabw \setbox0=\hbox{\tt\space} \tabw=8\wd0 % tab amount
%
% We typeset each line of the verbatim in an \hbox, so we can handle
% tabs. The `\global` is in case the verbatim line starts with an accent,
% or some other command that starts with a begin-group. Otherwise, the
% entire `\verbbox` would disappear at the corresponding end-group, before
% it is typeset. Meanwhile, we can't have nested verbatim commands
% (can we?), so the `\global` won't be overwriting itself.
\newbox\verbbox
\def\starttabbox{\global\setbox\verbbox=\hbox{\bgroup}}
%
\begingroup
\catcode\^^I=\active
\gdef\tabexpand{%
\catcode\^^I=\active
\def\^^I{\leavevmode\egroup
\dimen\verbbox=\wd\verbbox % the width so far, or since the previous tab
\divide\dimen\verbbox by\tabw
\multiply\dimen\verbbox by\tabw % compute previous multiple of \tabw
\advance\dimen\verbbox by\tabw % advance to next multiple of \tabw
\wd\verbbox=\dimen\verbbox \box\verbbox \starttabbox
}%
}\endgroup
%
% start the verbatim environment.
\def\setupverbatim{%
\let\nonarrowing = t%
\nonfillstart
\tt % easiest (and conventionally used) font for verbatim
% The \leavevmode here is for blank lines. Otherwise, we would
% never \starttabbox and the \egroup would end verbatim mode.
% \def\par{\leavevmode\egroup\box\verbbox\endgraf}%
% \tabexpand
% \setupmarkupstyle{verbatim}%
% \ Respect line breaks,
% \ print special symbols as themselves, and
% \ make each space count.
% \ Must do in this order:
% \obeylines \uncatcodespecials \sepspaces
% \everypar{\starttabbox}%
%
% Do the @verb magic: verbatim text is quoted by unique
% delimiter characters. Before first delimiter expect a
% right brace, after last delimiter expect closing brace:
% %
% \def\doverb{'<char>#1<char>'}{#1}
%%
% [Knuth] p. 382; only eat outer {}
% \begingroup
% \catcode`[=1\catcode`]=2\catcode`\{=\other\catcode`\}=\other
% \gdef\doverb[#1]{\def\next##1#1}
% [##1\endgroup\next]
% \endgroup
%
% \verb{\begingroup\setupverb\doverb}
% %
% % Do the @verbatim magic: define the macro \doverbatim so that
% % the (first) argument ends when '@end verbatim' is reached, ie:
% %
% \def\doverbatim#1@end verbatim{#1}
% %
% % For Texinfo it's a lot easier than for LaTeX,
% % because texinfo's \verbatim doesn't stop at \end{verbatim}:
% % we need not redefine \', '{' and '}'.
% %
% % Inspired by LaTeX's verbatim command set [latex.ltx]
% %
% \begingroup
% \catcode`\ =\active
% \obeylines%
% \ ignore everything up to the first ^^M, that's the newline at the end
% \ of the @verbatim input line itself. Otherwise we get an extra blank
% \ line in the output.
% \xdef\doverbatim#1^^M#2@end verbatim{\def\next\#2\noexpand\end\gobble\verbatim}
% % We really want [...]@end verbatim in the body of the macro, but
% % without the active space; thus we have to use \xdef and \gobble.
% Start the processing of @deffn:
\def\startdefun{%
  \ifnum\lastpenalty<10000
    \medbreak
    \defunpenalty=10003 % Will keep this @deffn together with the
    % following @def command, see below.
  \else
    % If there are two @def commands in a row, we'll have a \nobreak,
    % which is there to keep the function description together with its
    % header. But if there's nothing but headers, we need to allow a
    % break somewhere. Check specifically for penalty 10002, inserted
    % by \printdefunline, instead of 10000, since the sectioning
    % commands also insert a nobreak penalty, and we don't want to allow
    % a break between a section heading and a defun.
    %
    % As a further refinement, we avoid "club" headers by signalling
    % with penalty of 10003 after the very first @deffn in the
    % sequence (see above), and penalty of 10002 after any following
    % @def command.
    \ifnum\lastpenalty=10002 \penalty3000 \else \defunpenalty=10002 \fi

    % Similarly, after a section heading, do not allow a break.
    % But do insert the glue.
    \medskip % preceded by discardable penalty, so not a breakpoint
  \fi
\parindent=0in
  \advance\leftskip by \defbodyindent
  \exdentamount=\defbodyindent
}\}
\def\dodefunx#1{%
  \checkenv#1%
  \ifnum\lastpenalty<10000
  \else
    \medbreak
    \defunpenalty=10003 % Will keep this @deffn together with the
    % following @def command, see below.
  \fi
  \parindent=0in
  \advance\leftskip by \defbodyindent
  \exdentamount=\defbodyindent
}\}
\def\dodefun#1\startdefun{}
\% \printdefunline \deffnheader{text}
\%
\def\printdefunline#1#2{\%
\begingroup
\% call \deffnheader:
#1#2 \endheader
\% common ending:
\interlinepenalty = 10000
\advance\rightskip by 0pt plus 1fil\relax
\endgraf
\nobreak\vskip -\parskip
\penalty\defunpenalty  % signal to \startdefun and \dodefunx
\checkparencounts
\endgroup
}
\def\Edefun{\endgraf\medbreak}
% \makedefun{deffn} creates \deffn, \deffnx and \Edefn;
% the only thing remaining is to define \deffnheader.
%
\def\makedefun#1{\%
\expandafter\let\csname E#1\endcsname = \Edefun
\edef\temp{\noexpand\domakedefun
\makecsname{#1} \makecsname{#1x} \makecsname{#1header}}\%
\temp}
%
\newif\ifdoingtypefn       % doing typed function?
\newif\ifrettypeownline    % typeset return type on its own line?
\newif\ifdoactiveparen
% Define \deffn and \deffnx, without parameters.
% \deffnheader has to be defined explicitly.
%
\def\domakedefun#1#2#3{\%
\envdef#1{\%
\startdefun
\doingtypefnfalse    % distinguish typed functions from all else
\parseargusing\activeparens{\printdefunline#3}\%
\}
\def#2{\dodefunx#1}\
\def#3%
}

% \makedefun{deffn} creates \deffn, \deffnx and \Edefn;
% the only thing remaining is to define \deffnheader.
%
% @deftypefnnewline on|off says whether the return type of typed functions
% are printed on their own line. This affects @deftypefn, @deftypefun,
% @deftypeop, and @deftypemethod.
%
\parseargdef{deftypefnnewline}{%
  \def\temp{#1}%
  \ifx\temp\onword
    \expandafter\let\csname SETtxideftypefnnl\endcsname = \empty
  \else\ifx\temp\offword
    \expandafter\let\csname SETtxideftypefnnl\endcsname = \relax
  \else
    \errhelp = \EMsimple\errmessage{Unknown @txideftypefnnl value `\temp',
      must be on|off}%
    \fi
  \fi
%
% Untyped functions:
%
% @deffn category name args
\makedefun{deffn}{\deffngeneral{}%}
%
% Untyped functions:
%
% @deffn category class name args
\makedefun{defop}{#1 \defopon{#1\ \putwordon}}%
% \defopon {category on}class name args
\def\defopon#1#2 {
\deffngeneral{
\putwordon\ \code{#2}}{#1\ \code{#2}}
}
%
% Typed functions:
%
% @deftypefn category type name args
\makedefun{deftypefn}{\deftypefngeneral{}%}
%
% @deftypefn category type name args
\makedefun{deftypeop}{#1 \defopon{#1\ \putwordon}}%
% \defopon {category on}class type name args
\def\defopon#1#2 {
\deftypefngeneral{
\putwordon\ \code{#2}}{#1\ \code{#2}}
}
%
\makedefun{defmac}{\deffnheader{putwordDefmac} }
\makedefun{defspec}{\deffnheader{putwordDefsSpec} }
\makedefun{deftypefun}{\deftypefnheader{putwordDeffunc} }
\makedefun{defvar}{\defvrheader{putwordDefvar} }
\makedefun{defopt}{\defvrheader{putwordDefopt} }
\makedefun{deftypevar}{\deftypevrheader{putwordDefvar} }
\makedefun{defmethod}{\defopon{putwordMethodon} }
\makedefun{deftypemethod}{\deftypeopon{putwordMethodon} }
\makedefun{defivar}{\defcvof{putwordInstanceVariableof} }
\makedefun{deftypeivar}{\deftypecvof{putwordInstanceVariableof} }

% \defname, which formats the name of the \@def (not the args).
% #1 is the category, such as "Function".
% #2 is the return type, if any.
% #3 is the function name.
% % We are followed by (but not passed) the arguments, if any.
% %
\def\defname#1#2#3{%
  \par
  \% Get the values of \leftskip and \rightskip as they were outside the \@def...
  \advance\leftskip by -\defbodyindent
  \%
  \% Determine if we are typesetting the return type of a typed function
  \% on a line by itself.
  \rettypeownlinefalse
  \ifdoingtypefn \%
  \% doing a typed function specifically?
  \% then check user option for putting return type on its own line:
  \expandafter{\ifx\csname SETtxideftypefnnl\endcsname \relax else \rettypeownlinetrue \fi}
  \fi
  \%
  \%
  \% How we'll format the category name. Putting it in brackets helps
  \% distinguish it from the body text that may end up on the next line
  \% just below it.
  \def\temp\@[1]\%
  \setbox0\=\hbox{\kern\deflastargmargin \ifx\temp\empty\else [\rm\temp]\fi}
  \%
  \% Figure out line sizes for the paragraph shape. We'll always have at
  \% least two.
  \tempnum = 2
  \%
  \% The first line needs space for \box0; but if \rightskip is nonzero,
  \% we need only space for the part of \box0 which exceeds it:
  \dimen0=\htsize \advance\dimen0 by -\wd0 \advance\dimen0 by \rightskip
  \%
  \% If doing a return type on its own line, we'll have another line.
\frettypeownline
\advance\tempnum by 1
\def\maybeshapeline{0in \hsize} %
\else
  \def\maybeshapeline{ } %
\fi
%
% The continuations:
dimen2=\hsize \advance\dimen2 by -\defargsindent %
%
% The final paragraph shape:
parshape \tempnum 0in \dimen0 \maybeshapeline \defargsindent \dimen2 %
%
% Put the category name at the right margin.
\noindent
\hbox to 0pt{ %
  \hfil\box0 \kern-\hsize
  % \hsize has to be shortened this way:
  \kern\leftskip
  % Intentionally do not respect \rightskip, since we need the space.
}\%
%
% Allow all lines to be underfull without complaint:
tolerance=10000 \hbadness=10000
\exdentamount=\defbodyindent %
% defun fonts. We use typewriter by default (used to be bold) because:
% . we're printing identifiers, they should be in tt in principle.
% . in languages with many accents, such as Czech or French, it's
%   common to leave accents off identifiers. The result looks ok in
%   tt, but exceedingly strange in rm.
% . we don't want -- and --- to be treated as ligatures.
% . this still does not fix the '?' and '!' ligatures, but so far no
%   one has made identifiers using them :).
\df \tt
\def\temp{#2}% text of the return type
\if\temp\empty\else
  \close{\temp}% typeset the return type
  \frettypeownline
  \frettypeownline
  \if\frettypeownline
    \hfill\vadjust{\nobreak}\break
  \else
  \space % type on same line, so just followed by a space
  \fi
  \fi % no return type
#3% output function name
}\%
\% \boldbrax
\%
arguments will be output next, if any.
\
\%
Print arguments in slanted roman (not ttsl), inconsistently with using
\%
tt for the name. This is because literal text is sometimes needed in
\% the argument list (groff manual), and ttsl and tt are not very
\%
distinguishable. Prevent hyphenation at `-' chars.
\%
\def\defunargs#1\{%
\% use sl by default (not ttsl),
\% tt for the names.
\df \sl \hyphenchar\font=0
\%
\%
On the other hand, if an argument has two dashes (for instance), we
\% want a way to get ttsl. We used to recommend @var for that, so
\% leave the code in, but it's strange for @var to lead to typewriter.
\%
Nowadays we recommend @code, since the difference between a ttsl hyphen
\% and a tt hyphen is pretty tiny. @code also disables ?` !`.
\def\var#1\{\setupmarkupstyle{var}\ttslanted{#1}\}\%
#1%
\sl \hyphenchar\font=45
\}
\%
We want ()&[] to print specially on the defun line.
\%
\def\activeparens\{%
\catcode`\(=\active \catcode`\)=\active
\catcode`\[=\active \catcode`\]=\active
\catcode`\&=\active
\}
\%
Make control sequences which act like normal parenthesis chars.
\let\lparen = ( \let\rparen = )
\%
Be sure that we always have a definition for `(`, etc. For example,
\% if the fn name has parens in it, \boldbrax will not be in effect yet,
\% so TeX would otherwise complain about undefined control sequence.
\{
\activeparens
\global\let(=\lparen \global\let)=\rparen
\global\let[=\lbrack \global\let]=\rbrack
\global\let& = \&
\global\let\(=\opnr \global\let\)=\clnr
\global\let\[=\lrbbr \global\let]=\rrbrb
\gdef\boldbrax\{\let(=\opnr\let)=\clnr\let[=\lrbbr\let]=\rrbrb\}
\gdef\magicamp\{\let&=\amprm\}
\}
\newcount\parencount

% If we encounter &foo, then turn on ()-hacking afterwards
\newif\ifampseen
\def\ampprm#1 {\ampseentrue{\bf\&#1 }}

\def\parenfont{%
  \ifampseen
  % At the first level, print parens in roman,
  % otherwise use the default font.
  \ifnum \parencount=1 \rm \fi
  \else
  % The \sf parens (in \boldbrax) actually are a little bolder than
  % the contained text. This is especially needed for [ and ].
  \sf
  \fi
} % The \sf parens (in \boldbrax) actually are a little bolder than
\def\infirstlevel#1{%
  \ifampseen
  \ifnum\parencount=1
    #1%
  \fi
  \fi
} % The \sf parens (in \boldbrax) actually are a little bolder than
\def\bfafterword#1 {#1 \bf}
\def\opnr{%
  \global\advance\parencount by 1
  {\parenfont{\bf(}\
  \infirstlevel \bfafterword
} % The \sf parens (in \boldbrax) actually are a little bolder than
\def\clnr{%
  {\parenfont{\bf)}\
  \infirstlevel \sl
  \global\advance\parencount by -1
}\def\lbrb{%
  \global\advance\brackcount by 1
  {\bf[}\
} % The \sf parens (in \boldbrax) actually are a little bolder than
\def\rbrb{%
  {\bf]}\
  \global\advance\brackcount by -1
} % The \sf parens (in \boldbrax) actually are a little bolder than
\newcount\brackcount
\def\checkparencounts{\%
  \ifnum\parencount=0 \else \badparencount \fi
  \ifnum\brackcount=0 \else \badbrackcount \fi
}
% these should not use \errmessage; the glibc manual, at least, actually
% has such constructs (when documenting function pointers).
\def\badparencount{\%
  \message{Warning: unbalanced parentheses in @def...}%
  \global\parencount=0
}
\def\badbrackcount{\%
  \message{Warning: unbalanced square brackets in @def...}%
  \global\brackcount=0
}
%
\message{macros,}
% @macro.
%
% To do this right we need a feature of e-Tex, \scantokens,
% which we arrange to emulate with a temporary file in ordinary TeX.
% \if\eTeXversion\thisisundefined
  \newwrite\macscribble
  \def\scantokens#1{\%
    \toks0={#1}%
    \immediate\openout\macscribble=\jobname.tmp
    \immediate\write\macscribble{\the\toks0}%
    \immediate\closeout\macscribble
    \input \jobname.tmp
  }
%\fi

% \def\scanmacro#1{\begingroup
%   \newlinechar`\^^M
%   \let\xeatspaces\eatspaces
% %
% %\newlinechar`\^^M
% %\let\xeatspaces\eatspaces
% %
% % Undo catcode changes of \startcontents and \doprintindex
% % When called from \@insertcopying or (short)caption, we need active
% % \bslash to get it printed correctly. Previously, we had
% % `\catcode`\bslash=\other instead. We'll see whether a problem appears
% % with macro expansion.--kasal, 19aug04
% \catcode`\@=0 \catcode`\\=\active \escapechar=`\@%
% % ... and for \example:
% \spaceisspace
% %
% % The \empty here causes a following catcode 5 newline to be eaten as
% % part of reading whitespace after a control sequence. It does not
% eat a catcode 13 newline. There's no good way to handle the two
% cases (untried: maybe e-Tex's \everyeof could help, though plain TeX
% would then have different behavior). See the Macro Details node in
% the manual for the workaround we recommend for macros and
% line-oriented commands.
%
% \scantokens{#1\empty}%
% \endgroup

\def\scanexp#1{%
  \edef\temp{\noexpand\scanmacro{#1}}%
  \temp
}

\newcount\paramno   % Count of parameters
\newtoks\macname    % Macro name
\newif\ifrecursive  % Is it recursive?

% List of all defined macros in the form
% \definedummyword\macro1\definedummyword\macro2...
% Currently is also contains all @aliases; the list can be split
% if there is a need.
\def\macrolist{}

% Add the macro to \macrolist
\def\addtomacrolist#1{\expandafter\addtomacrolistxxx \csname#1\endcsname}
\def\addtomacrolistxxx#1{%
  \toks0 = \expandafter{\macrolist\definedummyword#1}%
  \xdef\macrolist{\the\toks0}%
}

% Utility routines.
% This does \let #1 = #2, with \csnames; that is,
% \let \csname#1\endcsname = \csname#2\endcsname
% (except of course we have to play expansion games).
%
\def\cslet#1#2{%
  \expandafter\let
  \csname#1\endcsname = \csname#2\endcsname
}

% Trim leading and trailing spaces off a string.
% Concepts from aro-bend problem 15 (see CTAN).
%\catcode`@=11
\gdef\eatspaces #1 {\expandafter\trim@\expandafter{#1}}
\gdef\trim@ #1 {\trim@@ @#1 @ @}
\gdef\trim@@ #1@ #2@ #3@@ {\trim@@@ \empty #2 @}
\def\unbrace#1{#1} \unbrace{\gdef\trim@@@ #1 } #2@{#1} }

% Trim a single trailing ^^M off a string.
{\catcode`\^^M=\other \catcode`\Q=3%
\gdef\eatcr #1{\eatcra #1Q\Q\Q}%
\gdef\eatcra#1\Q\Q{\eatcrb#1Q\Q\Q}%
\gdef\eatcrb#1Q\Q\Q\Q\Q\Q\Q}\Q\Q{#1}%
}

% Macro bodies are absorbed as an argument in a context where
% all characters are catcode 10, 11 or 12, except \ which is active
% (as in normal texinfo). It is necessary to change the definition of \n% to recognize macro arguments; this is the job of \mbodybackslash.
% % Non-ASCII encodings make 8-bit characters active, so un-activate
% them to avoid their expansion. Must do this non-globally, to
% confine the change to the current group.
% % It's necessary to have hard CRs when the macro is executed. This is
% done by making ^^M \endlinechar catcode 12 when reading the macro
% body, and then making it the \newlinechar in \scanmacro.
% \def\scanctxt{% used as subroutine
  \catcode`\"=\other
  \catcode`\+=\other
  \catcode`\<\=\other
  \catcode`\>\=\other
  \catcode`\@\=\other
  \catcode`\^\=\other
  \catcode`\_\=\other
  \catcode`\|\=\other
  \catcode`\~\=\other
  \if\declaredencoding\ascii \else \setnonasciicharscatcodenonglobal\other \fi
  \def\scanargctxt{% used for copying and captions, not macros.
    \scanctxt
    \catcode`\="\other
    \catcode`\^^M=\other
  }
  \def\macrobodyctxt{% used for @macro definitions
    \scanctxt
    \catcode`\{=\other
    \catcode`\}=\other
    \catcode`\\=\other
    \catcode`\\^^M=\other
  }

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\usembodybackslash

\def\macroargctxt{% used when scanning invocations
\scanctxt
\catcode`\=0
}

% why catcode 0 for \ in the above? To recognize /\ { } as "escapes"
% for the single characters \ { }. Thus, we end up with the "commands"
% that would be written @\\@[ @] in a Texinfo document.
%
% We already have @[ and @]. For @\, we define it here, and only for
% this purpose, to produce a typewriter backslash (so, the @\ that we
% define for @math can't be used with @macro calls):
%
\def\\{
ormalbackslash}

% We would like to do this for \, too, since that is what makeinfo does.
% But it is not possible, because Texinfo already has a command @, for a
% cedilla accent. Documents must use @comma{} instead.
%
% anythingelse will almost certainly be an error of some kind.

% \mbodybackslash is the definition of \ in @macro bodies.
% It maps \foo\ => \csname macarg.foo\endcsname => #N
% where N is the macro parameter number.
% We define \csname macarg.endcsname to be \realbackslash, so
% \ in macro replacement text gets you a backslash.
%
{\catcode`@=0 @catcode`@=\active
@gdef@usembodybackslash{ @let\=@mbodybackslash}
@gdef@mbodybackslash#1\{@csname macarg.#1@endcsname}
}
\expandafter\def\csname macarg.endcsname{\realbackslash}

\def\margbackslash#1{\char`#1 }

\def\macro{\recursivefalse\parsearg\macroxxx}
\def\rmacro{\recursivetrue\parsearg\macroxxx}

\def\macroxxx#1{%
\getargs{#1} % now \macname is the macname and \argl the arglist
\ifx\argl\empty % no arguments
\paramno=0\relax
\else
\expandafter\parsearg\def\argl;%
\if\paramno>256\relax

\ifx\eTeXversion\thisisundefined
\errhelp = \EMsimple
\errmsg{You need e\TeX to compile a file with macros with more than 256 arguments}
\fi
\fi
\fi\csname ismacro.\the\macname\endcsname
\message{Warning: redefining \the\macname}\
\else
\expandafter\ifx\csname \the\macname\endcsname \relax
\else \errmsg{Macro name \the\macname space already defined}\fi
\global\cslet{macsave.\the\macname} \[\the\macname]\%
\global\expandafter\let\csname ismacro.\the\macname\endcsname=1%
\addtomacrolist{\the\macname}\
\fi
\begingroup \macrobodyctxt
\ifrecursive \expandafter\parsermacbody
\else \expandafter\parsemacbody
\fi}
\parseargdef\unmacro{%
\if1\csname ismacro.#1\endcsname
\global\cslet{#1}{macsave.#1}\
\global\expandafter\let \csname ismacro.#1\endcsname=0%
\% Remove the macro name from \macrolist:
\begingroup
\expandafter\let#1 \relax
\let\definedummyword\unmacrodo
\xdef\macrolist{\macrolist}\
\endgroup
\else
\errmsg{Macro #1 not defined}%
\fi
}
%
\parseargdef\unmacro% #1
\if1\csname ismacro.\#1\endcsname
\global\cslet{\#1}{macsave.\#1}%
\global\expandafter\let \csname ismacro.\#1\endcsname=0%
\% Remove the macro name from \macrolist:
\begingroup
\expandafter\let\csname\#1\endcsname \relax
\let\definedummyword\unmacrodo
\xdef\macrolist{\macrolist}%
\endgroup
\else
\errmsg{Macro #1 not defined}%
\fi
}% Called by \do from \dounmacro on each macro. The idea is to omit any \% macro definitions that have been changed to \relax.
% \def\unmacrodo#1{%
% \ifx #1\relax
% % remove this
% \else
% \noexpand\definedummyword \noexpand#1%
% \fi
%}
%
% This makes use of the obscure feature that if the last token of a
% \langle parameter list\rangle is \#, then the preceding argument is delimited by
% an opening brace, and that opening brace is not consumed.
def\getargs#1\{\getargsxxx#1\}
def\getargsxxx#1#{\getmacname #1 \relax\getmacargs}
def\getmacname#1 #2\relax{\macname={#1}}
def\getmacargs#1{\def\argl{#1}}

% For macro processing make @ a letter so that we can make Texinfo private macro names.
def\textiatcatcode{\the\catcode`@}
catcode`@=11\relax

% Parse the optional {params} list. Set up \paramno and \paramlist
% so \defmacro knows what to do. Define \macarg.BLAH for each BLAH
% in the params list to some hook where the argument si to be expanded. If
% there are less than 10 arguments that hook is to be replaced by ##N where N
% is the position in that list, that is to say the macro arguments are to be
% defined `a la TeX in the macro body.
%
% That gets used by \mbodybackslash (above).
%
% We need to get `macro parameter char #` into several definitions.
% The technique used is stolen from LaTeX: let `hash be something
% unexpandable, insert that wherever you need a #, and then redefine
% it to # just before using the token list produced.
%
% The same technique is used to protect \eatspaces till just before
% the macro is used.
%
% If there are 10 or more arguments, a different technique is used, where the
% hook remains in the body, and when macro is to be expanded the body is
% processed again to replace the arguments.
%
% In that case, the hook is \the\toks N-1, and we simply set \toks N-1 to the
% argument N value and then \edef the body (nothing else will expand because of
% the catcode regime underwhich the body was input).
%
% If you compile with TeX (not eTeX), and you have macros with 10 or more
% arguments, you need that no macro has more than 256 arguments, otherwise an
% error is produced.
def\parsemargdef#1;{%
  \paramno=0\def\paramlist{}%
  \let\hash\relax
  \def\eatspaces\relax
  \def\eatspacesrelax
  \parsemargdefxxx#1,;,%
% In case that there are 10 or more arguments we parse again the arguments
% list to set new definitions for the \macarg.BLAH macros corresponding to
% each BLAH argument. It was anyhow needed to parse already once this list
% in order to count the arguments, and as macros with at most 9 arguments
% are by far more frequent than macro with 10 or more arguments, defining
% twice the \macarg.BLAH macros does not cost too much processing power.
\ifnum\paramno<10\relax\else
\paramno0\relax
\fi
}
\def\parsemargdefxxx#1,{% 
\if#1;\let\next=\relax
\else \let\next=\parsemargdefxxx
\advance\paramno by 1
\expandafter\edef\csname macarg.\eatspaces{#1}\endcsname
{\xeatspaces{\hash\the\paramno}}%
\edef\paramlist{\paramlist\hash\the\paramno,}%
\fi\next}
\def\parsemmanyargdef@@#1,{% 
\if#1;\let\next=\relax
\else
\let\next=\parsemmanyargdef@@
\edef\tempb{\eatspaces{#1}}%
\expandafter\def\expandafter\tempa
\expandafter{\csname macarg.\tempb\endcsname}%%
% Note that we need some extra \noexpand\noexpand, this is because we 
% don't want \the to be expanded in the \parsemacbody as it uses an 
% \def .
\expandafter\def\tempa
{\noexpand\noexpand\noexpand\the\toks\the\paramno}%
\advance\paramno by 1\relax
\fi\next}

% These two commands read recursive and nonrecursive macro bodies.
% (They're different since rec and nonrec macros end differently.)
%
\catcode `\@=11\relax
\let\endargs@\relax
\let\nil@\relax
\def\nilm@\nil@%
\long\def\nilm@\nil@%

% This macro is expanded during the Texinfo macro expansion, not during its
% definition. It gets all the arguments values and assigns them to macros
% macarg.ARGNAME
%
% #1 is the macro name
% #2 is the list of argument names
% #3 is the list of argument values
\def\getargvals@#1#2#3{% 
\def\macargdeflist@ {}% 
\def\saveparamlist@ {#2} % Need to keep a copy for parameter expansion.
\def\paramlist {#2,\nil@ }%
\def\macroname{#1}%
\begingroup
\macroargctxt
\def\argvaluelist{#3,\nil@ }%
\def\@tempa {#3}%
\ifx\@tempa\empty
\setemptyargvalues@
\else
\getargvals@@
\fi
}
%
\def\getargvals@@{% 
\ifx\paramlist\nilm@% Some sanity check needed here that \argvaluelist is also empty.
\ifx\argvaluelist\nilm@% 
\else
\errhelp = \EMsimple\errmessage{Too many arguments in macro `\macroname'!}%
\fi
\let\next\macargexpandinbody@
\else
\ifx\argvaluelist\nilm@% 
\% No more arguments values passed to macro. Set remaining named-arg 
\% macros to empty.
\let\next\setemptyargvalues@
\else
\% pop current arg name into \@tempb
\def\@tempa{#1}{\pop@ {\@tempb} {\paramlist} #1\@ends@}%
\expandafter\@tempa\expandafter {\paramlist} %
% pop current argument value into \@tempc
\def\@tempa{#1}{\longpop@ {\@tempc} {\argvaluelist} #1\@ends@}%
\expandafter\@tempa\expandafter {\argvaluelist} %
% Here \@tempb is the current arg name and \@tempc is the current arg value.
% First place the new argument macro definition into \@tempd
\expandafter\expandafter\macname\expandafter{\@tempd}%
\expandafter\let\csname macarg.\@tempb\endcsname\relax
\expandafter\expandafter\def\expandafter\@tempe\expandafter{%
\def\macvalstoargs@{\begingroup\paramno0\relax
% First we save the token context, and initialize argument numbering.
\begin{group}
% Then, for each argument number \#N, we place the corresponding argument
% value into a new token list register \toks\#N
\expandafter\putargsintokens@\saveparamlist@,;,,% \endgroup
% Then, we expand the body so that argument are replaced by their
% values. The trick for values not to be expanded themselves is that they
% are within tokens and that tokens expand only once in an \edef .
\edef\@tempc{\csname macname .body\endcsname}\
% Now we restore the token stack pointer to free the token list registers
% which we have used, but we make sure that expanded body is saved after
% group.
\expandafter\@tempa\expandafter{\@tempc}\
% First the replace in body the macro arguments by their values, the result
% is in \@tempa .
\def\macargexpandinbody@{\%%% Define the named-macro outside of this group and then close this group.
\expandafter\endgroup
\macargdeflist@}
\macvalstoargs@% Then we point at the \norecurse or \gobble (for recursive) macro value% with \@tempb.
\expandafter\let\expandafter\@tempb\csname mac.\macroname .recurse\endcsname% Depending on whether it is recursive or not, we need some tailing% \egroup.
\ifx\@tempb\gobble
\let\@tempc\relax
\else
\let\@tempc\egroup
\fi
% And now we do the real job:
\edef\@tempd{\noexpand\@tempb{\macroname}\noexpand\scanmacro{\@tempa}\@tempc} %
\@tempd
}
\def\putargsintokens@#1,{%
\if#1;\let\next\relax
\else
\let\next\putargsintokens@
% First we allocate the new token list register, and give it a temporary% alias \@tempb.
\toksdef\@tempb\the\paramno
% Then we place the argument value into that token list register.
\expandafter\let\expandafter\@tempa\csname macarg.#1\endcsname
\expandafter\@tempb\expandafter{\@tempa} %
\advance\paramno by 1\relax
\fi
\next
%
% Save the token stack pointer into macro #1
\def\texisavetoksstackpoint#1{\edef#1{\the\@cclvi}}
% Restore the token stack pointer from number in macro #1
\def\texirestoretoksstackpoint#1{\expandafter\mathchardef\expandafter\@cclvi#1\relax}
% newtoks that can be used non \outer.
\def\texinonouternewtoks{\alloc@ 5\toks \toksdef \@cclvi}
%
% Tailing missing arguments are set to empty
\def\setemptyargvalues@{%
\ifx\paramlist\nilm@
\let\next\macargexpandinbody@
\else
\expandafter\setemptyargvaluesparser@\paramlist\endargs@
\let\next\setemptyargvalues@
\fi
\next
}
\def\setemptyargvaluesparser@#1,#2\endargs@{%
  \expandafter\def\expandafter\@tempa\expandafter{\expandafter\def\csname macarg.#1\endcsname{}}%
  \push@\@tempa\macargdeflist@
  \def\paramlist{#2}%
}%

% #1 is the element target macro
% #2 is the list macro
% #3,#4\endargs@ is the list value
\def\pop@#1#2#3,#4\endargs@{%
  \def#1{#3}%
  \def#2{#4}%
}
\long\def\longpop@#1#2#3,#4\endargs@{%
  \long\def#1{#3}%
  \long\def#2{#4}%
}%
% This defines a Texinfo @macro. There are eight cases: recursive and
% nonrecursive macros of zero, one, up to nine, and many arguments.
% Much magic with \expandafter here.
% \xdef is used so that macro definitions will survive the file
% they're defined in; @include reads the file inside a group.
%
\def\defmacro{%
  \let\hash=##% convert placeholders to macro parameter chars
  \ifrecursive
    \ifcase\paramno
      % 0
      \expandafter\xdef\csname the\macname\endcsname{%
        \noexpand\scanmacro{\temp}}%
    \or % 1
      \expandafter\xdef\csname the\macname\endcsname{%
        \bgroup\noexpand\macroargctxt
        \noexpand\braceorline
        \expandafter\noexpand\csname the\macname xxx\endcsname}%
        \expandafter\xdef\csname the\macname xxx\endcsname##1{%
          \egroup\noexpand\scanmacro{\temp}}%
    \else
      \ifnum\paramno<10\relax % at most 9
        \expandafter\xdef\csname the\macname\endcsname{%
          \bgroup\noexpand\macroargctxt
          \noexpand\csname the\macname xx\endcsname}%
          \expandafter\xdef\csname the\macname xx\endcsname##1{%
            \expandafter\noexpand\csname the\macname xxx\endcsname ##1,}%
      \expandafter\expandafter
      \else
        \expandafter\noexpand\csname the\macname xxx\endcsname"##1,}%
        \expandafter\expandafter

\def\norecurse#1{\bgroup\cslet{#1}{macsave.#1}}

% \braceorline decides whether the next nonwhitespace character is a
% {.  If so it reads up to the closing }, if not, it reads the whole
% line.  Whatever was read is then fed to the next control sequence
% as an argument (by \parsebrace or \parsearg).
%
\def\braceorline#1{\let\macnamexxx=#1\futurelet\nchar\braceorlinexxx}
\def\braceorlinexxx{%
  \ifx\nchar\bgroup
  \else
    \expandafter\parsearg
  \fi
  \macnamexxx}

% @alias.
% We need some trickery to remove the optional spaces around the equal
% sign.  Make them active and then expand them all to nothing.
%
\def\alias{\parseargusing\obeyspaces\aliasxxx}
\def\aliasxxx #1{\aliasyyy#1\relax}
\def\aliasyyy #1=#2\relax{%\%
  \expandafter\let\obeyedspace=\empty
  \addtomacrolist{\#1}%
  \xdef\next{\global\let\makecsname{\#1}=\makecsname{\#2}}%
}%
\next

\message{cross references,}

\newwrite\auxfile
\newif\ifhave\xrefs  % True if xref values are known.
\newif\ifwarn\xrefs  % True if we warned once that they aren't known.

% @inforef is relatively simple.
\def\inforef #1{\inforefzzz #1,,,,**}
\def\inforefzzz #1,#2,#3,#4**{%
  \putwordSee{} \putwordInfo{} \putwordfile{} \file{\ignorespaces \#3},
  node \samp{\ignorespaces \#1{}}}

\message{cross references,}

\newwrite\auxfile
\newif\ifhave\xrefs  % True if xref values are known.
\newif\ifwarn\xrefs  % True if we warned once that they aren't known.

% @inforef is relatively simple.
\def\inforef #1{\inforefzzz #1,,,,**}
\def\inforefzzz #1,#2,#3,#4**{%
  \putwordSee{} \putwordInfo{} \putwordfile{} \file{\ignorespaces \#3},
  node \samp{\ignorespaces \#1{}}}

\message{cross references,}

\newwrite\auxfile
\newif\ifhave\xrefs  % True if xref values are known.
\newif\ifwarn\xrefs  % True if we warned once that they aren't known.

% @inforef is relatively simple.
\def\inforef #1{\inforefzzz #1,,,,**}
\def\inforefzzz #1,#2,#3,#4**{%
  \putwordSee{} \putwordInfo{} \putwordfile{} \file{\ignorespaces \#3},
  node \samp{\ignorespaces \#1{}}}

\message{cross references,}

\newwrite\auxfile
\newif\ifhave\xrefs  % True if xref values are known.
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% @inforef is relatively simple.
\def\inforef #1{\inforefzzz #1,,,,**}
\def\inforefzzz #1,#2,#3,#4**{%
  \putwordSee{} \putwordInfo{} \putwordfile{} \file{\ignorespaces \#3},
  node \samp{\ignorespaces \#1{}}}

\message{cross references,}
% @node's only job in TeX is to define \lastnode, which is used in
% cross-references. The @node line might or might not have commas, and
% might or might not have spaces before the first comma, like:
% @node foo , bar , ...
% We don't want such trailing spaces in the node name.
%
\parseargdef\node{\checkenv{}\donode #1 , \finishnodeparse}
%
% also remove a trailing comma, in case of something like this:
% @node Help-Cross, , Cross-refs
\def\donode#1 , #2 \finishnodeparse \{ \dodonode #1 , \finishnodeparse \}
\let\unnode=\node
\let\lastnode=\empty
%
% Write a cross-reference definition for the current node. #1 is the
% type (Ynumbered, Yappendix, Ynothing).
%
\def\donoderef#1{\%
\ifx\lastnode\empty\else
\setref{\lastnode}{#1}\%
\global\let\lastnode=\empty
\fi
\}%
%
% @anchor{NAME} -- define xref target at arbitrary point.
%
\newcount\savesfregister
%
\def\savesf{\relax \ifhmode \savesfregister=\spacefactor \fi}
\def\restoresf{\relax \ifhmode \spacefactor=\savesfregister \fi}
\def\anchor#1{\savesf \setref{#1}{Ynothing}\restoresf \ignorespaces}
%
% \setref{NAME}{SNT} defines a cross-reference point NAME (a node or an
% anchor), which consists of three parts:
% 1) NAME-title - the current sectioning name taken from \lastsection,
%    or the anchor name.
% 2) NAME-snt   - section number and type, passed as the SNT arg, or
%    empty for anchors.
% 3) NAME-pg    - the page number.
%
% This is called from \donoderef, \anchor, and \dofloat. In the case of
% floats, there is an additional part, which is not written here:
% 4) NAME-lof   - the text as it should appear in a @listoffloats.
%
\def\setref#1#2 #3{\%
\pdfmkdest{#1} %
\newbox\printedmanualbox
%
def\xref{[#1,#2,#3,#4,#5,#6]}\begingroup
\unsepspaces
%
% Get args without leading/trailing spaces.
def\printedrefname{\ignorespaces #3}%
\setbox\printedrefnamebox = \hbox{\printedrefname\unskip}%
%
def\infofilename{\ignorespaces #4}%
\setbox\infofilenamebox = \hbox{\infofilename\unskip}%
%
def\printedmanual{\ignorespaces #5}%
\setbox\printedmanualbox = \hbox{\printedmanual\unskip}%
%
% If the printed reference name (arg #3) was not explicitly given in
% the @xref, figure out what we want to use.
\ifdim \wd\printedrefnamebox = 0pt
% No printed node name was explicitly given.
\expandafter\ifx\csname SETxref-automatic-section-title\endcsname \relax
% Not auto section-title: use node name inside the square brackets.
def\printedrefname{\ignorespaces #1}%
\else
% Auto section-title: use chapter/section title inside
% the square brackets if we have it.
\ifdim \wd\printedmanualbox > 0pt
% It is in another manual, so we don’t have it; use node name.
def\printedrefname{\ignorespaces #1}%
\else
\ifhavexrefs
% We (should) know the real title if we have the xref values.
def\printedrefname{\ref{#1-title}[]}%
\else
% Otherwise just copy the Info node name.
def\printedrefname{\ignorespaces #1}%
\fi
\fi
\fi
%
% Make link in pdf output.
\ifpdf
\indexnoreferrer
\turnoffactive
\makevalueexpandable
% This expands tokens, so do it after making catcode changes, so _
% etc. don’t get their TeX definitions. This ignores all spaces in
% #4, including (wrongly) those in the middle of the filename.

\getfilename{#4}\\
% This (wrongly) does not take account of leading or trailing
% spaces in #1, which should be ignored.
\edef\pdfxrefdest{#1}\\
\ifx\pdfxrefdest\empty
\def\pdfxrefdest{Top}% no empty targets
\else
\txiescapepdf\pdfxrefdest  % escape PDF special chars
\fi
% \leavevmode
\startlink attr{/Border [0 0 0]}\\
\ifnum\filenamelength>0
goto file{\the\filename.pdf} name{\pdfxrefdest}\\
\else
go to name{\pdfmkpgn{\pdfxrefdest}}\\
\fi
\setcolor{\linkcolor}\\
% Float references are printed completely differently: "Figure 1.2"
% instead of ":[somenode], p.3". We distinguish them by the
% LABEL-title being set to a magic string.
{\indexnofonts
\turnoffactive
\expandafter\global\expandafter\let\expandafter\Xthisreftitle
\csname XR#1-title\endcsname
\iffloat\Xthisreftitle
% If the user specified the print name (third arg) to the ref,
% print it instead of our usual "Figure 1.2".
\ifdim\wd\printedrefnamebox = 0pt
\refx{#1-snt}{}\\
\else
\printedrefname
\fi
% If the user also gave the printed manual name (fifth arg), append
% "in MANUALNAME".
\ifdim \wd\printedmanualbox > 0pt
\space \putwordin{} \cite{\printedmanual}\\
\fi
\else
% node/anchor (non-float) references.
%
% If we use \unhbox to print the node names, TeX does not insert
% empty discretionaries after hyphens, which means that it will not
% find a line break at a hyphen in a node names. Since some manuals
% are best written with fairly long node names, containing hyphens,
% this is a loss. Therefore, we give the text of the node name
% again, so it is as if TeX is seeing it for the first time.
%
\ifdim \wd\printedmanualbox > 0pt
  % Cross-manual reference with a printed manual name.
  %
  \crossmanualxref{\cite{\printedmanual\unskip}}%
%
\else\ifdim \wd\infofilenamebox > 0pt
  % Cross-manual reference with only an info filename (arg 4), no
  % printed manual name (arg 5). This is essentially the same as
  % the case above; we output the filename, since we have nothing else.
  %
  \crossmanualxref{\code{\infofilename\unskip}}%
%
\else
  % Reference within this manual.
  %
  % _ (for example) has to be the character _ for the purposes of the
  % control sequence corresponding to the node, but it has to expand
  % into the usual \leavevmode...\vrule stuff for purposes of
  % printing. So we \turnoffactive for the \refx-snt, back on for the
  % printing, back off for the \refx-pg.
  \turnoffactive
  % Only output a following space if the -snt ref is nonempty; for
  % \unnumbered and @anchor, it won't be.
  \setbox2 = \hbox{\ignorespaces \refx{#1-snt}{}}\fi\fi
  % output the `[mynode]' via the macro below so it can be overridden.
  \xrefprintnodename\printedrefname
%
% But we always want a comma and a space:
% \space
%
% output the `page 3'.
\turnoffactive \putwordpage\tie\refx{#1-pg}{\space}\fi
\fi
\endlink
\endgroup}
% Output a cross-manual xref to #1. Used just above (twice).
%
% Only include the text "Section "foo" in" if the foo is neither
% missing or Top. Thus, @xref[,...foo,The Foo Manual] outputs simply
% "see The Foo Manual", the idea being to refer to the whole manual.
%
% But, this being TeX, we can't easily compare our node name against the
% string "Top" while ignoring the possible spaces before and after in
% the input. By adding the arbitrary 7sp below, we make it much less
% likely that a real node name would have the same width as "Top" (e.g.,
% in a monospaced font). Hopefully it will never happen in practice.
%
% For the same basic reason, we retypeset the "Top" at every
% reference, since the current font is indeterminate.
%
\def\crossmanualxref#1{%
  \setbox\toprefbox = \hbox{Top\kern7sp}
  \setbox2 = \hbox{\ignorespaces \printedrefname \unskip \kern7sp}
  \ifdim \wd2 > 7sp % nonempty?
    \ifdim \wd2 = \wd\toprefbox % same as Top?
      \putwordSection{} ``\printedrefname'' \putwordin{}
    \else
      \fi
    \fi
  \fi

#1%
}%

% This macro is called from \xrefX for the [nodename] part of xref
% output. It's a separate macro only so it can be changed more easily,
% since square brackets don't work well in some documents. Particularly
% one that Bob is working on :)..
%
\def\xrefprintnodename#1{[#1]}

% Things referred to by \setref.
%
\def\Ynothing{}\def\Yomitfromtoc{}\def\Ynumbered{%
  \ifnum\secno=0
    \putwordChapter@tie \the\chapno
  \else\ifnum\subsecno=0
    \putwordSection@tie \the\chapno.\the\secno
  \else\ifnum\subsubsecno=0
    \putwordSection@tie \the\chapno.\the\secno.\the\subsecno
  \else
    \putwordSection@tie \the\chapno.\the\secno.\the\subsecno.\the\subsubsecno
  \fi\fi\fi}


\def\xref#1#2{%
\% The node name might contain 8-bit characters, which in our current
\% implementation are changed to commands like @e. Don't let these
\% mess up the control sequence name.
\indexnofonts
\turnoffactive
\xdef\safexrefname{#1}%
%
\expandafter\gdef\csname XR\safexrefname\endcsname{#2}% remember this xref
%
\% Was that xref control sequence that we just defined for a float?
\expandafter\iffloat\csname XR\safexrefname\endcsname
\% it was a float, and we have the (safe) float type in \iffloattype.
\expandafter\let\expandafter\floatlist\csname floatlist\iffloattype\endcsname
\% Is this the first time we've seen this float type?
\expandafter\iffxf\floatlist\relax
\toks0 = \{do\} \% yes, so just \do
\else
\% had it before, so preserve previous elements in list.
\toks0 = \expandafter{\floatlist\do}%
\fi
\% Remember this xref in the control sequence \floatlistFLOATTYPE,
\% for later use in \listoffloats.
\expandafter\xdef\csname floatlist\iffloattype\endcsname{\the\toks0
\{\safexrefname\}}%
\fi
}
%
\def\tryauxfile{%
\openin 1 \jobname.aux
\ifeof 1 \else
\readdatafile{aux}%
\global\havexrefstrue
\fi
\closein 1
}
%
\def\setupdatafile{%
\catcode\^^@=\other
\catcode\^^A=\other
\catcode\^^B=\other
\catcode\^^C=\other

---

Open Source Used In SD-WAN 19.3.0
\catcode`\^=\other
\catcode`\_=\other

% It was suggested to set the catcode of ^ to 7, which would allow ^^e4 etc.
% in xref tags, i.e., node names. But since ^^e4 notation isn't
% supported in the main text, it doesn't seem desirable. Furthermore,
% that is not enough: for node names that actually contain a ^
% character, we would end up writing a line like this: 'xrdef {'hat
% b-title}{'hat b} and \xrdef does a \csname...\endcsname on the first
% argument, and \hat is not an expandable control sequence. It could
% all be worked out, but why? Either we support ^^ or we don't.
%
% The other change necessary for this was to define \auxhat:
% \def\auxhat{\def^{'hat }}% extra space so ok if followed by letter
% and then to call \auxhat in \setq.
%
\catcode`\^=\other
%
% Special characters. Should be turned off anyway, but...
\catcode`\_=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\|=\other
\catcode`\#=\other
\catcode`\&=\other
\catcode`\%=\other
\catcode`+=\other % avoid + for paranoia even though we've turned it off
%
% This is to support \ in node names and titles, since the \ characters end up in a \csname. It's easier than
% leaving it active and making its active definition an actual \ character. What I don't understand is why it works in the *value*
% of the xrdef. Seems like it should be a catcode12 \, and that
% should not typeset properly. But it works, so I'm moving on for
% now. --karl, 15jan04.
\catcode`\#=\other
%
% Make the characters 128-255 be printing characters.
{%
\count1=128
\def\loop{%
  \catcode\count1=\other
  \advance\count1 by 1
  \ifnum \count1<256 \loop \fi
}%
}%
%
% @ is our escape character in .aux files, and we need braces.
\catcode`\{=1
\catcode`\}=2
\catcode`@=0
}

\def\readdatafile#1{%
\begingroup
\setupdatafile
\input\jobname.#1
\endgroup
}

\message{insertions,}
% including footnotes.

\newcount \footnoteno
%
% The trailing space in the following definition for supereject is
% vital for proper filling; pages come out unaligned when you do a
% pagealignmacro call if that space before the closing brace is
% removed. (Generally, numeric constants should always be followed by a
% space to prevent strange expansion errors.)
\def\supereject{\par\penalty -20000 \footnoteno =0 }
Because we use hanging indentation in footnotes, a @noindent appears to exdent this text, so make it be a no-op. makeinfo does not use hanging indentation so @noindent can still be needed within footnote text after an @example or the like (not that this is good style).
\let\noindent = \relax

% Hang the footnote text off the number.  Use \everypar in case the footnote extends for more than one paragraph.
\everypar = {\hang} %
\textindent{\thisfootno} %

% Don’t crash into the line above the footnote text. Since this expands into a box, it must come within the paragraph, lest it provide a place where TeX can split the footnote.
\footstrut

% Invoke rest of plain TeX footnote routine.
\futurelet\next\fo@t
}
%end \catcode`\@=11

% In case a @footnote appears in a vbox, save the footnote text and create the real \insert just after the vbox finished. Otherwise, the insertion would be lost.
% Similarly, if a @footnote appears inside an alignment, save the footnote text to a box and make the \insert when a row of the table is finished.
% And the same can be done for other insert classes. --kasal, 16nov03.

% Replace the \insert primitive by a cheating macro.
% Deeper inside, just make sure that the saved insertions are not spilled out prematurely.
%
\def\startsavinginserts{
  \ife \insert\ptexinsert
    \let\insert\saveinsert
  \else
    \let\checkinserts\relax
  \fi
}

% This \insert replacement works for both \insert\footins{foo} and \insert\footins\bgroup foo\egroup, but it doesn’t work for \insert27{foo}.
% \def\saveinsert#1{
  \edef\next{\noexpand\savetobox \makeSAVEname#1}
  \afterassignment\next
  % swallow the left brace
\closein
%
% We will only complain once about lack of epsf.tex.
\newif\ifwarnednoepsf
\newhelp\noepsfhelp{epsf.tex must be installed for images to
work. It is also included in the Texinfo distribution, or you can get
it from ftp://tug.org/tex/epsf.tex.}
%
\def\image#1{%
  \ifx\epsfbox\thisisundefined
    \ifwarnednoepsf \else
      \errhelp = \noepsfhelp
      \errmessage{epsf.tex not found, images will be ignored}%
    \fi
    \fi
  \else
    \imagexxx #1,,,,,\finish
  \fi
%
% Arguments to @image:
% #1 is (mandatory) image filename; we tack on .eps extension.
% #2 is (optional) width, #3 is (optional) height.
% #4 is (ignored optional) html alt text.
% #5 is (ignored optional) extension.
% #6 is just the usual extra ignored arg for parsing stuff.
\defaultimagevmode
\def\imagexxx#1,#2,#3,#4,#5,#6\finish{
\begingroup
\catcode`^^M = 5 % in case we're inside an example
\normalturnoffactive % allow _ et al. in names
% If the image is by itself, center it.
\ifvmode
  \imagevmodetrue
\else \ifx\centersub\centerV
% for @center @image, we need a vbox so we can have our vertical space
\imagevmodetrue
  \vbox\bgroup % vbox has better behavior than vtop herev
\fi\fi
%
\ifimagevmode
  \nobreak
\medskip
% Usually we'll have text after the image which will insert
% \parskip glue, so insert it here too to equalize the space
% above and below.
  \nobreak\vskip\parskip\nobreak
\fi
\fi
% Leave vertical mode so that indentation from an enclosing environment such as @quotation is respected.
% However, if we're at the top level, we don't want the normal paragraph indentation.
% On the other hand, if we are in the case of @center @image, we don't want to start a paragraph, which will create a hsize-width box and eradicate the centering.
\ifx\centersub\centerV\else \noindent \fi
%
% Output the image.
\ifpdf
 \dopdfimage{#1}{#2}{#3} %
\else
 % \epsfbox itself resets \epsf?size at each figure.
 \setbox0 = \hbox{\ignorespaces #2}\ifdim\wd0 > 0pt \epsfxsize=#2\relax \fi
 \setbox0 = \hbox{\ignorespaces #3}\ifdim\wd0 > 0pt \epsfysize=#3\relax \fi
 \epsfbox{#1.eps} %
\fi
%
% \fimagevmode
 \medskip  % space after a standalone image
\fi
\ifx\centersub\centerV \egroup \fi
\endgroup}

% @float FLOATTYPE,LABEL,LOC ... @end float for displayed figures, tables, etc. We don't actually implement floating yet, we always include the float "here". But it seemed the best name for the future.
%
\envparseargdef\float{\eatcommaspace\eatcommaspace\dofloat#1, , ,\finish}

% There may be a space before second and/or third parameter; delete it.
\def\eatcommaspace#1, {#1,}

% #1 is the optional FLOATTYPE, the text label for this float, typically "Figure", "Table", "Example", etc. Can't contain commas. If omitted, this float will not be numbered and cannot be referred to.
%
% #2 is the optional xref label. Also must be present for the float to be referable.
%
% #3 is the optional positioning argument; for now, it is ignored. It will somehow specify the positions allowed to float to (here, top, bottom).
%
% We keep a separate counter for each FLOATTYPE, which we reset at each chapter-level command.
\let\resetallfloatnos=\empty
\def\dofloat#1,#2,#3,#4\finish{%
\let\thiscaption=\empty
\let\thisshortcaption=\empty
%
% don't lose footnotes inside @float.
%
% BEWARE: when the floats start float, we have to issue warning whenever an
% insert appears inside a float which could possibly float. --kasal, 26may04
%
\startsavinginserts
%
% We can't be used inside a paragraph.
\par
%
\vtop\bgroup
\def\floattype{#1}%
\def\floatlabel{#2}%
\def\floatloc{#3}% we do nothing with this yet.
%
\ifx\floattype\empty
\let\safefloattype=\empty
\else
%
% the floattype might have accents or other special characters,
% but we need to use it in a control sequence name.
\indexnofonts
\turnoffactive
\def\safefloattype{\floattype}%
%
% If label is given but no type, we handle that as the empty type.
\ifx\floatlabel\empty \else

% We want each FLOATTYPE to be numbered separately (Figure 1,
% Table 1, Figure 2, ...). (And if no label, no number.)
%
\expandafter{\getfloatno\csname safefloattype\endcsname
\global\advance\floatno by 1
%
%
% This magic value for \lastsection is output by \setref as the
% XREFLABEL-title value. \xrefX uses it to distinguish float
% labels (which have a completely different output format) from
% node and anchor labels. And \xref uses it to construct the
% lists of floats.
%
\edef\lastsection{\floatmagic=\safefloattype}%
\setref{\floatlabel} {Yfloat}\%
}
\fi
%
% start with \parskip glue, I guess.
\vskip\parskip
%
% Don't suppress indentation if a float happens to start a section.
\restorefirstparagraphindent
}
%
% we have these possibilities:
% @float Foo,lbl & @caption{Cap}: Foo 1.1: Cap
% @float Foo,lbl & no caption: Foo 1.1
% @float Foo & @caption{Cap}: Foo: Cap
% @float Foo & no caption: Foo
% @float ,lbl & Caption{Cap}: 1.1: Cap
% @float ,lbl & no caption: 1.1
% @float & @caption{Cap}: Cap
% @float & no caption:
%
\def\Efloat{\
\let\floatident = \empty
%
% In all cases, if we have a float type, it comes first.
\ifx\floattype\empty \else \def\floatident{\floattype}\fi
%
% If we have an xref label, the number comes next.
\ifx\floatlabel\empty \else \def\floatident{\empty}\fi
\ifx\floattype\empty \else % if also had float type, need tie first.
\appendtomacro\floatident{\tie}\% 
\fi
% the number.
\appendtomacro\floatident{\chaplevelprefix\the\floatno}\% 
\fi
%
% Start the printed caption with what we've constructed in 
% \floatident, but keep it separate; we need \floatident again.
\let\captionline = \floatident
%
\ifx\thiscaption\empty \else
\ifx\floatident\empty \else % had ident, so need a colon between 
\appendtomacro\captionline{ : }\% 
\fi
%
% caption text.
\appendtomacro\captionline{\scanexp\thiscaption}\% 
\fi
\% If we have anything to print, print it, with space before.
\% Eventually this needs to become an \insert.
\ifx\captionline\empty \else
\vskip.5\parskip
\captionline
\%
\% Space below caption.
\vskip\parskip
\fi
\%
\% If have an xref label, write the list of floats info. Do this
\% after the caption, to avoid chance of it being a breakpoint.
\ifx\floatlabel\empty \else
\% Write the text that goes in the lof to the aux file as
\% \floatlabel-lof. Besides \floatident, we include the short
\% caption if specified, else the full caption if specified, else nothing.
\%
\atdummies
\%
\% since we read the caption text in the macro world, where ^^M
\% is turned into a normal character, we have to scan it back, so
\% we don't write the literal three characters ^^M into the aux file.
\scanexp{\%
\xdef\noexpand\gtemp{\%
\ifx\thisshortcaption\empty \thiscaption \else \thisshortcaption \fi}
\immediate\write\auxfile{@xrdef{\floatlabel-lof}{\floatident \ifx\gtemp\empty \else : \gtemp \fi}}\%
\}%
\fi
\egroup % end of \vtop
%
% place the captured inserts
%
% BEWARE: when the floats start floating, we have to issue warning
% whenever an insert appears inside a float which could possibly
% float. --kasal, 26may04
%
\checkinserts

% Append the tokens #2 to the definition of macro #1, not expanding either.
\def\appendtomacro#1#2{\
  \expandafter\def\expandafter#1\expandafter{#1#2}\
}

% @caption, @shortcaption
%\def\caption{\docaption\thiscaption}
\def\shortcaption{\docaption\thisshortcaption}
\def\docaption{\checkenv\float \bgroup\scanargctxt\defcaption}
\def\defcaption#1#2{\egroup \def#1{#2}}

% The parameter is the control sequence identifying the counter we are going to use. Create it if it doesn't exist and assign it to \floatno.
\def\getfloatno#1{\relax
  \ifx#1\relax
    \csname newcount\endcsname #1\relax
    \let\floatno#1\relax
  \fi
}

% \setref calls this to get the XREFLABEL-snt value. We want an @xref to the FLOATLABEL to expand to "Figure 3.1". We call \setref when we first read the @float command.
%\def\Yfloat{\floattype@tie \chaplevelprefix\the\floatno}%

% Magic string used for the XREFLABEL-title value, so \xrefX can distinguish floats from other xref types.
\def\floatmagic{!!float!!}

% #1 is the control sequence we are passed; we expand into a conditional which is true if #1 represents a float ref. That is, the magic \lastsection value which we \setref above.
%\def\iffloat#1[\expandafter\doiffloat#1==\finish]{%
\def\iffloattype{#2}

% #1 is (maybe) the \floatmagic string. If so, #2 will be the (safe) float type for this float. We set \iffloattype to #2.
%\def\doiffloat#1=#2=#3\finish{%
\def\temp{#1}%
\def\iffloattype{#2}%
\listoffloats \@listoffloats FLOATTYPE - print a list of floats like a table of contents.
\parseargdef \listoffloats \%
\def \floottypename{\@arg}
\% the floottypename might have accents or other special characters,
\% but we need to use it in a control sequence name.
\indexnofonts
\turnoffactive
\xdef \floottypename {\floottypename}
%
\XRdef saves the floats as a \do-list in \floottypename
\expandafter \ifx \csname \floottypename \endcsname \relax
\ifhavexrefs
\message{\linenumber No \floottypename floats to list.}\
\else
\begingroup
\leftskip = \tocindent  \% indent these entries like a toc
\def \do=\listoffloatsdodo
\csname \floottypename \endcsname
\endgroup
\fi
\else
\begingroup
\leftskip = \tocindent  \% indent these entries like a toc
\def \do=\listoffloatsdodo
\csname \floottypename \endcsname
\endgroup
\fi
%
\This is called on each entry in a list of floats. We're passed the
\% xref label, in the form LABEL-title, which is how we save it in the
\% aux file. We strip off the -title and look up XRLABEL-lof, which
\% has the text we're supposed to typeset here.
%
\% Figures without xref labels will not be included in the list (since
\% they won't appear in the aux file).
%
\def\listoffloatsdodo\#1 \{ \listoffloatsdoodoentry\#1 \} \finish
\def\listoffloatsdoodoentry\#1\title\finish\{ \%
\% Can't fully expand XR#1-lof because it can contain anything. Just
\% pass the control sequence. On the other hand, XR#1-pg is just the
\% page number, and we want to fully expand that so we can get a link
\% in pdf output.
\toksA = \expandafter { \csname XR#1-lof \endcsname } \%
\%
\% use the same \entry macro we use to generate the TOC and index.
\edef \writeentry \{ \noexpand \entry \{ \the \toksA \} \{ \csname XR#1-pg \endcsname \} \%

\writeentry
}

\message{localization,}

% For single-language documents, @documentlanguage is usually given very early, just after @documentencoding. Single argument is the language (de) or locale (de_DE) abbreviation.
%
{
\catcode`\_ = \active
\globaldefs=1
\parseargdef\documentlanguage{\begingroup
\let_ = \normalunderscore  % normal _ character for filenames
\tex % read txi-???.tex file in plain TeX.
% Read the file by the name they passed if it exists.
\openin 1 txi-#1.tex
\ifeof 1
\documentlanguagetrywithoutunderscore{#1}\finish% \
else
\globaldefs = 1  % everything in the txi-LL files needs to persist
\input txi-#1.tex
\fi
\closein 1
\endgroup % end raw TeX
\endgroup}
%
% If they passed de_DE, and txi-de_DE.tex doesn't exist,
% try txi-de.tex.
%
\edef\documentlanguagetrywithoutunderscore#1\_#2\finish{% 
\openin 1 txi-#1.tex
\ifeof 1
\errhelp = \nolanghelp
\errmessage{Cannot read language file txi-#1.tex}%
\else
\globaldefs = 1  % everything in the txi-LL files needs to persist
\input txi-#1.tex
\fi
\closein 1
}
}

\newhelp
\nolanghelp{The given language definition file cannot be found or is empty. Maybe you need to install it? Putting it in the current directory should work if nowhere else does.}
This macro is called from txi-???.tex files; the first argument is the language name to set (without the \"lang@\" prefix), the second and third args are \{left,right\} hyphenmin.

The language names to pass are determined when the format is built. See the etex.log file created at that time, e.g., /usr/local/texlive/2008/texmf-var/web2c/pdftex/etex.log.

With TeX Live 2008, etex now includes hyphenation patterns for all available languages. This means we can support hyphenation in Texinfo, at least to some extent. (This still doesn't solve the accented characters problem.)

\catcode`@=11
\def\txisetlanguage#1#2#3{%
  \ifx\csname lang@#1\endcsname \relax
    \message{no patterns for #1}\relax
  \else
    \global\language = \csname lang@#1\endcsname
  \fi
  \global\lefthyphenmin = #2\relax
  \global\righthyphenmin = #3\relax
}

Helpers for encodings.

\def\setnonasciicharscatcode#1{%
  \loop\ifnum\count255<256
    \global\catcode\count255=#1\relax
    \global\count255=\count255+1
  \repeat
}

\def\setnonasciicharscatcodenonglobal#1{%
  \loop\ifnum\count255<256
    \catcode\count255=#1\relax
    \global\count255=\count255+1
  \repeat
}

@documentencoding sets the definition of non-ASCII characters according to the specified encoding.

%
\parsearg{documentencoding}{%
% Encoding being declared for the document.
\def\declaredencoding{\csname #1.enc\endcsname}%
%
% Supported encodings: names converted to tokens in order to be able
% to compare them with \ifx.
\def\ascii{\csname US-ASCII.enc\endcsname}%
\def\latnine{\csname ISO-8859-15.enc\endcsname}%
\def\latone{\csname ISO-8859-1.enc\endcsname}%
\def\lattwo{\csname ISO-8859-2.enc\endcsname}%
\def\utfeight{\csname UTF-8.enc\endcsname}%
%
\ifx \declaredencoding \ascii
 \asciichardefs
 %
\else \ifx \declaredencoding \lattwo
 \setnonasciicharscatcode\active
 \lattwochardefs
 %
\else \ifx \declaredencoding \latone
 \setnonasciicharscatcode\active
 \latonechardefs
 %
\else \ifx \declaredencoding \latnine
 \setnonasciicharscatcode\active
 \latninechardefs
 %
\else \ifx \declaredencoding \utfeight
 \setnonasciicharscatcode\active
 \utfeightchardefs
 %
\else
 \message{Unknown document encoding #1, ignoring.}%
 %
 \fi % utfeight
 \fi % latnine
 \fi % latone
 \fi % lattwo
 \fi % ascii
}

% A message to be logged when using a character that isn't available
% the default font encoding (OT1).
%
\def\missingcharmsg#1{\message{Character missing in OT1 encoding: #1.}}

% Take account of \c (plain) vs. \, (Texinfo) difference.
\def\cedilla#1{\ifx\c\ptexc\c{#1}\else\,#1\fi}
% First, make active non-ASCII characters in order for them to be
correctly categorized when TeX reads the replacement text of
macros containing the character definitions.
\setnonasciicharscatcode\active
%
% Latin1 (ISO-8859-1) character definitions.
\def\latonechardefs{%
\gdef\^a0{\tie}
\gdef\^a1{\exclamdown}
\gdef\^a2{\missingcharmsg{CENT SIGN}}
\gdef\^a3{\pounds}
\gdef\^a4{\missingcharmsg{CURRENCY SIGN}}
\gdef\^a5{\missingcharmsg{YEN SIGN}}
\gdef\^a6{\missingcharmsg{BROKEN BAR}}
\gdef\^a7{\$}
\gdef\^a8{\^{}}
\gdef\^a9{\copyright}
\gdef\^aa{\ordf}
\gdef\^ab{\guillemetleft}
\gdef\^ac{\$\lnot\$}
\gdef\^ad{\-}
\gdef\^ae{\registeredsymbol}
\gdef\^af{\=}
%
\gdef\^b0{\textdegree}
\gdef\^b1{\pm}
\gdef\^b2{\^2}
\gdef\^b3{\^3}
\gdef\^b4{\{}
\gdef\^b5{\mu\$}
\gdef\^b6{\P}
%
\gdef\^b7{\^\$}
\gdef\^b8{\cedilla\ }
\gdef\^b9{\^1\$}
\gdef\^ba{\ordm}
%
\gdef\^bb{\guillemetright}
\gdef\^bc{\overset4\$}
\gdef\^bd{\overset2\$}
\gdef\^be{\overset4\$}
\gdef\^bf{\questiondown}
%
\gdef\^c0{\^A}
\gdef\^c1{\^A}
\gdef\^c2{\^A}
\gdef\^c3{\~A}
% Latin9 (ISO-8859-15) encoding character definitions.
def\latninechardefs{%
% Encoding is almost identical to Latin1.
\latonechardefs
%
def\^a4{\euro}
def\^a6{\v S}
def\^a8{\v s}
def\^b4{\v Z}
def\^b8{\v z}
def\^bc{\OE}
def\^bd{\oe}
def\^be{\"Y}
}

% Latin2 (ISO-8859-2) character definitions.
def\lattwochardefs{%
def\^a0{\tie}
def\^a1{\ogonek{A}}
def\^a2{\u{}}
def\^a3{\L}
def\^a4{\missingcharmsg{CURRENCY SIGN}}
def\^a5{\v L}
def\^a6{\VS}
def\^a7{\S}
def\^a8{\"{}}
def\^a9{\v S}
def\^aa{\cedilla S}
def\^ab{\v T}
def\^ac{\v Z}
def\^ad{\-}
UTF-8 character definitions.

This code to support UTF-8 is based on LaTeX's utf8.def, with some changes for Texinfo conventions. It is included here under the GPL by permission from Frank Mittelbach and the LaTeX team.

\newcount\countUTFx
\gdef\parseUTFviiiA#1{\countUTFx = \countUTFz \divide\countUTFz by 64 \countUTFy = \countUTFz \multiply\countUTFz by 64 \advance\countUTFx by -\countUTFz \advance\countUTFx by 128 \uccode `#1\countUTFx \countUTFz = \countUTFy}
\gdef\parseUTFviiiB#1#2#3#4{\advance\countUTFz by #10\relax \uccode `#3\countUTFz \uppercase{\gdef\UTFviiiTmp{#2#3#4}}}
\endgroup
\def\utfeightchardefs{\DeclareUnicodeCharacter{00A0}{\tie} \DeclareUnicodeCharacter{00A1}{\exclamdown} \DeclareUnicodeCharacter{00A3}{\pounds} \DeclareUnicodeCharacter{00A8}{"{ }} \DeclareUnicodeCharacter{00A9}{\copyright} \DeclareUnicodeCharacter{00AA}{\ordf} \DeclareUnicodeCharacter{00AB}{\guillemetleft} \DeclareUnicodeCharacter{00AD}{\-} \DeclareUnicodeCharacter{00AE}{\registersymbol} \DeclareUnicodeCharacter{00AF}{\={ }} \DeclareUnicodeCharacter{00B0}{\ringaccent{ }} \DeclareUnicodeCharacter{00B4}{\^{} } \DeclareUnicodeCharacter{00B8}{\cedilla{ }} \DeclareUnicodeCharacter{00BA}{\ordm} \DeclareUnicodeCharacter{00BB}{\guillemetright} \DeclareUnicodeCharacter{00BF}{\questiondown}}
\DeclareUnicodeCharacter{00B0}{\wingaccent{ }} \DeclareUnicodeCharacter{00B4}{\{\{} } \DeclareUnicodeCharacter{00B8}{\cedilla{ }} \DeclareUnicodeCharacter{00BA}{\ordm} \DeclareUnicodeCharacter{00BB}{\guillemetright} \DeclareUnicodeCharacter{00BF}{\questiondown} \DeclareUnicodeCharacter{00C0}{\^{} A} \DeclareUnicodeCharacter{00C1}{\^{}} A \DeclareUnicodeCharacter{00C2}{\^{}} A \DeclareUnicodeCharacter{00C3}{\~{} A} \DeclareUnicodeCharacter{00C4}{\^{}} A \DeclareUnicodeCharacter{00C5}{\^{}} A \DeclareUnicodeCharacter{00C6}{\^{}} E \DeclareUnicodeCharacter{00C7}{\cedilla{ C}} \DeclareUnicodeCharacter{00C8}{\^{}} E \DeclareUnicodeCharacter{00C9}{\^{}} E \DeclareUnicodeCharacter{00CA}{\^{}} E \DeclareUnicodeCharacter{00CB}{\^{}} E \DeclareUnicodeCharacter{00CC}{\^{}}
\DeclareUnicodeCharacter{1EF4}{\udotaccent{Y}}
\DeclareUnicodeCharacter{1EF8}{\~Y}
\DeclareUnicodeCharacter{1EF9}{\~y}
\DeclareUnicodeCharacter{2013}{--}
\DeclareUnicodeCharacter{2014}{---}
\DeclareUnicodeCharacter{2018}{\quoteleft}
\DeclareUnicodeCharacter{2019}{\quoteright}
\DeclareUnicodeCharacter{201A}{\quotesinglbase}
\DeclareUnicodeCharacter{201C}{\quotedblleft}
\DeclareUnicodeCharacter{201D}{\quotedblright}
\DeclareUnicodeCharacter{201E}{\quotedblbase}
\DeclareUnicodeCharacter{2022}{\bullet}
\DeclareUnicodeCharacter{2026}{\ldots}
\DeclareUnicodeCharacter{2039}{\guilsinglleft}
\DeclareUnicodeCharacter{203A}{\guilsinglright}
\DeclareUnicodeCharacter{20AC}{\euro}
\DeclareUnicodeCharacter{2192}{\expansion}
\DeclareUnicodeCharacter{21D2}{\result}
\DeclareUnicodeCharacter{2212}{\minus}
\DeclareUnicodeCharacter{2217}{\point}
\DeclareUnicodeCharacter{2261}{\equiv}
% end of \utfeightchardefs

% US-ASCII character definitions.
\def\asciichardefs{% nothing need be done
 \relax
}
% Make non-ASCII characters printable again for compatibility with
% existing Texinfo documents that may use them, even without declaring a
% document encoding.
%
\setnonasciicharscatcode\other

\message{formatting,}
\newdimen\defaultparindent \defaultparindent = 15pt
\chapheadingskip = 15pt plus 4pt minus 2pt
\secheadingskip = 12pt plus 3pt minus 2pt
\subsecheadingskip = 9pt plus 2pt minus 2pt
% Prevent underfull vbox error messages.
\vbadness = 10000

% Don't be very finicky about underfull hboxes, either.
\hbadness = 6666

% Following George Bush, get rid of widows and orphans.
\widowpenalty=10000
\clubpenalty=10000

% Use TeX 3.0's \emergencystretch to help line breaking, but if we're
% using an old version of TeX, don't do anything. We want the amount of
% stretch added to depend on the line length, hence the dependence on
% \hsize. We call this whenever the paper size is set.
%
\def\setemergencystretch{%
  \ifx\emergencystretch\thisisundefined
  % Allow us to assign to \emergencystretch anyway.
  \def\emergencystretch{\dimen0}%
  \else
  \emergencystretch = .15\hsize
  \fi
}

% Parameters in order: 1) textheight; 2) textwidth;
% 3) voffset; 4) hoffset; 5) binding offset; 6) topskip;
% 7) physical page height; 8) physical page width.
%
% We also call \setleading{\textleading}, so the caller should define
% \textleading. The caller should also set \parskip.
%
\def\internalpagesizes#1#2#3#4#5#6#7#8{%
  \voffset = #3\relax
  \topskip = #6\relax
  \splittopskip = \topskip
  \vsize = #1\relax
  \advance\vsize by \topskip
  \outervsize = \vsize
  \advance\outervsize by 2\topandbottommargin
  \pageheight = \vsize

  \hspace = #4\relax
  \outerhspace = \hspace
  \advance\outerhspace by 0.5\inspace
  \pagewidth = \hspace

  \normaloffset = #5\relax
\bindingoffset = #5\relax
%
\ifpdf
\pdfpageheight #7\relax
\pdfpagewidth #8\relax
% if we don’t reset these, they will remain at ”1 true in” of
% whatever layout pdftex was dumped with.
\pdfhorigin = 1 true in
\pdfvorigin = 1 true in
\fi
%
\setleading{\textleading}
%
\parindent = \defaultparindent
\setemergencystretch

%
\relax
\if@letterpaper (the default).
\def\letterpaper{{\globaldefs = 1
\parskip = 3pt plus 2pt minus 1pt
\textleading = 13.2pt
%
% If page is nothing but text, make it come out even.
\internalpagesizes{607.2pt}{6in}{% that’s 46 lines
\voffset}{.25in}{%  
\bindingoffset}{36pt}{%  
\textleading}{13.2pt}{%  
}
}}
%
% Use @smallbook to reset parameters for 7x9.25 trim size.
\def\smallbook{\globaldefs = 1
\parskip = 2pt plus 1pt
\textleading = 12pt
%
\internalpagesizes{7.5in}{5in}{%  
\voffset}{-.2in}{%  
\bindingoffset}{16pt}{%  
\textleading}{12pt}{%  
\lispnarrowing = 0.3in
\tolerance = 700
\hfuzz = 1pt
\contentsrightmargin = 0pt
\defbodyindent = .5cm
}
}}
%
% Use @smallerbook to reset parameters for 6x9 trim size.
% (Just testing, parameters still in flux.)
\dimen0 = \#1 \relax
\advance \dimen0 by \voffset
%
\dimen2 = \hsizex
\advance \dimen2 by \normaloffset
%
\internalpagesizes {\#1} {\hsizex}
  {\voffset} {\normaloffset}
  {\bindingoffset} {44pt}
  {\dimen0} {\dimen2}
}
%
% Set default to letter.
%
\letterpaper

\message { and turning on texinfo input format. }

\def ^L { \par } % remove \outer, so ^L can appear in an \@comment
%
% DEL is a comment character, in case \c does not suffice.
\catcode `\^ = 14
%
% Define macros to output various characters with catcode for normal text.
\catcode `\^ = \other \def \normaldoublequote { " }
\catcode `\$ = \other \def \normaldollar { $ } \%$ font-lock fix
\catcode `+ = \other \def \normalplus { + }
\catcode `< = \other \def \normalless { < }
\catcode `> = \other \def \normalgreater { > }
\catcode `^ = \other \def \normalcaret { ^ }
\catcode `\_ = \other \def \normalunderscore { _ }
\catcode `\| = \other \def \normalverticalbar { | }
\catcode `\~ = \other \def \normaltilde { ~ }
%
% This macro is used to make a character print one way in \tt
% (where it can probably be output as-is), and another way in other fonts,
% where something hairier probably needs to be done.
%
% #1 is what to print if we are indeed using \tt; #2 is what to print
% otherwise. Since all the Computer Modern typewriter fonts have zero
% interword stretch (and shrink), and it is reasonable to expect all
% typewriter fonts to have this, we can check that font parameter.
%
\def \ifusingtt #1 #2 { \ifdim \fontdimen3 \font = 0pt #1 \else #2 \fi }
%
% Same as above, but check for italic font. Actually this also catches
% non-italic slanted fonts since it is impossible to distinguish them from
% italic fonts. But since this is only used by \$ and it uses \sl anyway
% this is not a problem.
\def\ifusingit#1#2{\ifdim \fontdimen1\font>0pt #1\else #2\fi}

% Turn off all special characters except @
% (and those which the user can use as if they were ordinary).
% Most of these we simply print from the \tt font, but for some, we can
% use math or other variants that look better in normal text.

\catcode`\="=active
\def\activeequalquote{\tt\char34}
\let"=\activeequalquote
\catcode`\~\=active
\def\tildename\char126
\chardef\hat=`\^\char 24
\catcode`\^\=active
\def\^\{\tt\hat\char 24
\catcode`\_\=active
\def_\{\leavevmode \kern.07em \vbox{\hrule width.3em height.1ex}\kern .07em }
\let\realunder=_
% Subroutine for the previous macro.
\def_\{\leavevmode \kern.07em \vbox{\hrule width.3em height.1ex}\kern .07em }
\catcode`\+=active
\def\{\tt\char 24
\chardef\less=`\<\char 9
\catcode`\<\=active
\def\<\{\tt\less\char 9
\chardef\gtr=`\>\char 62
\catcode`\>\=active
\def\>\{\tt\gtr\char 62
\catcode`\+=active
\def+\{\tt \char 43
\catcode`\$\=active
\def$\{\tt\sl\char 36\}$\char 36
% If a .fmt file is being used, characters that might appear in a file
% name cannot be active until we have parsed the command line.
% So turn them off again, and have \everyjob (or @setfilename) turn them on.
% \otherifyactive is called near the end of this file.
\def\otherifyactive{\catcode`+=\other \catcode`\_=\other}

% Used sometimes to turn off (effectively) the active characters even after
% parsing them.
\def\turnoffactive{\%
\normalturnoffactive
\otherbackslash
\catcode`\@=0

% \backslashcurfont outputs one backslash character in current font,
% as in \char`\.
\global\chardef\backslashcurfont=`\.
\global\let\rawbackslashxx=\backslashcurfont  % let existing .??s files work

% \realbackslash is an actual character `\' with catcode other, and
% \doublebackslash is two of them (for the pdf outlines).
{\catcode`\=\other @gdef@realbackslash\{\} @gdef@doublebackslash\{\\}}

% In texinfo, backslash is an active character; it prints the backslash
% in fixed width font.
\catcode`\=\active  % @ for escape char from now on.

% The story here is that in math mode, the \char of \backslashcurfont
% ends up printing the roman `\ from the math symbol font (because \char
% in math mode uses the `mathcode, and plain.tex sets
% `mathcode`\=\"026E). It seems better for @backslashchar{} to always
% print a typewriter backslash, hence we use an explicit \mathchar,
% which is the decimal equivalent of "715c (class 7, e.g., use \fam;
% ignored family value; char position "5C). We can't use ` for the
% usual hex value because it has already been made active.
@def@normalbackslash{[\@tt @ifmmode \mathchar29020 @else \backslashcurfont @fi]}
@let@backslashchar = @normalbackslash % @backslashchar{} is for user documents.

% On startup, @fixbackslash assigns:
% @let \ = @normalbackslash
% \rawbackslash defines an active \ to do \backslashcurfont.
% \otherbackslash defines an active \ to be a literal `\ character with
% catcode other. We switch back and forth between these.
@gdef@rawbackslash{[@let=`@backslashcurfont]
@gdef@otherbackslash[@let=`@realbackslash]

% Same as @turnoffactive except outputs \ as `{\tt\char`\}` instead of
% the literal character `\`. Also revert - to its normal character, in
% case the active - from code has slipped in.
{% @catcode`- = @active
@gdef@normalturnoffactive{% 
@let=`@normaldash
@let"=@normaldoublequote
@let$=@normaldollar %$ font-lock fix
@let+=@normalplus
@let<=@normalless
@let>=@normalgreater

}
% Make _ and + \other characters, temporarily.
% This is canceled by @fixbackslash.
@otherifyactive

% If a .fmt file is being used, we don't want the \input texinfo' to show up.
% That is what \eatinput is for; after that, the \ should revert to printing
% a backslash.
% @gdef@eatinput input texinfo{ @fixbackslash }
@global@let\ = @eatinput

% On the other hand, perhaps the file did not have a \input texinfo'. Then
% the first \ in the file would cause an error. This macro tries to fix
% that, assuming it is called before the first \ could plausibly occur.
% Also turn back on active characters that might appear in the input
% file name, in case not using a pre-dumped format.
% @gdef@fixbackslash{%
@ifx\@eatinput @let\ = @normalbackslash @fi
@catcode`+=@active
@catcode`_=@active
%
%
% Say @foo, not \foo, in error messages.
@escapechar = `@@

% These (along with & and #) are made active for url-breaking, so need
% active definitions as the normal characters.
@def@normaldot{.}
@def@normalquest{?}
@def@normalslash{/}
@catcode`& = @other @def@normalamp{&}
@catcode`# = @other @def@normalhash{#}
@catcode`% = @other @def@normalpercent{ %}
@let @hashchar = @normalhash

@c Finally, make ` and ' active, so that txicodequoteundirected and
@c txicodequotebacktick work right in, e.g., @w{@code{`foo'}}. If we
@c don't make ` and ' active, @code will not get them as active chars.
@c Do this last of all since we use ` in the previous @catcode assignments.
@c catcode` @'= @active
@c catcode` @'= @active
@markupsetuplqdefault
@markupsetuprqdefault

@c Local variables:
@c eval: (add-hook 'write-file-hooks 'time-stamp)
@c page-delimiter: ^=\message
@c time-stamp-start: def\texinfoversion{ 
@c time-stamp-format: %:y-%02m-%02d.%02H
@c time-stamp-end: }
@c End:

@c vim:sw=2:

@ignore
arch-tag: e1b36e32-c96e-4135-a41a-0b2efa2ea115
@end ignore

1.82 libffi/mcsv.sh 3.2.1

1.82.1 Available under license:

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# Version: MPL 1.1/GPL 2.0/LGPL 2.1
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# The Original Code is the MSVC wrappificator.
#
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1.83 libgcc1 1:8.2.0-1ubuntu2~18.04

1.83.1 Available under license:

This is the Debian GNU/Linux prepackaged version of the GNU compiler collection, containing Ada, C, C++, Fortran 95, Java, Objective-C, Objective-C++, and Treelang compilers, documentation, and support libraries. In addition, Debian provides the GNU Pascal compiler in the same source package. Packaging is done by the Debian GCC Maintainers <debian-gcc@lists.debian.org>, with sources obtained from:

ftp://gcc.gnu.org/pub/gcc/releases/ (for full releases)
svn://gcc.gnu.org/svn/gcc/ (for prereleases)
http://gnu-pascal.de/alpha/ (for GNU Pascal)
http://dgcc.sourceforge.net/ (for D)

The current gcc-4.4 source package is taken from the SVN gcc-4_4-branch.

Changes: See changelog.Debian.gz

Debian splits the GNU Compiler Collection into packages for each language, library, and documentation as follows:

<table>
<thead>
<tr>
<th>Language</th>
<th>Compiler package</th>
<th>Library package</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ada</td>
<td>gnat-4.4</td>
<td>libgnat-4.4</td>
<td>gnat-4.4-doc</td>
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<td>C</td>
<td>gcc-4.4</td>
<td></td>
<td>gcc-4.4-doc</td>
</tr>
<tr>
<td>C++</td>
<td>g++-4.4</td>
<td>libstdc++6</td>
<td>libstdc++6-4.4-doc</td>
</tr>
<tr>
<td>Fortran 95</td>
<td>gfortran-4.4</td>
<td>libgfortran3</td>
<td>gfortran-4.4-doc</td>
</tr>
</tbody>
</table>
For some language run-time libraries, Debian provides source files, development files, debugging symbols and libraries containing position-independent code in separate packages:

<table>
<thead>
<tr>
<th>Language</th>
<th>Sources</th>
<th>Development</th>
<th>Debugging</th>
<th>Position-Independent</th>
</tr>
</thead>
<tbody>
<tr>
<td>C++</td>
<td>libstdc++6-4.4-dbg libstdc++6-4.4-pic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Java</td>
<td>libgcj10-src libgcj10-dev libgcj10-dbg</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional packages include:

- GCC intrinsics (platform-dependent): libgcc1, libgcc2, libgcc4
- Base files common to all compilers: gcc-4.4-base
- Software floating point (ARM only): gcc-4.4-soft-float
- The sources with patches: gcc-4.4-source

Ada:
- GNAT version library: libgnatvsn-dev, libgnatvsn4.4
- GNAT Project Manager library: libgnatprj-dev, libgnatprj4.4

C:
- GNU C Preprocessor: cpp-4.4, cpp-4.4-doc
- Library for instrumenting pointers: libmudflap0-dev, libmudflap0
- GCC stack smashing protection library: libssp0-dev, libssp0
- Fix non-ANSI header files: fixincludes
- Create/remove ANSI prototypes from C code: protoize

Java:
- The Java bytecode interpreter and VM: gij
- Common files for the Java run-time: libgcj-common
- The Abstract Windowing Toolkit: libgcj10-awt
- Java ARchive for the Java run-time: libgcj10-jar

C, C++ and Fortran 95:
- GCC OpenMP (GOMP) support library: libgomp1-dev, libgomp1

Biarch support: On some 64-bit platforms which can also run 32-bit code, Debian provides additional packages containing 32-bit versions of some libraries. These packages have names beginning with 'lib32' instead of 'lib', for example lib32stdc++6. Similarly, on some 32-bit platforms which can also run 64-bit code, Debian provides additional packages with names beginning with 'lib64' instead of 'lib'. These packages contain 64-bit versions of the libraries. (At this time, not all platforms and not all
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- libdecnumber
- libgomp
- libssp
- libstdc++-v3
- libobjc
- libmudflap
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Version 3.1, 31 March 2009

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Mudflap is part of GCC.

Authors: Frank Ch. Eigler <fche@redhat.com>, Graydon Hoare <graydon@redhat.com>

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// DO NOT EDIT THIS FILE - it is machine generated -*- c++ -*-

ifndef __java_security_Permission__
define __java_security_Permission__

#pragma interface

#include <java/lang/Object.h>
extern "Java"
{
namespace java
{
namespace security
{
class Permission;
class PermissionCollection;
}
}
}

class java::security::Permission : public ::java::lang::Object
{
public:
    Permission(::java::lang::String *);
    virtual void checkGuard(::java::lang::Object *);
    virtual jboolean implies(::java::security::Permission *) = 0;
    virtual jboolean equals(::java::lang::Object *) = 0;
    virtual jint hashCode() = 0;
    virtual ::java::lang::String * getName();
    virtual ::java::lang::String * getActions() = 0;
    virtual ::java::security::PermissionCollection * newPermissionCollection();
    virtual ::java::lang::String * toString();
private:
    static const jlong serialVersionUID = -5636570222231596674LL;
    ::java::lang::String * __attribute__((aligned(__alignof__(::java::lang::Object)))) name;
public:
    static ::java::lang::Class class$;
};

#endif // __java_security_Permission__
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David Megginson, sax@megginson.com
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* m4/ax_func_which_gethostbyname_r.m4

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02111-1307 USA. */

package gnu.classpath.tools.taglets;

import java.util.Map;
import com.sun.tools.doclets.Taglet;
import com.sun.javadoc.Tag;

/**
 * A simple Taglet which handles Copyright information.
 */
public class CopyrightTaglet implements Taglet {

private static final String NAME = "copyright";
private static final String HEADER = "Copyright:";

public String getName() {
    return NAME;
}

public boolean inField() {
    return true;
}

public boolean inConstructor() {
    return true;
}

public boolean inMethod() {
    return true;
}
public boolean inOverview() {
    return true;
}

public boolean inPackage() {
    return true;
}

public boolean inType() {
    return true;
}

public boolean isInlineTag() {
    return false;
}

public static void register(Map<java.lang.String, java.lang.Object> tagletMap) {
    CopyrightTaglet copyrightTaglet = new CopyrightTaglet();
    tagletMap.put(copyrightTaglet.getName(), copyrightTaglet);
}

public String toString(Tag tag) {
    return toString(new Tag[1] { tag });
}

public String toString(Tag[] tags) {
    if (tags.length == 0) {
        return null;
    } else {
        boolean haveValidTag = false;
        for (int i = 0; i < tags.length && !haveValidTag; ++i) {
            if (tags[i].text().length() > 0) {
                haveValidTag = true;
            }
        }
        if (haveValidTag) {
            StringBuffer result = new StringBuffer();
            result.append("<dl>\n            for (int i = 0; i < tags.length; i++) {
            if (tags[i].text().length() > 0) {
                result.append("<dt><i>Copyright © " + tags[i].text() + "</i></dt>\n            }
            result.append("</dl>\n            return result.toString();
        }
    }
}
if (gnu.classpath.tools.taglets.CopyrightTaglet.java/lang/Objectcom/sun/tools/doclets/TagletNAMELjava/lang/String;

    ConstantValue copyrightHEADER
    Copyright:<init>()VCode
    LineNumberTable LocalVariableTable
    gnu/classpath/tools/taglets/CopyrightTaglet.getName(Ljava/lang/String;inField())Z
    inConstructor inMethod
    inOverview inPackage inType isInlineTag register(Ljava/util/Map;)V

    &(*)
    java/util/Map.put8(Ljava/lang/Object:Ljava/lang/Object:)Ljava/lang/Object;
tagletMap(Ljava/util/Map;copyrightTaglettoString)(Lcom/sun/javadoc/Tag;)Ljava/lang/String;3com/sun/javadoc/Tag
    506*(Ljava/lang/String;tagLcom/sun/javadoc/Tag;2:;text
    BF<dl>
    BHIJappend,(Ljava/lang/String;)Ljava/lang/StringBuffer;Ljava/lang/StringBuilderN<dt><i>Copyright &#169;
    KSIT-(Ljava/lang/String;)Ljava/lang/StringBuilder;V	</i></dt>
    BXtags[Lcom/sun/javadoc/Tag;haveValidTagZiI$result(Ljava/lang/StringBuffer
    SourceFileCopyrightTaglet.java!

/* -
&,.":,>,!B"#QYSL*+%+WFGH-.
/01A
*2Y+S4K

/* Permission.java -- The superclass for all permission objects

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package java.security;

import gnu.java.lang.CPStringBuilder;

import java.io.Serializable;

/**
 * This class is the abstract superclass of all classes that implement
 * the concept of a permission. A permission consists of a permission name
 * and optionally a list of actions that relate to the permission. The
 * actual meaning of the name of the permission is defined only in the
 * context of a subclass. It may name a resource to which access permissions
 * are granted (for example, the name of a file) or it might represent
 * something else entirely. Similarly, the action list only has meaning
 * within the context of a subclass. Some permission names may have no
 * actions associated with them. That is, you either have the permission
 * or you don't.
 *
 * <p>The most important method in this class is <code>implies</code>. This
 * checks whether if one has this permission, then the specified
 * permission is also implied. As a conceptual example, consider the
 * permissions "Read All Files" and "Read File foo". The permission
* "Read All Files" implies that the caller has permission to read the
* file foo.
*
* <p><code>Permission</code>’s must be immutable - do not change their
* state after creation.
*
* @author Aaron M. Renn (arenn@urbanophile.com)
* @see Permissions
* @see PermissionCollection
* @since 1.1
* @status updated to 1.4
* /
public abstract class Permission implements Guard, Serializable
{
/**
 * Compatible with JDK 1.1+.
 */
private static final long serialVersionUID = -5636570222231596674L;

/**
 * This is the name assigned to this permission object.
 *
 * @serial the name of the permission
 */
private String name;

/**
 * Create an instance with the specified name.
 *
 * @param name the permission name
 */
public Permission(String name)
{
    this.name = name;
}

/**
 * This method implements the <code>Guard</code> interface for this class.
 * It calls the <code>checkPermission</code> method in
 * <code>SecurityManager</code> with this <code>Permission</code> as its
 * argument. This method returns silently if the security check succeeds
 * or throws an exception if it fails.
 *
 * @param obj the <code>Object</code> being guarded - ignored by this class
 * @throws SecurityException if the security check fails
 * @see GuardedObject
 * @see SecurityManager#checkPermission(Permission)
 */
public void checkGuard(Object obj)
{
    SecurityManager sm = System.getSecurityManager();
    if (sm != null)
        sm.checkPermission(this);
}

/**
 * This method tests whether this <code>Permission</code> implies that the
 * specified <code>Permission</code> is also granted.
 * @param perm the <code>Permission</code> to test against
 * @return true if perm is implied by this
 */
public abstract boolean implies(Permission perm);

/**
 * Check to see if this object equals obj. Use <code>implies</code>, rather
 * than <code>equals</code>, when making access control decisions.
 * @param obj the object to compare to
 */
public abstract boolean equals(Object obj);

/**
 * This method returns a hash code for this <code>Permission</code>. It
 * must satisfy the contract of <code>Object.hashCode</code>: it must be
 * the same for all objects that equals considers to be the same.
 * @return a hash value
 */
public abstract int hashCode();

/**
 * Get the name of this <code>Permission</code>.
 * @return the name
 */
public final String getName()
{
    return name;
}

/**
 * This method returns the list of actions for this <code>Permission</code>
 * as a <code>String</code>. The string should be in canonical order, for
 * example, both <code>new FilePermission(f, "write,read")</code> and
 * <code>new FilePermission(f, "read,write")</code> have the action list
public abstract String getActions();

/**
 * This method returns an empty <code>PermissionCollection</code> object
 * that can store permissions of this type, or <code>null</code> if no
 * such collection is defined. Subclasses must override this to provide
 * an appropriate collection when one is needed to accurately calculate
 * <code>implies</code>.
 *
 * @return a new <code>PermissionCollection</code>
 */
public PermissionCollection newPermissionCollection()
{
    return null;
}

/**
 * This method returns a <code>String</code> representation of this
 * <code>Permission</code> object. This is in the format:
 * <code>'(' + getClass().getName() + ' ' + getName() + ' ' + getActions
 * + ')'</code>.
 *
 * @return this object as a <code>String</code>
 */
public String toString()
{
    CPStringBuilder string = new CPStringBuilder();

    string = string.append('(');
    string = string.append(getClass().getName());
    string = string.append(' '); // Check if getActions() is empty
    string = string.append(getName());
    string = string.append(' '); // Append getActions if not empty
    string = string.append(getActions());
    string = string.append(')');

    if (!(getActions().equals('')))
    {
        string = string.append(' ');
        string = string.append(getActions());
    }

    string = string.append(')');
    return string.toString();
}
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package java.security.acl;

/**
 * This interface provides information about a permission that can be
 * granted. Note that this is <em>not</em> the same as the class
 * <code>java.security.Permission</code>.
 *
 * @version 0.0
 *
 * @author Aaron M. Renn (arenn@urbanophile.com)
 */
public interface Permission
{
/**
 * This method tests whether or not a specified <code>Permission</code>
 * (passed as an <code>Object</code>) is the same as this permission.
 *
 * @param perm The permission to check for equality
 *
 * @return <code>true</code> if the specified permission is the same as this one, <code>false</code> otherwise
 */
boolean equals (Object perm);

/**
 * This method returns this <code>Permission</code> as a <code>String</code>
 * representing this permission.
 */
String toString();
}

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extern "Java"
{
namespace gnu
{
namespace javax
{
namespace sound
{
class AudioSecurityManager$Permission;
}
}
}
}

class gnu::javax::sound::AudioSecurityManager$Permission : public ::java::lang::Enum
{

AudioSecurityManager$Permission(::java::lang::String *, jint);

public:
static JArray< ::gnu::javax::sound::AudioSecurityManager$Permission * > * values();
static ::gnu::javax::sound::AudioSecurityManager$Permission * valueOf(::java::lang::String *);
static ::gnu::javax::sound::AudioSecurityManager$Permission * PLAY;
static ::gnu::javax::sound::AudioSecurityManager$Permission * RECORD;
static ::gnu::javax::sound::AudioSecurityManager$Permission * ALL;

private:
static JArray< ::gnu::javax::sound::AudioSecurityManager$Permission * > * ENUM$VALUES;

public:
static ::java::lang::Class class$;
};

" Automatically generated by Pod::Man 2.16 (Pod::Simple 3.07) "
"
Standard preamble:
=======================================================================
... Subsection heading
... Vertical space (when we can't use .PP)
... Begin verbatim text
.\fB\$1\fR...
... End verbatim text
... Set up some character translations and predefined strings. \^(- will
\^ give an unbreakable dash, \^PI will give pi, \^L" will give a left
\^ double quote, and \^R" will give a right double quote. \^C+ will
\^ give a nicer C++. Capital omega is used to do unbreakable dashes and
\^ therefore won't be available. \^C" and \^C' expand to " in nroff,
\^ nothing in troff, for use with C<>.
... (\^W-.
... ds C+ C\v'-.1v\h'-.1p\v'-2+\h'-.1p'+s0\v'.1v\h'-.1p'
... ds PI pi
... if (n.H=4u)&(1m=24u) .ds -- \^W\h'-.12u\(\^W\h'-.12u\-\) diablo 10 pitch
... if (n.H=4u)&(1m=20u) .ds -- \^W\h'-.12u\(\^W\h'-.8u\-\) diablo 12 pitch
... ds L" "
... ds R" "
... ds C" "
... ds C' "
'b\r\}
... ds -- \/(em\v
... ds PI \^p
... ds L" "
... ds R" "
'b\r\}
...
λ" Escape single quotes in literal strings from groff's Unicode transform.
.ie \n(.g .ds Aq \aq
.el .ds Aq '
λ" λ" If the F register is turned on, we'll generate index entries on stderr for
λ" titles (.TH), headers (.SH), subsections (.Sh), items (.Ip), and index
λ" entries marked with X<> in POD. Of course, you'll have to process the
λ" output yourself in some meaningful fashion.
.ie \nF \{
 . de IX
 . tm Index:\$1\n\n% "\$2"
 ..
 . nr % 0
 . rr F
 λ}
.el \{
 . de IX
..
λ} λ" λ" Accent mark definitions (@(#)ms.acc 1.5 88/02/08 SMI; from UCB 4.2).
λ" Fear. Run. Save yourself. No user-serviceable parts.
 . λ" fudge factors for nroff and troff
.if n \{
 . ds #H 0
 . ds #V .8m
 . ds #F .3m
 . ds #[ \f1
 . ds #] \fP
 λ}
.if t \{
 . ds #H ((1u-(\\n(.fu%2u))*.13m)
 . ds #V .6m
 . ds #F 0
 . ds #[ \&
 . ds #] \&
 λ}
 . λ" simple accents for nroff and troff
.if n \{
 . ds ` \\&
 . ds ` \&
 . ds ^ \&
 . ds , \&
 . ds ~ ~
 . ds /
 λ]
.if t \{
 . ds `\k:h'-((\\n.wu*8/10-*(#H)\\n\h")\\n\u"
Open Source Used In SD-WAN 19.3.0

IX Title "GPL 7"

.TH GPL 7 "2010-01-21" "gcc-4.4.3" "GNU"

"For nroff, turn off justification. Always turn off hyphenation; it makes way too many mistakes in technical documents.

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RS 4
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.. IP "6. Conveying Non-Source Forms." 4

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.. RS 4

.. IP "a." 4

.. IX Item "a."

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.. IP "b." 4

.. IX Item "b."

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.. IP "c." 4

.. IX Item "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.

.. IP "d." 4

.. IX Item "d."

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/* Use the Sequent Symmetry assembler syntax. */

/* Define the syntax of pseudo-ops, labels and comments. */

/* Prefix for internally generated assembler labels. If we aren't using  
   underscores, we are using prefix `.'s to identify labels that should  
   be ignored, as in `i386/gas.h' --karl@cs.umb.edu */

#define LPREFIX "L"

/* Assembler pseudos to introduce constants of various size. */

#define ASM_SHORT "\t.word\t"  
#define ASM_LONG "\t.long\t"  
#define ASM_QUAD "\t.quad\t"  /* Should not be used for 32bit compilation. */

/* This was suggested, but it shouldn't be right for DBX output. -- RMS  
   #define ASM_OUTPUT_SOURCE_FILENAME(FILE, NAME) */

/* Define the syntax of labels and symbol definitions/declarations. */
/* This is how to output an assembler line 
   that says to advance the location counter by SIZE bytes. */

#define ASM_OUTPUT_SKIP(FILE,SIZE) \ 
  fprintf (FILE, "\t.space HOST_WIDE_INT_PRINT_UNSIGNED\n", (SIZE))

/* Define the syntax of labels and symbol definitions/declarations. */

/* This says how to output an assembler line 
   to define a global common symbol. */

#define ASM_OUTPUT_COMMON(FILE, NAME, SIZE, ROUNDED) \ 
  fprintf (FILE, \n    ".comm \t", (FILE)),
    assemble_name ((FILE), (NAME)),
  fprintf ((FILE), ".%u\n", (int)(ROUNDED))

/* This says how to output an assembler line 
   to define a local common symbol. */

#define ASM_OUTPUT_LOCAL(FILE, NAME, SIZE, ROUNDED) \ 
  fprintf (FILE, \n    ".lcomm \t", (FILE)),
    assemble_name ((FILE), (NAME)),
  fprintf ((FILE), ".%u\n", (int)(ROUNDED))

#ifdef HAVE_GAS_LCOMM_WITH_ALIGNMENT
#define ASM_OUTPUT_ALIGNED_LOCAL(FILE, NAME, SIZE, ALIGNMENT) \ 
  fprintf (FILE, \n    ".lcomm \t", (FILE)),
    assemble_name ((FILE), (NAME)),
  fprintf ((FILE), ".%u,%u\n", (int)(SIZE), (int)(ALIGNMENT) / BITS_PER_UNIT))
#endif

/* This is how to output an assembler line 
   that says to advance the location counter 
   to a multiple of 2**LOG bytes. */

#define ASM_OUTPUT_ALIGN(FILE,LOG) \ 
  if ((LOG)!=0) fprintf ((FILE), "\t.align %d\n", (LOG))

/* This is how to store into the string BUF 
   the symbol_ref name of an internal numbered label where 
   PREFIX is the class of label and NUM is the number within the class. 
   This is suitable for output with `assemble_name'. */

#define ASM_GENERATE_INTERNAL_LABEL(BUF,PREFIX,NUMBER) \ 
  sprintf ((BUF), "*%s%ld", (PREFIX), (long)(NUMBER))

/* The prefix to add to user-visible assembler symbols. */
#define USER_LABEL_PREFIX " _"

/* Sequent has some changes in the format of DBX symbols. */
#define DBX_NO_XREFS 1

/* Don't split DBX symbols into continuations. */
#define DBX_CONTIN_LENGTH 0

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This is the Debian GNU/Linux prepackaged version of the GNU compiler collection, containing Ada, C, C++, Fortran 95, Java, Objective-C, Objective-C++, and Treelang compilers, documentation, and support libraries. In addition, Debian provides the GNU Pascal compiler in the same source package. Packaging is done by the Debian GCC Maintainers <debian-gcc@lists.debian.org>, with sources obtained from:

ftp://gcc.gnu.org/pub/gcc/releases/ (for full releases)
svn://gcc.gnu.org/svn/gcc/ (for prereleases)
http://gnu-pascal.de/alpha/ (for GNU Pascal)
http://dgcc.sourceforge.net/ (for D)

The current gcc-@BV@ source package is taken from the SVN @SVN_BRANCH@.

Changes: See changelog.Debian.gz

Debian splits the GNU Compiler Collection into packages for each language, library, and documentation as follows:

<table>
<thead>
<tr>
<th>Language</th>
<th>Compiler package</th>
<th>Library package</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ada</td>
<td>gnat-@BV@</td>
<td>libgnat-@BV@</td>
<td>gnat-@BV@-doc</td>
</tr>
<tr>
<td>C</td>
<td>gcc-@BV@</td>
<td>gcc-@BV@-doc</td>
<td></td>
</tr>
<tr>
<td>C++</td>
<td>g++-@BV@</td>
<td>libstdc++6</td>
<td>libstdc++6-@BV@-doc</td>
</tr>
<tr>
<td>Fortran 95</td>
<td>gfortran-@BV@</td>
<td>libgfortran3</td>
<td>gfortran-@BV@-doc</td>
</tr>
<tr>
<td>Java</td>
<td>gcj-@BV@</td>
<td>libgcj10</td>
<td>libgcj-doc</td>
</tr>
<tr>
<td>Objective C</td>
<td>gobjc-@BV@</td>
<td>libobjc2</td>
<td></td>
</tr>
<tr>
<td>Objective C++</td>
<td>gobjc++-@BV@</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For some language run-time libraries, Debian provides source files, development files, debugging symbols and libraries containing position-independent code in separate packages:

<table>
<thead>
<tr>
<th>Language</th>
<th>Sources</th>
<th>Development</th>
<th>Debugging</th>
<th>Position-Independent</th>
</tr>
</thead>
<tbody>
<tr>
<td>C++</td>
<td>libstdc++6-@BV@-dbg</td>
<td>libstdc++6-@BV@-pic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Java</td>
<td>libgcj10-src</td>
<td>libgcj10-dev</td>
<td>libgcj10-dbgs</td>
<td></td>
</tr>
</tbody>
</table>

Additional packages include:

All languages:
libgcc1, libgcc2, libgcc4 GCC intrinsics (platform-dependent)
gcc-@BV@-base Base files common to all compilers
gcc-@BV@-soft-float Software floating point (ARM only)
gcc-@BV@-source  The sources with patches

Ada:
libgnatvsn-dev, libgnatvsn@BV@  GNAT version library
libgnatprj-dev, libgnatprj@BV@  GNAT Project Manager library

C:
cpp-@BV@, cpp-@BV@-doc  GNU C Preprocessor
libmudflap0-dev, libmudflap0  Library for instrumenting pointers
libssp0-dev, libssp0  GCC stack smashing protection library
fixincludes  Fix non-ANSI header files
protoize  Create/remove ANSI prototypes from C code

Java:
gij  The Java bytecode interpreter and VM
libgcj-common  Common files for the Java run-time
libgcj10-awt  The Abstract Windowing Toolkit
libgcj10-jar  Java ARchive for the Java run-time

C, C++ and Fortran 95:
libgomp1-dev, libgomp1GCC OpenMP (GOMP) support library

Biarch support: On some 64-bit platforms which can also run 32-bit code, Debian provides additional packages containing 32-bit versions of some libraries. These packages have names beginning with 'lib32' instead of 'lib', for example lib32stdc++6. Similarly, on some 32-bit platforms which can also run 64-bit code, Debian provides additional packages with names beginning with 'lib64' instead of 'lib'. These packages contain 64-bit versions of the libraries. (At this time, not all platforms and not all libraries support biarch.) The license terms for these lib32 or lib64 packages are identical to the ones for the lib packages.

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- libdecnumber
- libgomp
- libssp
- libstdc++-v3
- libobjc
- libmudflap
- libgfortran
- The libgnat-@BV@ Ada support library and libgnatsvsn library.
- Various config files in gcc/config/ used in runtime libraries.

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Version 3.1, 31 March 2009

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structure layouts and accessors, and small macros and small inline
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HISTORY -

Early versions of this collector were developed as a part of research projects supported in part by the National Science Foundation and the Defense Advance Research Projects Agency.

The garbage collector originated as part of the run-time system for the Russell programming language implementation. The first version of the garbage collector was written primarily by Al Demers. It was then refined and mostly rewritten, primarily by Hans-J. Boehm, at Cornell U., the University of Washington, Rice University (where it was first used for C and assembly code), Xerox PARC, SGI, and HP Labs. However, significant contributions have also been made by many others.

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More recent contributors are mentioned in the modification history in README.changes. My apologies for any omissions.

The SPARC specific code was originally contributed by Mark Weiser. The Encore Multimax modifications were supplied by Kevin Kenny (kenny@m.cs.uiuc.edu). The adaptation to the IBM PC/RT is largely due to Vernon Lee, on machines made available to Rice by IBM. Much of the HP specific code and a number of good suggestions for improving the generic code are due to Walter Underwood. Robert Brazile (brazile@diamond.bbn.com) originally supplied the ULTRIX code. Al Dosser (dosser@src.dec.com) and Regis Cridlig (Regis.Cridlig@cl.cam.ac.uk) subsequently provided updates and information on variation between ULTRIX systems. Parag Patel (parag@netcom.com) supplied the A/UX code. Jesper Peterson(jep@mtiame.mtia.oz.au), Michel Schinz, and Martin Tauchmann (martintauchmann@bigfoot.com) supplied the Amiga port. Thomas Funke (thf@zelator.in-berlin.de(?)) and Brian D.Carlstrom (bdc@clark.lcs.mit.edu) supplied the NeXT ports. Douglas Steel (doug@wg.icl.co.uk) provided ICL DRS6000 code. Bill Janssen (janssen@parc.xerox.com) supplied the SunOS dynamic loader specific code. Manuel Serrano (serrano@cornas.inria.fr) supplied linux and Sony News specific code. Al Dosser provided Alpha/OSF/1 code. He and Dave Deteifs(deteifs@src.dec.com) also provided several generic bug fixes. Alistair G. Crooks(agt@uts.amdahl.com) supplied the NetBSD and 386BSD ports. Jeffrey Hsu (hsu@soda.berkeley.edu) provided the FreeBSD port. Brent Benson (brent@jade.ssd.csd.harris.com) ported the collector to a Motorola 88K processor running CX/UX (Harris NightHawk). Ari Huttunen (Ari.Huttunen@hut.fi) generalized the OS/2 port to nonIBM development environments (a nontrivial task). Patrick Beard (beard@cs.ucdavis.edu) provided the initial MacOS port. David Chase, then at Olivetti Research, suggested several improvements. Scott Schwartz (schwartz@groucho.cse.psu.edu) supplied some of the...
code to save and print call stacks for leak detection on a SPARC. Jesse Hull and John Ellis supplied the C++ interface code. Zhong Shao performed much of the experimentation that led to the current typed allocation facility. (His dynamic type inference code hasn't made it into the released version of the collector, yet.)

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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 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 "Lesser" General Public License because it does 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.

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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
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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
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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
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7. You may place library facilities that are a work based on the
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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.

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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
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.

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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 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.
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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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DRuntime: Runtime Library for the D Programming Language
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Version 2, June 1991

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[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
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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 Library General Public License, applies to some specially designated Free Software Foundation software, and to any other libraries whose authors decide to use it. You can use it for your libraries, too.

When we speak of free software, we are referring to freedom, 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
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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
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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
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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
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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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0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library 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
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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 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
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   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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SIGNATURE OF TY COON, 1 April 1990
Ty Coon, President of Vice

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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 "Lesser" General Public License because it does 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.

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   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.

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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.

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AdaCore

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/* Definitions for BSD assembler syntax for Intel 386
(actually AT&T syntax for insns and operands,
adapted to BSD conventions for symbol names and debugging.)
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<http://www.gnu.org/licenses/>. */

/* Use the Sequent Symmetry assembler syntax. */

/* Define the syntax of pseudo-ops, labels and comments. */

/* Prefix for internally generated assembler labels. If we aren't using
underscores, we are using prefix `.'s to identify labels that should
be ignored, as in `i386/gas.h' --karl@cs.umb.edu */

#define LPREFIX "L"

/* Assembler pseudos to introduce constants of various size. */

#define ASM_BYTE "\t.byte\t"
#define ASM_SHORT "\t.word\t"
#define ASM_LONG "\t.longs\t"
#define ASM_QUAD "\t.quad\t" /* Should not be used for 32bit compilation. */

/* This was suggested, but it shouldn't be right for DBX output. -- RMS
#define ASM_OUTPUT_SOURCE_FILENAME(FILE, NAME) */
/* Define the syntax of labels and symbol definitions/declarations. */

/* This is how to output an assembler line 
that says to advance the location counter by SIZE bytes. */

#define ASM_OUTPUT_SKIP(FILE, SIZE) \ 
   fprintf (FILE, "\t.space " HOST_WIDE_INT_PRINT_UNSIGNED"\n", (SIZE))

/* Define the syntax of labels and symbol definitions/declarations. */

/* This says how to output an assembler line 
to define a global common symbol. */

#define ASM_OUTPUT_COMMON(FILE, NAME, SIZE, ROUNDED) \ 
   ( fputs (".comm ", (FILE)), \ 
     assemble_name ((FILE), (NAME)), \ 
     fprintf ((FILE), ",%u\n", (int)(ROUNDED)))

/* This says how to output an assembler line 
to define a local common symbol. */

#define ASM_OUTPUT_LOCAL(FILE, NAME, SIZE, ROUNDED) \ 
   ( fputs (".lcomm ", (FILE)), \ 
     assemble_name ((FILE), (NAME)), \ 
     fprintf ((FILE), ",%u\n", (int)(ROUNDED)))

#if defined HAVE_GAS_LCOMM_WITH_ALIGNMENT
#define ASM_OUTPUT_ALIGNED_LOCAL(FILE, NAME, SIZE, ALIGNMENT) \ 
   ( fputs (".lcomm ", (FILE)), \ 
     assemble_name ((FILE), (NAME)), \ 
     fprintf ((FILE), ",%u,%u\n", (int)(SIZE), (int)(ALIGNMENT) / BITS_PER_UNIT))
#endif

/* This is how to output an assembler line 
that says to advance the location counter 
to a multiple of 2**LOG bytes. */

#define ASM_OUTPUT_ALIGN(FILE, LOG) \ 
   if ((LOG) != 0) fprintf ((FILE), "\t.align %d\n", (LOG))

/* This is how to store into the string BUF 
the symbol_ref name of an internal numbered label where 
PREFIX is the class of label and NUM is the number within the class. 
This is suitable for output with `assemble_name'. */

#define ASM_GENERATE_INTERNAL_LABEL(BUF, PREFIX, NUMBER) \ 
   sprintf ((BUF), "+%s%ld", (PREFIX), (long)(NUMBER))
/* The prefix to add to user-visible assembler symbols. */

#define USER_LABEL_PREFIX "_

/* Sequent has some changes in the format of DBX symbols. */
#define DBX_NO_XREFS 1

/* Don't split DBX symbols into continuations. */
#define DBX_CONTIN_LENGTH 0

\" Automatically generated by Pod::Man 4.09 (Pod::Simple 3.35)
\" Standard preamble:
\" ========================================================================
.de Sp \" Vertical space (when we can't use .PP)
 .. if t .sp .5v
 .. if n .sp
 ..
 .. de Vb \" Begin verbatim text
 .. ft CW
 .. nf
 .. ne \$1
 ..
 .. de Ve \" End verbatim text
 .. ft R
 .. fi
 ..
 .. \" Set up some character translations and predefined strings. \"(-- will
 .. \" give an unbreakable dash, \"(PI will give pi, \"(L" will give a left
 .. \" double quote, and \"(R" will give a right double quote. \"(C+ will
 .. \" give a nicer C++.  Capital omega is used to do unbreakable dashes and
 .. \" therefore won't be available. \"(C’ and \"(C’ expand to ‘’ in nroff,
 .. \" nothing in troff, for use with C<>.
 .. \tr \"(W-
 .. ds C+ C\v'-1.1v'\h'-1p'\u'-2+\h'-1p'+\s0\v'.1v'\h'-1p'
 .. \ie n \{
 .. ds -- \"(W-
 .. ds PI pi
 .. if (\n(H=4u)&(1m=24u) .ds -- \"(W\h'-12u\"(W\h'-12u\" diablo 10 pitch
 .. if (\n(H=4u)&(1m=20u) .ds -- \"(W\h'-12u\"(W\h'-8u\" diablo 12 pitch
 .. ds L""
 .. ds R""
 .. ds C’"
 .. ds C’"
 .. \}br\}
 .. el\{
 .. ds -- \$(em\}
 .. ds PI \"p
 .. ds L""
\" Escape single quotes in literal strings from groff's Unicode transform.
\ie \\
\" If the F register is >0, we'll generate index entries on stderr for
\" titles (.TH), headers (.SH), subsections (.SS), items (.Ip), and index
\" entries marked with X<> in POD. Of course, you'll have to process the
\" output yourself in some meaningful fashion.
\"
\" Avoid warning from groff about undefined register 'F'.
\de IX
\-
\if !\nF .nr F 0
\if \nF>0 \|
  \de IX
  \tm Index:\$1\t\n%	"\$2"
\-
  \if !\nF==2 \|
    \nr % 0
    \nr F 2
  \}
\}
\"
\" Accent mark definitions (@(#)ms.acc 1.5 88/02/08 SMI; from UCB 4.2).
\"
\" Fear. Run. Save yourself. No user-serviceable parts.
\- \" fudge factors for nroff and troff
\if n \|
  \ds #H 0
  \ds #V .8m
  \ds #F .3m
  \ds #[ A1
  \ds #] M
\-
  \if t \|
    \ds #H ((1u-\n\n(\fu%2u))*13m)
    \ds #V .6m
    \ds #F 0
    \ds #[ \&
    \ds #] \&
\-
  \" simple accents for nroff and troff
\if n \|
  \ds \"\&
" corrections for vroff
.if v .ds ~ \n(\n.wu*9/10-\*(#H)\n.s-2u-\n.s+2h\n\n.u'
.if v .ds ^ \n(\n.wu*10/11-\*(#H)\n.s-4m\n.s+4m\n\n.u'
." V" for low resolution devices (crt and lpr)
.if \n(H>23 .if \n.(V>19 \n\n" \n. ds : e
. ds 8 ss
. ds o a
. ds d- d'h'-1\n. ds D- D'h'-1\n. ds th \n'o\'b\n'p'
. ds Th \n'o\'L\n'P'
. ds ae ae
. ds Ae AE
"}
.rm #[ #] #H #V #F C
"V" ================
"V" ================
.JX Title "GPL 7"
.TH GPL 7 "2018-07-26"  "gcc-8.2.0" "GNU"
"V" For nroff, turn off justification. Always turn off hyphenation; it makes
"V" way too many mistakes in technical documents.
.if n .ad 1

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@end enumerate

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Julian Seward, jseward@bzip.org
bzip2/libbzip2 version 1.0.6 of 6 September 2010

# Copyright (C) 2013-2018 Free Software Foundation, Inc.
#
# This script is free software; you can redistribute it and/or modify
# it under the terms of the GNU General Public License as published by
# the Free Software Foundation; either version 3, or (at your option)
# any later version.
#
# This script adjusts the copyright notices at the top of source files
# so that they have the form:
#
#   Copyright XXXX-YYYY Free Software Foundation, Inc.
#
# It doesn't change code that is known to be maintained elsewhere or
# that carries a non-FSF copyright.
#
# The script also doesn't change testsuite files, except those in
# libstdc++-v3. This is because libstdc++-v3 has a conformance testsuite,
# while most tests in other directories are just things that failed at some
# point in the past.
#
# Pass --this-year to the script if you want it to add the current year
# to all applicable notices. Pass --quilt if you are using quilt and
# want files to be added to the quilt before being changed.
#
# By default the script will update all directories for which the
# output has been vetted. You can instead pass the names of individual
# directories, including those that haven't been approved. So:
#
# update-copyright.py --this-year
#
# is the command that would be used at the beginning of a year to update
# all copyright notices (and possibly at other times to check whether
# new files have been added with old years). On the other hand:
#
# update-copyright.py --this-year libitm
#
# would run the script on just libitm/.
#
# Note that things like --version output strings must be updated before
# this script is run. There's already a separate procedure for that.

import os
import re
import sys
import time
import subprocess

class Errors:
    def __init__(self):
        self.num_errors = 0

    def report(self, filename, string):
        if filename:
            string = filename + ': ' + string

        sys.stderr.write(string + '
')

        self.num_errors += 1

    def ok(self):
        return self.num_errors == 0

class GenericFilter:
    def __init__(self):
        self.skip_files = set()
        self.skip_dirs = set()
        self.skip_extensions = set()
        self.fossilised_files = set()
        self.own_files = set()

        self.skip_files |= set([}
# Skip licence files.
'COPYING',
'COPYING.LIB',
'COPYING3',
'COPYING3.LIB',
'LICENSE',
'fdl.texi',
'gpl_v3.texi',
'fdl-1.3.xml',
'gpl-3.0.xml',

# Skip auto- and libtool-related files
'aclocal.m4',
'compile',
'config.guess',
'config.sub',
'depcomp',
'install-sh',
'libtool.m4',
'ltmain.sh',
'ltptools.m4',
'ltsgn.m4',
'ltversion.m4',
'lt~obsolete.m4',
'missing',
'mkdep',
'mkinstalldirs',
'move-if-change',
'shlibpath.m4',
'symlink-tree',
'ylwrap',

# Skip FSF mission statement, etc.
'gnu.texi',
'funding.texi',
'appendix_free.xml',

# Skip imported texinfo files.
'texinfo.tex',
)

def get_line_filter (self, dir, filename):
    if filename.startswith ('ChangeLog'):
        # Ignore references to copyright in changelog entries.
        return re.compile ('	')

    return None
def skip_file(self, dir, filename):
    if filename in self.skip_files:
        return True

    (base, extension) = os.path.splitext(os.path.join(dir, filename))
    if extension in self.skip_extensions:
        return True

    if extension == '.in':
        # Skip .in files produced by automake.
        if os.path.exists(base + '.am'):
            return True

    # Skip files produced by autogen
    if (os.path.exists(base + '.def')
        and os.path.exists(base + '.tpl')):
        return True

    # Skip configure files produced by autoconf
    if filename == 'configure':
        if os.path.exists(base + '.ac'):
            return True
        if os.path.exists(base + '.in'):
            return True

    return False

def skip_dir(self, dir, subdir):
    return subdir in self.skip_dirs

def is_fossilised_file(self, dir, filename):
    if filename in self.fossilised_files:
        return True

    # Only touch current ChangeLogs.
    if filename != 'ChangeLog' and filename.find('ChangeLog') >= 0:
        return True

    return False

def by_package_author(self, dir, filename):
    return filename in self.own_files

class Copyright:
    def __init__(self, errors):
        self.errors = errors

        # Characters in a range of years. Include '.' for typos.
        ranges = '[0-9]+[0-9,\s]+[0-9]'
# Non-whitespace characters in a copyright holder's name.
name = '\[\w.,-\]'

# Matches one year.
self.year_re = re.compile ('[0-9]+')

# Matches part of a year or copyright holder.
self.continuation_re = re.compile (ranges + '|' + name)

# Matches a full copyright notice:
self.copyright_re = re.compile (  # 1: 'Copyright (C)', etc.
    '([Cc]opyright'  # the years. Include the whitespace in the year, so that
    '((?:' + ranges + ',?  # we can remove any excess.
    '|@value\{[^{}]*\})\s*)'  # 2: the years. Include the whitespace in the year, so that
    '|copyright = u"'  # 2: the years. Include the whitespace in the year, so that
    '|@set\s+copyright\[w-\]+'  # 2: the years. Include the whitespace in the year, so that
    '(@copying: '@copying'  # 3: 'by ', if used
    '(by\s+)?'  # 4: the copyright holder. Don't allow multiple consecutive
    '# spaces, so that right-margin gloss doesn't get caught
    '# (e.g. gnat_ugn.texi).
    '(' + name + '(?:\s?' + name + ')*)?')  # A regexp for notices that might have slipped by. Just matching
# 'copyright' is too noisy, and 'copyright.*[0-9]' falls foul of
# HTML header markers, so check for 'copyright' and two digits.
self.other_copyright_re = re.compile ('copyright.*[0-9][0-9]',  # A regexp for notices that might have slipped by. Just matching
    re.IGNORECASE)

self.comment_re = re.compile('#+|[*]+|;+|%+|//+|@c |dnl ')  # A regexp for notices that might have slipped by. Just matching
self.holders = { '@copying': '@copying'  # A regexp for notices that might have slipped by. Just matching
    self.holder_prefixes = set()  # A regexp for notices that might have slipped by. Just matching

# True to 'quilt add' files before changing them.
self.use_quilt = False  # A regexp for notices that might have slipped by. Just matching

# If set, force all notices to include this year.
self.max_year = None  # A regexp for notices that might have slipped by. Just matching
# Goes after the year(s). Could be '\', '.
self.separator = '\n'

def add_package_author(self, holder, canon_form=None):
    if not canon_form:
        canon_form = holder
    self.holders[holder] = canon_form
    index = holder.find(' ')
    while index >= 0:
        self.holder_prefixes.add(holder[:index])
        index = holder.find(' ', index + 1)

def add_external_author(self, holder):
    self.holders[holder] = None

class BadYear():
    def __init__(self, year):
        self.year = year
    def __str__(self):
        return 'unrecognised year: ' + self.year

def parse_year(self, string):
    year = int(string)
    if len(string) == 2:
        if year > 70:
            return year + 1900
        elif len(string) == 4:
            return year
    raise self.BadYear(string)

def year_range(self, years):
    year_list = [self.parse_year(year)
                 for year in self.year_re.findall(years)]
    assert len(year_list) > 0
    return (min(year_list), max(year_list))

def set_use_quilt(self, use_quilt):
    self.use_quilt = use_quilt

def include_year(self, year):
    assert not self.max_year
    self.max_year = year

def canonicalise_years(self, dir, filename, filter, years):
    # Leave texinfo variables alone.
    if years.startswith('@value'):
return years

(min_year, max_year) = self.year_range(years)

# Update the upper bound, if enabled.
if self.max_year and not filter.is_fossilised_file(dir, filename):
    max_year = max(max_year, self.max_year)

# Use a range.
if min_year == max_year:
    return '%d' % min_year
else:
    return '%d-%d' % (min_year, max_year)

def strip_continuation(self, line):
    line = line.lstrip()
    match = self.comment_re.match(line)
    if match:
        line = line[match.end():].lstrip()
    return line

def is_complete(self, match):
    holder = match.group(4)
    return (holder
        and (holder not in self.holder_prefixes
        or holder in self.holders))

def update_copyright(self, dir, filename, filter, file, line, match):
    orig_line = line
    next_line = None
    pathname = os.path.join(dir, filename)

    intro = match.group(1)
    if intro.startswith('@set'):
        # Texinfo year variables should always be on one line
        after_years = line[match.end(2):].strip()
        if after_years != '':
            self.errors.report(pathname,
                'trailing characters in @set: ' + after_years)
            return (False, orig_line, next_line)
    else:
        # If it looks like the copyright is incomplete, add the next line.
        while not self.is_complete(match):
            try:
                next_line = file.next()
            except StopIteration:
                break
        return (True, orig_line, next_line)
# If the next line doesn't look like a proper continuation,
# assume that what we've got is complete.
continuation = self.strip_continuation(next_line)
if not self.continuation_re.match(continuation):
    break

# Merge the lines for matching purposes.
orig_line += next_line
line = line.rstrip() + ' ' + continuation
next_line = None

# Rematch with the longer line, at the original position.
match = self.copyright_re.match(line, match.start())
assert match
holder = match.group(4)

# Use the filter to test cases where markup is getting in the way.
if filter.by_package_author(dir, filename):
    assert holder not in self.holders

elif not holder:
    self.errors.report(pathname, 'missing copyright holder')
    return (False, orig_line, next_line)

elif holder not in self.holders:
    self.errors.report(pathname, 'unrecognised copyright holder: ' + holder)
    return (False, orig_line, next_line)
else:
    # See whether the copyright is associated with the package
    # author.
canon_form = self.holders[holder]
if not canon_form:
    return (False, orig_line, next_line)

    # Make sure the author is given in a consistent way.
    line = (line[:match.start(4)]
        + canon_form
        + line[match.end(4):])

    # Remove any 'by'
    line = line[:match.start(3)] + line[match.end(3):]

    # Update the copyright years.
    years = match.group(2).strip()
try:
    canon_form = self.canonicalise_years (dir, filename, filter, years)
except self.BadYear as e:
    self.errors.report (pathname, str (e))
    return (False, orig_line, next_line)

line = (line[:match.start (2)]
    + ('' if intro.startswith ('copyright = ') else ' ')
    + canon_form + self.separator
    + line[match.end (2):])

    # Use the standard (C) form.
    if intro.endswith ('right'):
        intro += ' (C)'
    elif intro.endswith ('(c)'):
        intro = intro[:-3] + '(C)'
    line = line[:match.start (1)] + intro + line[match.end (1):]

    # Strip trailing whitespace
    line = line.rstrip() + '\n'

    return (line != orig_line, line, next_line)

def process_file (self, dir, filename, filter):
    pathname = os.path.join (dir, filename)
    if filename.endswith ('.tmp'):
        # Looks like something we tried to create before.
        try:
            os.remove (pathname)
        except OSError:
            pass
        return
    lines = []
    changed = False
    line_filter = filter.get_line_filter (dir, filename)
    mode = None
    with open (pathname, 'r') as file:
        prev = None
        mode = os.fstat (file.fileno()).st_mode
        for line in file:
            while line:
                next_line = None
                # Leave filtered-out lines alone.
                if not (line_filter and line_filter.match (line)):
                    match = self.copyright_re.search (line)
                    if match:
                        res = self.update_copyright (dir, filename, filter,
file, line, match)
    (this_changed, line, next_line) = res
changed = changed or this_changed

# Check for copyright lines that might have slipped by.
eelif self.other_copyright_re.search (line):
    self.errors.report (pathname,
        'unrecognised copyright: %s'
        % line.strip())
    lines.append (line)
    line = next_line

# If something changed, write the new file out.
if changed and self.errors.ok():
    tmp_pathname = pathname + '.tmp'
    with open (tmp_pathname, 'w') as file:
        for line in lines:
            file.write (line)
            os.fchmod (file.fileno(), mode)
    if self.use_quilt:
        subprocess.call (['quilt', 'add', pathname])
    os.rename (tmp_pathname, pathname)

def process_tree (self, tree, filter):
    for (dir, subdirs, filenames) in os.walk (tree):
        # Don’t recurse through directories that should be skipped.
        for i in xrange (len (subdirs) - 1, -1, -1):
            if filter.skip_dir (dir, subdirs[i]):
                del subdirs[i]

        # Handle the files in this directory.
        for filename in filenames:
            if filter.skip_file (dir, filename):
                sys.stdout.write ('Skipping %s
' % os.path.join (dir, filename))
            else:
                self.process_file (dir, filename, filter)

class CmdLine:
def __init__ (self, copyright = Copyright):
    self.errors = Errors()
    self.copyright = copyright (self.errors)
    self.dirs = []
    self.default_dirs = []
    self.chosen_dirs = []
    self.option_handlers = dict()
    self.option_help = []
self.add_option ('--help', 'Print this help', self.o_help)
self.add_option ('--quilt', '"quilt add" files before changing them',
    self.o_quilt)
self.add_option ('--this-year', 'Add the current year to every notice',
    self.o_this_year)

def add_option (self, name, help, handler):
    self.option_help.append ((name, help))
    self.option_handlers[name] = handler

def add_dir (self, dir, filter = GenericFilter()):
    self.dirs.append ((dir, filter))

def o_help (self, option = None):
    sys.stdout.write ('Usage: %s [options] dir1 dir2...

' % sys.argv[0])
    'Options:
    format = '%-15s %s
' % sys.argv[0])
    for (what, help) in self.option_help:
        sys.stdout.write (format % (what, help))
    sys.stdout.write ('Directories:
')
    'Directories:
    format = '%-25s
' % (dir + 'n')
    i = 0
    for (dir, filter) in self.dirs:
        i += 1
        if i % 3 == 0 or i == len (self.dirs):
            sys.stdout.write (dir + 'n')
        else:
            sys.stdout.write (format % dir)
    sys.exit (0)

def o_quilt (self, option):
    self.copyright.set_use_quilt (True)

def o_this_year (self, option):
    self.copyright.include_year (time.localtime().tm_year)

def main (self):
    for arg in sys.argv[1:]:
        if arg[1] == '':
            self.chosen_dirs.append (arg)
        elif arg in self.option_handlers:
            self.option_handlers[arg] (arg)
        else:
            self.errors.report (None, 'unrecognised option: ' + arg)
    if self.errors.ok():
        if len (self.chosen_dirs) == 0:
            self.chosen_dirs = self.default_dirs
if len(self.chosen_dirs) == 0:
    self.o_help()
else:
    for chosen_dir in self.chosen_dirs:
        canon_dir = os.path.join(chosen_dir, '')
        count = 0
        for (dir, filter) in self.dirs:
            if (dir + os.sep).startswith(canon_dir):
                count += 1
                self.copyright.process_tree(dir, filter)
        if count == 0:
            self.errors.report(None, 'unrecognised directory: ' + chosen_dir)
        sys.exit(0 if self.errors.ok() else 1)

#----------------------------------------------------------------------
class TopLevelFilter(GenericFilter):
    def skip_dir(self, dir, subdir):
        return True

class ConfigFilter(GenericFilter):
    def __init__(self):
        GenericFilter.__init__(self)

    def skip_file(self, dir, filename):
        if filename.endswith('.m4'):
            pathname = os.path.join(dir, filename)
            with open(pathname) as file:
                # Skip files imported from gettext.
                if file.readline().find('gettext-') >= 0:
                    return True
            return GenericFilter.skip_file(self, dir, filename)

class GCCFilter(GenericFilter):
    def __init__(self):
        GenericFilter.__init__(self)
        self.skip_files |= set(['math-68881.h',])
        self.skip_dirs |= set(['ada',])

        # Not part of GCC
        self.skip_files |= set([{}
            # Handled separately.

Open Source Used In SD-WAN 19.3.0
testsuite,
)

def skip_file (self, dir, filename):
    # g++.niklas/README contains historical copyright information
    # and isn't updated.
    if filename == 'README' and os.path.basename (dir) == 'g++.niklas':
        return True
    # Similarly params/README.
    if filename == 'README' and os.path.basename (dir) == 'params':
        return True
    if filename == 'pdt_5.f03' and os.path.basename (dir) == 'gfortran.dg':
        return True
    return GenericFilter.skip_file (self, dir, filename)

class LibCppFilter (GenericFilter):
    def __init__ (self):
GenericFilter.__init__(self)

self.skip_extensions |= set([
    # Maintained by the translation project.
    '.po',
    
    # Automatically-generated.
    '.pot',
    ])

class LibGCCFilter(GenericFilter):
def __init__(self):
    GenericFilter.__init__(self)

    self.skip_dirs |= set([
        # Imported from GLIBC.
        'soft-fp',
        ])

class LibStdCxxFilter(GenericFilter):
def __init__(self):
    GenericFilter.__init__(self)

    self.skip_files |= set([
        # Contains no copyright of its own, but quotes the GPL.
        'intro.xml',
        ])

    self.skip_dirs |= set([
        # Contains automatically-generated sources.
        'html',
        
        # The testsuite data files shouldn't be changed.
        'data',
        
        # Contains imported images
        'images',
        ])

    self.own_files |= set([
        # Contains markup around the copyright owner.
        'spine.xml',
        ])

def get_line_filter(self, dir, filename):
    if filename == 'boost_concept_check.h':
        return re.compile('// (C) Copyright Jeremy Siek')
    return GenericFilter.get_line_filter(self, dir, filename)
class GCCCopyright (Copyright):
    def __init__ (self, errors):
        Copyright.__init__ (self, errors)

        canon_fsf = 'Free Software Foundation, Inc.'
        self.add_package_author ('Free Software Foundation', canon_fsf)
        self.add_package_author ('Free Software Foundation.', canon_fsf)
        self.add_package_author ('Free Software Foundation Inc.', canon_fsf)
        self.add_package_author ('Free Software Foundation, Inc', canon_fsf)
        self.add_package_author ('Free Software Foundation, Inc.', canon_fsf)
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class GCCCmdLine (CmdLine):
    def __init__ (self):
        CommandLine.__init__ (self, GCCCopyright)
self.add_dir('.', TopLevelFilter())
# boehm-gc is imported from upstream.
self.add_dir('config', ConfigFilter())
# contrib isn't really part of GCC.
self.add_dir('fixincludes')
self.add_dir('gcc', GCCFilter())
self.add_dir(os.path.join('gcc', 'testsuite'), TestsuiteFilter())
self.add_dir('gnattools')
self.add_dir('gotools')
self.add_dir('include')
# intl is imported from upstream.
self.add_dir('libada')
self.add_dir('libatomic')
self.add_dir('libbacktrace')
self.add_dir('libcc1')
self.add_dir('libcpp', LibCppFilter())
self.add_dir('libdecnumber')
# libffi is imported from upstream.
self.add_dir('libgcc', LibGCCFilter())
self.add_dir('libgfortran')
# libgo is imported from upstream.
self.add_dir('libgomp')
self.add_dir('libhsail-rt')
self.add_dir('libiberty')
self.add_dir('libitm')
self.add_dir('libobjc')
# liboffloadmic is imported from upstream.
self.add_dir('libquadmath')
# libsanitizer is imported from upstream.
self.add_dir('libssp')
self.add_dir('libstdc++-v3', LibStdCxxFilter())
self.add_dir('libvtv')
self.add_dir('lto-plugin')
# maintainer-scripts maintainer-scripts
# zlib is imported from upstream.

self.default_dirs = [
    'gcc',
    'include',
    'libada',
    'libatomic',
    'libbacktrace',
    'libcc1',
    'libcpp',
    'libdecnumber',
    'libgcc',
    'libgfortran',
    'libgomp',
    'libhsail-rt',
    'libiberty',
    'libitm',
    'libobjc',
    'libquadmath',
    'libssp',
    'libstdc++-v3',
    'libvtv',
    'lto-plugin']
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</bridgehead>

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</para>

<orderedlist numeration="loweralpha" inheritnum="ignore" continuation="restarts">
  <listitem>
    <para>
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    </para>
  </listitem>
  <listitem>
    <para>
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    </para>
  </listitem>
  <listitem>
    <para>
    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.
    </para>
  </listitem>
  <listitem>
    <para>
    Convey the object code by offering access from a designated place
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Regardless of what server hosts the Corresponding Source, you remain
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satisfy these requirements.
</para>
</listitem>
</listitem>
</orderedlist>

<para>
Convey the object code using peer-to-peer transmission, provided you
inform other peers where the object code and Corresponding Source of the
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</para>
</listitem>
</orderedlist>

<para>
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</para>
</para>

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</para>

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</appendix>

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^L

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Author: Per Bothner

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That's all there is to it!
This is an attempt to acknowledge early contributions to the garbage
collector. Later contributions should instead be mentioned in
README.changes.

HISTORY -

Early versions of this collector were developed as a part of research
projects supported in part by the National Science Foundation
and the Defense Advance Research Projects Agency.

The garbage collector originated as part of the run-time system for
the Russell programming language implementation. The first version of the
garbage collector was written primarily by Al Demers. It was then refined
and mostly rewritten, primarily by Hans-J. Boehm, at Cornell U.,
the University of Washington, Rice University (where it was first used for
C and assembly code), Xerox PARC, SGI, and HP Labs. However, significant
contributions have also been made by many others.

Some other contributors:

More recent contributors are mentioned in the modification history in
README.changes. My apologies for any omissions.

The SPARC specific code was originally contributed by Mark Weiser.
The Encore Multimax modifications were supplied by
Kevin Kenny (kenny@m.cs.uiuc.edu). The adaptation to the IBM PC/RT is largely
due to Vernon Lee, on machines made available to Rice by IBM.
Much of the HP specific code and a number of good suggestions for improving the
generic code are due to Walter Underwood.
Robert Brazile (brazile@diamond.bbn.com) originally supplied the ULTRIX code.
Al Dosser (dosser@src.dec.com) and Regis Cridlig (Regis.Cridlig@cl.cam.ac.uk)
subsequently provided updates and information on variation between ULTRIX systems. Parag Patel (parag@netcom.com) supplied the A/UX code.
Jesper Peterson(jep@mtiame.mtia.oz.au), Michel Schinz, and
Martin Tauchmann (martintauchmann@bigfoot.com) supplied the Amiga port.
Thomas Funke (thf@zelator.in-berlin.de(?)) and
Brian D.Carlstrom (bdc@clark.lcs.mit.edu) supplied the NeXT ports.
Douglas Steel (doug@wg.icl.co.uk) provided ICL DRS6000 code.
Bill Janssen (janssen@parc.xerox.com) supplied the SunOS dynamic loader
specific code. Manuel Serrano (serrano@cornas.inria.fr) supplied linux and
Sony News specific code. Al Dosser provided Alpha/OSF/1 code. He and
Dave Detlefs(detlefs@src.dec.com) also provided several generic bug fixes.
Alistair G. Crooks(agic@uts.amdahl.com) supplied the NetBSD and 386BSD ports.
Jeffrey Hsu (hsu@soda.berkeley.edu) provided the FreeBSD port.
Brent Benson (brent@jade.ssd.csd.harris.com) ported the collector to
a Motorola 88K processor running CX/UX (Harris NightHawk).
Ari Huttunen (Ari.Huttunen@hut.fi) generalized the OS/2 port to
nonIBM development environments (a nontrivial task).
Patrick Beard (beard@cs.ucdavis.edu) provided the initial MacOS port.
David Chase, then at Olivetti Research, suggested several improvements.
Scott Schwartz (schwartz@groucho.cse.psu.edu) supplied some of the
code to save and print call stacks for leak detection on a SPARC.
Jesse Hull and John Ellis supplied the C++ interface code.
Zhong Shao performed much of the experimentation that led to the
current typed allocation facility. (His dynamic type inference code hasn’t
made it into the released version of the collector, yet.)

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#
# 128 bit long double support was introduced with GCC 4.6.0 for FreeBSD.
# These lines make the symbols to get a @@GCC_4.6.0.

%exclude {
  __addtf3
  __copysigntf3
  __divtc3
  __divtf3
  __eqtf2
  __extenddftf2
  __extendsftf2
  __extendxtf2
  __fabstf2
  __fixtfdi
  __fixtfsi
  __fixtfi
  __fixunstfdi
  __fixunstfsi
  __fixunstfti
  __floatditf
  __floatsitf
  __floattitf
  __floatunditf
  __floatunsitf
  __floatuntitf
  __getf2
  __gttf2
  __letf2
  __lttf2
  __multc3
__multf3
__negtf2
__netf2
__powitf2
__subtf3
__trunctfdf2
__trunctfsf2
__trunctxf2
__unordtf2
}

GCC_4.6.0 {
__addtf3
%ifndef __x86_64__
__copsigntf3
%endif
__divtc3
__dvtf3
__eqtf2
__extenddfdf2
__extendsftf2
__extendxftf2
%ifndef __x86_64__
__fabsuftf2
%endif
__fixtfdfi
__fixtfsi
%ifdef __x86_64__
__fixtfti
%endif
__fixunstfdi
__fixunstfsi
%ifdef __x86_64__
__fixunstfti
%endif
__floatditf
__floatsitf
%ifdef __x86_64__
__floattitf
%endif
__floatunditf
__floatunsitf
%ifdef __x86_64__
__floatuntitf
%endif
__getf2
__gttf2
__letf2
__lttf2
__multc3
__multf3
__negtf2
__netf2
__powitf2
__subtf3
__trunctdf2
__trunctsf2
__trunctxf2
__unordtf2
}

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@heading TERMS AND CONDITIONS

@enumerate 0
@item Definitions.

``This License'' refers to version 3 of the GNU General Public License.

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

``The Program'' refers to any copyrightable work licensed under this License. Each licensee is addressed as ``you''. ``Licensees'' and
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A ``covered work'' means either the unmodified Program or a work based on the Program.

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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 extent that warranties are provided), that licensees may convey the work under this License, and how to view a copy of this License. If the interface presents a list of user commands or options, such as a menu, a prominent item in the list meets this criterion.

@item 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 packaging a Major Component, but which is not part of that Major 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.

The “Corresponding Source” for a work in object code form means all 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 programs which are used unmodified in performing those activities but 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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@enumerate a
@item The work must carry prominent notices stating that you modified it, and giving a relevant date.

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@end enumerate

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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
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@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.

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@end enumerate

@end enumerate

@heading END OF TERMS AND CONDITIONS

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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.

@example
@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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General Public License for more details.

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@end example

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:

@example
@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 example

The hypothetical commands @samp{show w} and @samp{show c} should show
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@c man end

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Version 2.1, February 1999

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making modifications to it. For a library, complete source code means
all the source code for all modules it contains, plus any associated
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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 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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0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library 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
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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 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.

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that part of it is a work based on the Library, and explaining
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Ty Coon, President of Vice

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Preamble

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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.

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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.

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 "Lesser" General Public License because it does 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.

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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.

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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 combine or
link a "work that uses the Library" with the Library to produce a
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a) Accompany the work with the complete corresponding
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Sections 1 and 2 above); and, if the work is an executable linked
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that the user who changes the contents of definitions files in the
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b) Use a suitable shared library mechanism for linking with the
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copy of the library already present on the user's computer system,
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will operate properly with a modified version of the library, if
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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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/* Use the Sequent Symmetry assembler syntax. */

/* Define the syntax of pseudo-ops, labels and comments. */

/* Prefix for internally generated assembler labels. If we aren't using
underscores, we are using prefix `.s to identify labels that should
be ignored, as in `i386/gas.h' --karl@cs.umb.edu */

#define LPREFIX "L"

/* Assembler pseudos to introduce constants of various size. */

#define ASM_BYTE "\t.byte\t"
#define ASM_SHORT "\t.word\t"
#define ASM_LONG "\t.long\t"
#define ASM_QUAD "\t.quad\t" /* Should not be used for 32bit compilation. */

/* This was suggested, but it shouldn't be right for DBX output. -- RMS
#define ASM_OUTPUT_SOURCE_FILENAME(FILE, NAME) */

/* Define the syntax of labels and symbol definitions/declarations. */

/* This is how to output an assembler line
that says to advance the location counter by SIZE bytes. */

#define ASM_OUTPUT_SKIP(FILE,SIZE) \
fprintf (FILE, "\t.space " HOST_WIDE_INT_PRINT_UNSIGNED"\n", (SIZE))

/* Define the syntax of labels and symbol definitions/declarations. */

/* This says how to output an assembler line
to define a global common symbol. */

#define ASM_OUTPUT_COMMON(FILE, NAME, SIZE, ROUNDED) \
( fputs (".comm " , (FILE)) ,
 assemble_name ((FILE), (NAME)) ,
fprintf (FILE, "\t.space " HOST_WIDE_INT_PRINT_UNSIGNED"\n", (SIZE))

#define ASM_OUTPUTCOMMON(FILE, NAME, SIZE, ROUNDED) \
( fputs (".comm " , (FILE)) ,
 assemble_name ((FILE), (NAME)) ,
fprintf (FILE, "\t.space " HOST_WIDE_INT_PRINT_UNSIGNED"\n", (SIZE))

/* Define the syntax of labels and symbol definitions/declarations. */

/* Define the syntax of labels and symbol definitions/declarations. */

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/* Define the syntax of labels and symbol definitions/declarations. */

/* Define the syntax of labels and symbol definitions/declarations. */

/* Define the syntax of labels and symbol definitions/declarations. */
fprintf ((FILE), ",%u\n", (int)(ROUNDED)))

/* This says how to output an assembler line
   to define a local common symbol. */

#define ASM_OUTPUT_LOCAL(FILE, NAME, SIZE, ROUNDED) \ 
( fputs (".lcomm ", (FILE)),\ 
 assemble_name ((FILE), (NAME)),\ 
 fprintf ((FILE), ",%u\n", (int)(ROUNDED)))

#ifdef HAVE_GAS_LCOMM_WITH_ALIGNMENT
#define ASM_OUTPUT_ALIGNED_LOCAL(FILE, NAME, SIZE, ALIGNMENT) \ 
( fputs (".lcomm ", (FILE)),\ 
 assemble_name ((FILE), (NAME)),\ 
 fprintf ((FILE), ",%u,%u\n", (int)(SIZE), (int)(ALIGNMENT) / BITS_PER_UNIT))
#endif

/* This is how to output an assembler line
   that says to advance the location counter
to a multiple of 2**LOG bytes. */

#define ASM_OUTPUT_ALIGN(FILE,LOG)\ 
if ((LOG)!=0) fprintf ((FILE), "\align %d\n", (LOG))

/* This is how to store into the string BUF
    the symbol_ref name of an internal numbered label where
    PREFIX is the class of label and NUM is the number within the class.
    This is suitable for output with `assemble_name'. */

#define ASM_GENERATE_INTERNAL_LABEL(BUF,PREFIX,NUMBER)\ 
sprintf ((BUF), "*%s%ld", (PREFIX), (long)(NUMBER))

/* The prefix to add to user-visible assembler symbols. */

#define USER_LABEL_PREFIX "_

/* Sequent has some changes in the format of DBX symbols. */
#define DBX_NO_XREFS 1

/* Don't split DBX symbols into continuations. */
#define DBX_CONTIN_LENGTH 0

/* Automatically generated by Pod::Man 4.09 (Pod::Simple 3.35)*/
/* Standard preamble:*/
/*=======================================================================
.de Sp */ Vertical space (when we can't use .PP)
.if t.sp .5v
.if n.sp
Set up some character translations and predefined strings. \*(-- will
\*(PI will give pi, \*(L" will give a left
\*(R" will give a right double quote. \*(C+ will
\*(C++ gives a nicer C++. Capital omega is used to do unbreakable dashes and
\*(C+ therefore won't be available. \*(C- and \*(C' expand to ` in nroff,
\*(C+ nothing in troff, for use with C<<.
.tr \*(W-
.ds C+ C\*v'-.1v'\*h'-1p\*\*s0v'.1v'\*h'-1p'
.ie n \{|\n    .ds -- \*(W-
    .ds PI pi
    .if (.H=4u)&(1m=24u) .ds -- \*(W\*h'-12u\*(W\*h'-12u'-\*") diablo 10 pitch
    .if (.H=4u)&(1m=20u) .ds -- \*(W\*h'-12u\*(W\*h'-8u'-\*) diablo 12 pitch
    .ds L" "
    .ds R" "
    .ds C" "
    .ds C' "
    'br\}
.el\{|\n    .ds -- \}(em\|
    .ds PI \*p
    .ds L" "
    .ds R" "
    .ds C'
    .ds C'
    'br\}
\"
\" Escape single quotes in literal strings from groff's Unicode transform.
.ie \n(.g .ds Aq \}(aq
.el .ds Aq '{
\"
\" If the F register is >0, we'll generate index entries on stderr for
\" titles (.TH), headers (.SH), subsections (.SS), items (.Ip), and index
\" entries marked with X<> in POD. Of course, you'll have to process the
\" output yourself in some meaningful fashion.
\"
\" Avoid warning from groff about undefined register 'F'.
.de IX
IX Title "GPL 7"
.TH GPL 7 "2018-07-26" "gcc-8.2.0" "GNU"
" For nroff, turn off justification. Always turn off hyphenation; it makes
" way too many mistakes in technical documents.
.if n .ad l
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gpl \- GNU General Public License
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.IX Header "DESCRIPTION"
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*IP "1. Source Code."* 4

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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
free software which everyone can redistribute and change under these
terms.

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.

@smlalexample
@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}

This program is free software: you can redistribute it and/or modify
it under the terms of the GNU General Public License as published by
the Free Software Foundation, either version 3 of the License, or (at
your option) any later version.

This program is distributed in the hope that it will be useful, but
WITHOUT ANY WARRANTY; without even the implied warranty of
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You should have received a copy of the GNU General Public License along with this program. If not, see @url{http://www.gnu.org/licenses/}.
@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:

@sreamble
@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 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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------------------------------------------------------------------

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Julian Seward, jseward@bzip.org
bzip2/libbzip2 version 1.0.6 of 6 September 2010

#!/usr/bin/python
#
# Copyright (C) 2013-2018 Free Software Foundation, Inc.
#
# This script is free software; you can redistribute it and/or modify
# it under the terms of the GNU General Public License as published by
# the Free Software Foundation; either version 3, or (at your option)
# any later version.
#
# This script adjusts the copyright notices at the top of source files
# so that they have the form:
#
#   Copyright XXXX-YYYY Free Software Foundation, Inc.
#
# It doesn't change code that is known to be maintained elsewhere or
# that carries a non-FSF copyright.
#
# The script also doesn't change testsuite files, except those in
# libstdc++-v3. This is because libstdc++-v3 has a conformance testsuite,
# while most tests in other directories are just things that failed at some
# point in the past.
#
# Pass --this-year to the script if you want it to add the current year
# to all applicable notices. Pass --quilt if you are using quilt and
# want files to be added to the quilt before being changed.
#
# By default the script will update all directories for which the
# output has been vetted. You can instead pass the names of individual
# directories, including those that haven't been approved. So:
#
# update-copyright.py --this-year
#
# is the command that would be used at the beginning of a year to update
# all copyright notices (and possibly at other times to check whether
# new files have been added with old years). On the other hand:
#
# update-copyright.py --this-year libitm
#
# would run the script on just libitm/.
# Note that things like --version output strings must be updated before
# this script is run. There's already a separate procedure for that.

import os
import re
import sys
import time
import subprocess

class Errors:
    def __init__(self):
        self.num_errors = 0

    def report(self, filename, string):
        if filename:
            string = filename + ': ' + string
        sys.stderr.write(string + '\n')
        self.num_errors += 1

    def ok(self):
        return self.num_errors == 0

class GenericFilter:
    def __init__(self):
        self.skip_files = set()
        self.skip_dirs = set()
        self.skip_extensions = set()
        self.fossilised_files = set()
        self.own_files = set()

        self.skip_files |= set(['
            # Skip licence files.
            'COPYING',
            'COPYING.LIB',
            'COPYING3',
            'COPYING3.LIB',
            'LICENSE',
            'fdl.texi',
            'gpl_v3.texi',
            'fdl-1.3.xml',
            'gpl-3.0.xml',

            # Skip auto- and libtool-related files
            'aclocal.m4',
            'compile',
            'config.guess',
            'config.sub',

            # Skip auto- and libtool-related files
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            'compile',
            'config.guess',
            'config.sub',

            # Skip auto- and libtool-related files
            'aclocal.m4',
            'compile',
            'config.guess',
            'config.sub'}
'depcomp',
'install-sh',
'libtool.m4',
'ltmain.sh',
'ltoptions.m4',
'lt~obsolete.m4',
'missing',
'mkdep',
'mkinstalldirs',
'move-if-change',
'shlibpath.m4',
'symlink-tree',
'ylwrap',

# Skip FSF mission statement, etc.
'gnu.texi',
'funding.texi',
'appendix_free.xml',

# Skip imported texinfo files.
'texinfo.tex',
}

def get_line_filter (self, dir, filename):
    if filename.startswith ('ChangeLog'):
        # Ignore references to copyright in changelog entries.
        return re.compile ('\t')
    return None

def skip_file (self, dir, filename):
    if filename in self.skip_files:
        return True
    (base, extension) = os.path.splitext (os.path.join (dir, filename))
    if extension in self.skip_extensions:
        return True
    if extension == '.in':
        # Skip .in files produced by automake.
        if os.path.exists (base + '.am'):
            return True
    # Skip files produced by autogen
    if (os.path.exists (base + '.def'))
and os.path.exists (base + '.tpl')):
    return True

# Skip configure files produced by autoconf
if filename == 'configure':
    if os.path.exists (base + '.ac'):
        return True
    if os.path.exists (base + '.in'):
        return True

return False

def skip_dir (self, dir, subdir):
    return subdir in self.skip_dirs

def is_fossilised_file (self, dir, filename):
    if filename in self.fossilised_files:
        return True
    # Only touch current current ChangeLogs.
    if filename != 'ChangeLog' and filename.find ('ChangeLog') >= 0:
        return True
    return False

def by_package_author (self, dir, filename):
    return filename in self.own_files

class Copyright:
    def __init__ (self, errors):
        self.errors = errors

        # Characters in a range of years. Include '.' for typos.
        ranges = '[0-9]([-0-9.,\s+\s+\s+]*[0-9])

        # Non-whitespace characters in a copyright holder's name.
        name = '([^\w.\-])

        # Matches one year.
        self.year_re = re.compile ('[0-9]+$')

        # Matches part of a year or copyright holder.
        self.continuation_re = re.compile (ranges + '\d+\d+$')

        # Matches a full copyright notice:
        self.copyright_re = re.compile (
            # 1: 'Copyright (C)', etc.
            '\[Cc\]opyright\d+\d+$')

    def is_copyright (self, line):
        return self.copyright_re.match (line) is not None

    def check_copyright (self, filename):
        with open (filename, 'r') as file:
            for line in file:
                if self.is_copyright (line):
                    self.errors.append (filename + ': Line ' + str(line_number))

    def run (self):
        for dir, subdirs, files in os.walk (self.root):
            for subdir in subdirs:
                if subdir in self.skip_dirs:
                    continue

            for filename in files:
                if filename == 'configure':
                    if os.path.exists (os.path.join (dir, filename + '.ac')):
                        continue
                    if os.path.exists (os.path.join (dir, filename + '.in')):
                        continue
                    continue

                if filename in self.fossilised_files:
                    continue

                # Only touch current current ChangeLogs.
                if filename != 'ChangeLog' and filename.find ('ChangeLog') >= 0:
                    continue

            self.check_copyright (os.path.join (dir, 'ChangeLog'))

# Class to find copyright notices in files.
class CopyrightFinder:
    def __init__ (self, root, skip_dirs):
        self.root = root
        self.skip_dirs = skip_dirs

    def find_copyrights (self):
        copyright = Copyright (self.errors)
        copyright.run ()

        return copyright.errors

# Example usage
finder = CopyrightFinder (os.getcwd (), [self.skip_dirs])
finder.find_copyrights ()
def add_package_author (self, holder, canon_form = None):
    if not canon_form:
        canon_form = holder
    self.holders[holder] = canon_form
    index = holder.find (',')
    while index >= 0:
        self.holder_prefixes.add (holder[:index])
        index = holder.find (',', index + 1)

def add_external_author (self, holder):
    self.holders[holder] = None
class BadYear:
    def __init__(self, year):
        self.year = year

    def __str__(self):
        return 'unrecognised year: ' + self.year

def parse_year(self, string):
    year = int(string)
    if len(string) == 2:
        if year > 70:
            return year + 1900
    elif len(string) == 4:
        return year
    raise self.BadYear(string)

def year_range(self, years):
    year_list = [self.parse_year(year)
                 for year in self.year_re.findall(years)]
    assert len(year_list) > 0
    return (min(year_list), max(year_list))

def set_use_quilt(self, use_quilt):
    self.use_quilt = use_quilt

def include_year(self, year):
    assert not self.max_year
    self.max_year = year

def canonicalise_years(self, dir, filename, filter, years):
    # Leave texinfo variables alone.
    if years.startswith('@value'):
        return years
    (min_year, max_year) = self.year_range(years)

    # Update the upper bound, if enabled.
    if self.max_year and not filter.is_fossilised_file(dir, filename):
        max_year = max(max_year, self.max_year)

    # Use a range.
    if min_year == max_year:
        return '%d' % min_year
    else:
        return '%d-%d' % (min_year, max_year)

def strip_continuation(self, line):
    line = line.lstrip()
match = self.comment_re.match(line)
if match:
    line = line[match.end():].lstrip()
return line

def is_complete(self, match):
    holder = match.group(4)
    return (holder
    and (holder not in self.holder_prefixes
         or holder in self.holders))

def update_copyright(self, dir, filename, filter, file, line, match):
    orig_line = line
    next_line = None
    pathname = os.path.join(dir, filename)

    intro = match.group(1)
    if intro.startswith('@set'):
        # Texinfo year variables should always be on one line
        after_years = line[match.end(2):].strip()
        if after_years != ':
            self.errors.report(pathname,
                               'trailing characters in @set:
                               + after_years)
            return (False, orig_line, next_line)
    else:
        # If it looks like the copyright is incomplete, add the next line.
        while not self.is_complete(match):
            try:
                next_line = file.next()
            except StopIteration:
                break

            # If the next line doesn't look like a proper continuation,
            # assume that what we've got is complete.
            continuation = self.strip_continuation(next_line)
            if not self.continuation_re.match(continuation):
                break

            # Merge the lines for matching purposes.
            orig_line += next_line
            line = line.rstrip() + ' ' + continuation
            next_line = None

        # Rematch with the longer line, at the original position.
        match = self.copyright_re.match(line, match.start())
        assert match
holder = match.group(4)

# Use the filter to test cases where markup is getting in the way.
if filter.by_package_author(dir, filename):
    assert holder not in self.holders

elif not holder:
    self.errors.report(pathname, 'missing copyright holder')
    return (False, orig_line, next_line)

elif holder not in self.holders:
    self.errors.report(pathname, 'unrecognised copyright holder: ' + holder)
    return (False, orig_line, next_line)

else:
    # See whether the copyright is associated with the package
    # author.
    canon_form = self.holders[holder]
    if not canon_form:
        return (False, orig_line, next_line)

    # Make sure the author is given in a consistent way.
    line = (line[:match.start(4)]
        + canon_form
        + line[match.end(4):])

    # Remove any 'by'
    line = line[:match.start(3)] + line[match.end(3):]

    # Update the copyright years.
    years = match.group(2).strip()
    try:
        canon_form = self.canonicalise_years(dir, filename, filter, years)
    except self.BadYear as e:
        self.errors.report(pathname, str(e))
        return (False, orig_line, next_line)

    line = (line[:match.start(2)]
        + ('' if intro.startswith('copyright = ') else ' ')
        + canon_form + self.separator
        + line[match.end(2):])

    # Use the standard (C) form.
    if intro.endswith('right'):
        intro += ' (C)'
    elif intro.endswith('(c)'):
        intro = intro[:-3] + '(C)'

    if intro.startswith('copyright = '):
        intro = intro.replace('copyright = ', 'copyright = C')
line = line[:match.start (1)] + intro + line[match.end (1):]

# Strip trailing whitespace
line = line.rstrip() + '\n'

return (line != orig_line, line, next_line)

def process_file (self, dir, filename, filter):
    pathname = os.path.join (dir, filename)
    if filename.endswith ('.tmp'):
        # Looks like something we tried to create before.
        try:
            os.remove (pathname)
        except OSError:
            pass
        return
    lines = []
    changed = False
    line_filter = filter.get_line_filter (dir, filename)
    mode = None
    with open (pathname, 'r') as file:
        prev = None
        mode = os.fstat (file.fileno()).st_mode
        for line in file:
            while line:
                next_line = None
                # Leave filtered-out lines alone.
                if not (line_filter and line_filter.match (line)):
                    match = self.copyright_re.search (line)
                    if match:
                        res = self.update_copyright (dir, filename, filter,
                                                     file, line, match)
                        (this_changed, line, next_line) = res
                        changed = changed or this_changed
                # Check for copyright lines that might have slipped by.
                elif self.other_copyright_re.search (line):
                    self.errors.report (pathname,
                                        'unrecognised copyright: %s'
                                        % line.strip())
                    lines.append (line)
                    line = next_line
                # If something changed, write the new file out.
                if changed and self.errors.ok():
                    tmp_pathname = pathname + '.tmp'
                    with open (tmp_pathname, 'w') as file:
for line in lines:
    file.write (line)
    os.fchmod (file.fileno(), mode)
if self.use_quilt:
    subprocess.call (["quilt", 'add', pathname])
    os.rename (tmp_pathname, pathname)

def process_tree (self, tree, filter):
    for (dir, subdirs, filenames) in os.walk (tree):
        # Don't recurse through directories that should be skipped.
        for i in xrange (len (subdirs) - 1, -1, -1):
            if filter.skip_dir (dir, subdirs[i]):
                del subdirs[i]

        # Handle the files in this directory.
        for filename in filenames:
            if filter.skip_file (dir, filename):
                sys.stdout.write ('Skipping %s
' % os.path.join (dir, filename))
            else:
                self.process_file (dir, filename, filter)

class CmdLine:
    def __init__ (self, copyright = Copyright):
        self.errors = Errors()
        self.copyright = copyright (self.errors)
        self.dirs = []
        self.default_dirs = []
        self.chosen_dirs = []
        self.option_handlers = dict()
        self.option_help = []

        self.add_option ('--help', 'Print this help', self.o_help)
        self.add_option ('--quilt', '"quilt add" files before changing them', self.o_quilt)
        self.add_option ('--this-year', 'Add the current year to every notice', self.o_this_year)

    def add_option (self, name, help, handler):
        self.option_help.append ((name, help))
        self.option_handlers[name] = handler

    def add_dir (self, dir, filter = GenericFilter()):
        self.dirs.append ((dir, filter))

    def o_help (self, option = None):
        sys.stdout.write ('Usage: %s [options] dir1 dir2...

        Options:
' % sys.argv[0])

    def add_dir (self, dir, filter = GenericFilter()):
        self.dirs.append ((dir, filter))

    def o_help (self, option = None):
        sys.stdout.write ('Usage: %s [options] dir1 dir2...

        Options: --help, --quilt, --this-year
' % sys.argv[0])

        sys.stdout.write ('Options: --help

        Options: --quilt

        Options: --this-year

        Options: --year

        Options: --version

        Options: --copyright

        Options: --dir

        Options: --filter

        Options: --copyright-year

        Options: --copyright-dir

        Options: --copyright-filter

        Options: --copyright-help
for (what, help) in self.option_help:
    sys.stdout.write (format % (what, help))
sys.stdout.write ("\n")

format = "%-15s %s\n"
for (what, help) in self.option_help:
    sys.stdout.write (format % (what, help))
sys.stdout.write ("\n")

format = "%-25s"
i = 0
for (dir, filter) in self.dirs:
    i += 1
    if i % 3 == 0 or i == len (self.dirs):
        sys.stdout.write (dir + "\n")
    else:
        sys.stdout.write (format % dir)
sys.exit (0)

def o_quilt (self, option):
    self.copyright.set_use_quilt (True)

def o_this_year (self, option):
    self.copyright.include_year (time.localtime().tm_year)

def main (self):
    for arg in sys.argv[1:]:
        if arg[1:] != ':':
            self.chosen_dirs.append (arg)
        elif arg in self.option_handlers:
            self.option_handlers[arg] (arg)
        else:
            self.errors.report (None, 'unrecognised option: ' + arg)
    if self.errors.ok():
        if len (self.chosen_dirs) == 0:
            self.chosen_dirs = self.default_dirs
        if len (self.chosen_dirs) == 0:
            self.o_help()
        else:
            for chosen_dir in self.chosen_dirs:
                canon_dir = os.path.join (chosen_dir, '')
                count = 0
                for (dir, filter) in self.dirs:
                    if (dir + os.sep).startswith (canon_dir):
                        count += 1
                self.copyright.process_tree (dir, filter)
                if count == 0:
                    self.errors.report (None, 'unrecognised directory: ' + chosen_dir)
                    sys.exit (0 if self.errors.ok() else 1)

#----------------------------------------------------------------------------
class TopLevelFilter (GenericFilter):
    def skip_dir (self, dir, subdir):
        return True

class ConfigFilter (GenericFilter):
    def __init__ (self):
        GenericFilter.__init__ (self)
    def skip_file (self, dir, filename):
        if filename.endswith ('.m4'):
            pathname = os.path.join (dir, filename)
            with open (pathname) as file:
                # Skip files imported from gettext.
                if file.readline().find ('gettext-') >= 0:
                    return True
        return GenericFilter.skip_file (self, dir, filename)

class GCCFilter (GenericFilter):
    def __init__ (self):
        GenericFilter.__init__ (self)
        self.skip_files |= set (
            # Not part of GCC
            'math-68881.h',
        )
        self.skip_dirs |= set (
            # Better not create a merge nightmare for the GNAT folks.
            'ada',
            # Handled separately.
            'testsuite',
        )
        self.skip_extensions |= set (
            # Maintained by the translation project.
            '.po',
            # Automatically-generated.
            '.pot',
        )
        self.fossilised_files |= set (
            # Old news won't be updated.
            'ONEWS',
        )
class TestsuiteFilter (GenericFilter):
    def __init__ (self):
        GenericFilter.__init__ (self)

        self.skip_extensions |= set ([
            # Don't change the tests, which could be written by anyone.
            '.c',
            '.C',
            '.cc',
            '.h',
            '.hs',
            '.f',
            '.f90',
            '.go',
            '.inc',
            '.java',
        ])

    def skip_file (self, dir, filename):
        # g++.niklas/README contains historical copyright information
        # and isn't updated.
        if filename == 'README' and os.path.basename (dir) == 'g++.niklas':
            return True
        # Similarly params/README.
        if filename == 'README' and os.path.basename (dir) == 'params':
            return True
        if filename == 'pdt_5.f03' and os.path.basename (dir) == 'gfortran.dg':
            return True
        return GenericFilter.skip_file (self, dir, filename)

class LibCppFilter (GenericFilter):
    def __init__ (self):
        GenericFilter.__init__ (self)

        self.skip_extensions |= set ([
            # Maintained by the translation project.
            '.po',

            # Automatically-generated.
            '.pot',
        ])

class LibGCCFilter (GenericFilter):
    def __init__ (self):
        GenericFilter.__init__ (self)

        self.skip_dirs |= set ([
            # Imported from GLIBC.

            # Imported from GLIBC.
        ])

        self.skip_dirs |= set ([
            # Imported from GLIBC.
        ])

        self.skip_dirs |= set ([
            # Imported from GLIBC.
        ])
class LibStdCxxFilter (GenericFilter):
    def __init__ (self):
        GenericFilter.__init__ (self)

        self.skip_files |= set ([
            # Contains no copyright of its own, but quotes the GPL.
            'intro.xml',
        ])

        self.skip_dirs |= set ([
            # Contains automatically-generated sources.
            'html',

            # The testsuite data files shouldn't be changed.
            'data',

            # Contains imported images
            'images',
        ])

        self.own_files |= set ([
            # Contains markup around the copyright owner.
            'spine.xml',
        ])

    def get_line_filter (self, dir, filename):
        if filename == 'boost_concept_check.h':
            return re.compile ('// \(C\) Copyright Jeremy Siek')
        return GenericFilter.get_line_filter (self, dir, filename)

class GCCCopyright (Copyright):
    def __init__ (self, errors):
        Copyright.__init__ (self, errors)

        canon_fsfd = 'Free Software Foundation, Inc.'
        self.add_package_author ('Free Software Foundation', canon_fsfd)
        self.add_package_author ('Free Software Foundation.', canon_fsfd)
        self.add_package_author ('Free Software Foundation Inc.', canon_fsfd)
        self.add_package_author ('Free Software Foundation, Inc', canon_fsfd)
        self.add_package_author ('Free Software Foundation, Inc.', canon_fsfd)
        self.add_package_author ('The Free Software Foundation', canon_fsfd)
        self.add_package_author ('The Free Software Foundation, Inc.', canon_fsfd)
        self.add_package_author ('Software Foundation, Inc.', canon_fsfd)

        self.add_external_author ('ARM')
class GCCCmdLine (CmdLine):
    def __init__(self):
        CmdLine.__init__(self, GCCCopyright)

        self.add_dir ('.', TopLevelFilter())
        # boehm-gc is imported from upstream.
        self.add_dir ('config', ConfigFilter())
        # contrib isn't really part of GCC.
        self.add_dir ('fixincludes')
        self.add_dir ('gcc', GCCFilter())
        self.add_dir (os.path.join ('gcc', 'testsuite'), TestsuiteFilter())
        self.add_dir (os.path.join ('gnattools'))
        self.add_dir ('gotools')
        self.add_dir ('include')
        # intl is imported from upstream.
        self.add_dir ('libada')
        self.add_dir ('libatomic')
        self.add_dir ('libbacktrace')
        self.add_dir ('libcpp')
        self.add_dir ('libcpp', LibCppFilter())

self.add_external_author ('AdaCore')
self.add_external_author ('Ami Tavory and Vladimir Dreizin, IBM-HRL.')
self.add_external_author ('Cavium Networks.')
self.add_external_author ('Faraday Technology Corp.')
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self.add_external_author ('Unicode, Inc.')
self.add_external_author ('University of Toronto.')
self.add_dir('libdecnumber')
# libffi is imported from upstream.
self.add_dir('libgcc', LibGCCFilter())
self.add_dir('libfortran')
# libgo is imported from upstream.
self.add_dir('libgomp')
self.add_dir('libhsail-rt')
self.add_dir('libiberty')
self.add_dir('libitm')
self.add_dir('libobjc')
# liboffloadmic is imported from upstream.
self.add_dir('libquadmath')
# libsanitizer is imported from upstream.
self.add_dir('libssp')
self.add_dir('libstdc++-v3', LibStdCxxFilter())
self.add_dir('libvtv')
self.add_dir('lto-plugin')
# maintainer-scripts maintainer-scripts
# zlib is imported from upstream.

self.default_dirs = [
    'gcc',
    'include',
    'libada',
    'libatomic',
    'libbacktrace',
    'libcc1',
    'libcpp',
    'libdecnumber',
    'libgcc',
    'libfortran',
    'libgomp',
    'libhsail-rt',
    'libiberty',
    'libitm',
    'libobjc',
    'libssp',
    'libstdc++-v3',
    'libvtv',
    'lto-plugin',
]

GCCCmdLine().main()
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with the Library, with the complete machine-readable "work that
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copy of the library already present on the user's computer system,
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will operate properly with a modified version of the library, if
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1.101 libuv 1.11.0 :1

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1.105 libyaml 0.1.6

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-- vile: txtmode file-encoding=utf-8
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-- vile:txtmode fc=72
-- $Id: COPYING,v 1.6 2018/01/01 12:00:00 tom Exp $
Upstream source https://invisible-island.net/ncurses/ncurses-examples.html

Current ncurses maintainer: Thomas Dickey <dickey@invisible-island.net>

Files: *
Licence: X11

Files: aclocal.m4 package
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1.117 ndisc6
1.0.4+git4c794b5512d23c649def1f94a684225dcbb6ac3e

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- Mark Andrews <mark_andrews@isc.org> Leitch atomic clock controller
- Bernd Altmeier <altmeier@atlsoft.de> hopf Elektronik serial line and PCI-bus devices
- Viraj Bais <vbais@mailman1.intel.com> and Clayton Kirkwood <kirkwood@striderfm.intel.com> port to WindowsNT 3.5
- Michael Barone <michael,barone@lmco.com> GPSVME fixes
- Karl Berry <karl@owl.HQ.ileaf.com> syslog to file option
- Greg Brackley <greg.brackley@bigfoot.com> Major
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Ulrich Windl <Ulrich.Windl@rz.uni-regensburg.de> corrected and validated HTML documents according to the HTML DTD

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jp "Clone me," says Dolly sheepishly.

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2. [2]Mark Andrews <mark_andrews@isc.org> Leitch atomic clock controller
3. [3]Bernd Altmeier <altmeier@atlsoft.de> hopf Elektronik serial line and PCI-bus devices
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
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10. [11]Nelson B Bolyard <nelson@bolyard.me> update and complete broadcast and crypto features in snntp
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34. [37]Louis A. Mamakos <louie@ni.umd.edu> MD5-based authentication
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37. [40]David L. Mills <mills@udel.edu> Version 4 foundation,
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THE SOFTWARE.
/* -.*- Mode: Text -.*- */

copyright = {
  date = "1992-2017";
  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/\[// -e '\]'.*/\' < ../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 snntp/include/version.texi .
 */
// doc-sub = {
//  sub-name = version;
//  sub-text = 's/#VERSION#/<<version>>/g';
// };

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1.124 open-vm-tools 10.1.5

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>>> freebsd-base64-4.8

base64.c -- routines to encode/decode base64 data
S:OpenLDAP: pkg/ldap/libraries/liblutil/base64.c,v 1.15 2006/01/03 22:12:11 kurt Exp $ /
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* @author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>
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 */

#ifndef HAVE_SETRESGID
int setresgid(gid_t, gid_t, gid_t);
#endif
#ifndef HAVE_SETRESUID
int setresuid(uid_t, uid_t, uid_t);
#endif
/*$OpenBSD: poll.h,v 1.11 2003/12/10 23:10:08 millert Exp $ */

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*/

/* OPENBSD ORIGINAL: sys/sys/poll.h */

#ifndef _COMPAT_POLL_H_
#define _COMPAT_POLL_H_

typedef struct pollfd {
    int fd;
    short events;
    short revents;
} pollfd_t;

typedef unsigned int nfds_t;

#define POLLIN 0x0001
#define POLLOUT 0x0004
#define POLLERR 0x0008
#define POLLHUP 0x0010
#define POLLNVAL 0x0020
#if 0
/* the following are currently not implemented */
#define POLLPRI 0x0002
#define POLLRDND 0x0040
#define POLLNORM POLLRDND
#define POLLWRNORM POLLOUT
#define POLLRD BAND 0x0080
#define POLLWRBAND 0x0100
#endif
#define INFTIM (-1) /* not standard */

int poll(struct pollfd *, nfds_t, int);
#endif /* !_COMPAT_POLL_H_ */
#endif /* !HAVE_POLL_H */
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 *
 */

#ifndef _BSD_WAITPID_H
#define _BSD_WAITPID_H
#endif
#ifndef HAVE_WAITPID
/* Clean out any potential issues */
#undef WIFEXITED
#undef WIFSTOPPED
#undef WIFSIGNALED

/* Define required functions to mimic a POSIX look and feel */
#define _W_INT(w) (*(int *)&(w)) /* convert union wait to int */
#define WIFEXITED(w) (!(_W_INT(w)) & 0377)
#define WIFSTOPPED(w) ((_W_INT(w)) & 0100)
#define WIFSIGNALED(w) !WIFEXITED(w) && !WIFSTOPPED(w)
#define WEXITSTATUS(w) (int)(WIFEXITED(w) ? ((_W_INT(w) >> 8) & 0377) : -1)
#define WTERMSIG(w) (int)(WIFSIGNALED(w) ? (_W_INT(w) & 0177) : -1)
#define WCOREFLAG 0x80
#define WCOREDUMP(w) ((_W_INT(w)) & WCOREFLAG)
/* Prototype */

pid_t waitpid(int, int *, int);

#endif /* !HAVE_WAITPID */
#endif /* _BSD_WAITPID_H */

1.126 opkg-utils 0.3.6

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1.133 pcre 8.41
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#!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 TestInit;
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) = $copyright_msg =~ /.*(\d{4,})/s
    or die "Year not found in README copyright message '$copyright_msg'";

  $year;
}

sub v_year
# returns the latest copyright year shown in perl -v
{
  my $output = runperl switches => ['\n
my ($year) = $output =~ /\n    or die "Copyright statement not found in perl -v output '$output'";

  $year;
}

---
abstract: 'Build and install Perl modules'
author:
  - 'Ken Williams <kwilliams@cpan.org>'
  - "Development questions, bug reports, and patches should be sent to the\n    Module-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
  license: http://dev.perl.org/licenses/
  repository: http://github.com/dagolden/module-build/
  version: 3

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1.135 popt 1.16

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1.136 ppp 2.4.7 :r0

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1.141 protobuf-c 1.3.0
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1.142 pyasn1 0.4.2

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1.143 pycparser 2.18

1.144 pycrypto 2.6.1

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1.145 python 2.7.14

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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
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Zope Corporation. In 2001, the Python Software Foundation (PSF, see
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-----------------

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   A C-program for MT19937, with initialization improved 2002/1/26.
   Coded by Takuji Nishimura and Makoto Matsumoto.

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http://www.math.sci.hiroshima-u.ac.jp/~m-mat/MT/emt.html
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Sockets
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-----------------------------

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Independent implementation of MD5 (RFC 1321).

This code implements the MD5 Algorithm defined in RFC 1321, whose text is available at

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The code is derived from the text of the RFC, including the test suite (section A.5) but excluding the rest of Appendix A. It does not include any code or documentation that is identified in the RFC as being copyrighted.

The original and principal author of md5.h is L. Peter Deutsch <ghost@aladdin.com>. Other authors are noted in the change history that follows (in reverse chronological order):

2002-04-13 lpd Removed support for non-ANSI compilers; removed references to Ghostscript; clarified derivation from RFC 1321; now handles byte order either statically or dynamically.
1999-11-04 lpd Edited comments slightly for automatic TOC extraction.
1999-10-18 lpd Fixed typo in header comment (ansi2knr rather than md5); added conditionalization for C++ compilation from Martin
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Modified by Jack Jansen, CWI, July 1995:
- Use binascii module to do the actual line-by-line conversion
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- Arguments more compliant with Python standard

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-----------------------------

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1.146 python-cffi 1.11.5

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1.147 python-cryptography 2.1.4

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1.148 python-idna 2.6

1.149 python-jsonpatch 1.23
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1.150 python-jsonpointer 2.0

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1.151 python-ndg-httpsclient 0.4.4

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1.152 python-pbr 3.1.1 :2.el7ost
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1.155 python-pyopenssl 17.5.0
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1.156 python-pysocks 1.6.8 :5.el7

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1.157 python-requests 2.18.4-r0

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1.158 python-six 1.11.0

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1.159 PyYAML 3.12

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1.164 requests 2.18.4

1.165 run-postinsts 1.0

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1.166 sbsigntool 0.6-951ee95a301674c046f55330cd7460e1314deff2:0ubuntu4~12.04.1

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1.167 setuptools 39.0.0

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1.170 shared-mime-info 1.9 :2

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1.184 trousers 0.3.13
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1.185 tzdata 2018d :1

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1.186 u-boot 2013.07

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1.194 xz 5.2.3 :0
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==================

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1.195 zlib 1.2.11

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