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Contents

1.1 ESR-Linux32-shared-libs-diffcn 1.0

1.1.1 Available under license

1.2 ESR-Linux32-shared-libs-elf 1.0

1.2.1 Available under license

1.3 ESR-Linux32-shared-libs-libio 1.0

1.3.1 Available under license

1.4 ESR-Linux32-shared-libs-math 1.0

1.4.1 Available under license

1.5 ESR-Linux32-shared-libs-nis 1.0

1.5.1 Available under license

1.6 ESR-Linux32-shared-libs-nptl 1.0

1.6.1 Available under license

1.7 ESR-Linux32-shared-libs-nptl-db 1.0

1.7.1 Available under license

1.8 ESR-Linux32-shared-libs-rt 1.0

1.8.1 Available under license

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/* Load a shared object at run time.

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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.

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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.

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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 interface-compatible with the version that the work was made with.

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

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

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

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

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- 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.

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1.4 ESR-Linux32-shared-libs-math 1.0

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1.5 ESR-Linux32-shared-libs-nis 1.0

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```

#include <string.h>
#include <rpc/rpc.h>
#include <rpcsvc/nis.h>
#include <shlib-compat.h>

#include "nis_xdr.h"

nis_object *
nis_clone_object (const nis_object *src, nis_object *dest)
{
    char *addr;
    unsigned int size;
    XDR xdrs;
    nis_object *res = NULL;

    if (src == NULL)
        return (NULL);

    size = xdr_sizeof ((xdrproc_t)_xdr_nis_object, (char *) src);
    if ((addr = calloc (1, size)) == NULL)
        return NULL;

    if (dest == NULL)
    {
        if ((res = calloc (1, sizeof (nis_object))) == NULL)
            goto out;
    }
    else
        res = dest;

    xdrmem_create (&xdrs, addr, size, XDR_ENCODE);
    if (!_xdr_nis_object (&xdrs, (nis_object *) src))
        goto out2;
    xdr_destroy (&xdrs);
    xdrmem_create (&xdrs, addr, size, XDR_DECODE);
    if (!_xdr_nis_object (&xdrs, res))
    {
        out2:
        if (dest == NULL)
            free (res);
        res = NULL;
    }

    xdr_destroy (&xdrs);
out:
    free (addr);

```

```
return res;
}
libnsl_hidden_nolink_def (nis_clone_object, GLIBC_2_1)
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Version 2.1, February 1999
```

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1.6 ESR-Linux32-shared-libs-nptl 1.0

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```
#include <assert.h>
#include <errno.h>
#include <signal.h>
#include <stdint.h>
#include <string.h>
#include <unistd.h>
#include <sys/mman.h>
#include <sys/param.h>
#include <dl-sysdep.h>
#include <dl-tls.h>
#include <tls.h>
#include <list.h>
#include <lowlevellock.h>
#include <futex-internal.h>
#include <kernel-features.h>
#include <stack-aliasing.h>

#ifndef NEED_SEPARATE_REGISTER_STACK

/* Most architectures have exactly one stack pointer. Some have more. */
#define STACK_VARIABLES void *stackaddr = NULL

/* How to pass the values to the 'create_thread' function. */
#define STACK_VARIABLES_ARGS stackaddr

/* How to declare function which gets there parameters. */
#define STACK_VARIABLES_PARMS void *stackaddr

/* How to declare allocate_stack. */
#define ALLOCATE_STACK_PARMS void **stack

/* This is how the function is called. We do it this way to allow
other variants of the function to have more parameters. */
#define ALLOCATE_STACK(attr, pd) allocate_stack (attr, pd, &stackaddr)
```

```

#else

/* We need two stacks. The kernel will place them but we have to tell
the kernel about the size of the reserved address space. */
#define STACK_VARIABLES void *stackaddr = NULL; size_t stacksize = 0

/* How to pass the values to the 'create_thread' function. */
#define STACK_VARIABLES_ARGS stackaddr, stacksize

/* How to declare function which gets there parameters. */
#define STACK_VARIABLES_PARMS void *stackaddr, size_t stacksize

/* How to declare allocate_stack. */
#define ALLOCATE_STACK_PARMS void **stack, size_t *stacksize

/* This is how the function is called. We do it this way to allow
other variants of the function to have more parameters. */
#define ALLOCATE_STACK(attr, pd) \
allocate_stack (attr, pd, &stackaddr, &stacksize)

#endif

/* Default alignment of stack. */
#ifndef STACK_ALIGN
#define STACK_ALIGN __alignof__ (long double)
#endif

/* Default value for minimal stack size after allocating thread
descriptor and guard. */
#ifndef MINIMAL_REST_STACK
#define MINIMAL_REST_STACK 4096
#endif

/* Newer kernels have the MAP_STACK flag to indicate a mapping is used for
a stack. Use it when possible. */
#ifndef MAP_STACK
#define MAP_STACK 0
#endif

/* This yields the pointer that TLS support code calls the thread pointer. */
#if TLS_TCB_AT_TP
#define TLS_TPADJ(pd) (pd)
#elif TLS_DTV_AT_TP
#define TLS_TPADJ(pd) ((struct pthread *)((char *) (pd) + TLS_PRE_TCB_SIZE))
#endif

```

```

/* Cache handling for not-yet free stacks. */

/* Maximum size in kB of cache. */
static size_t stack_cache_maxsize = 40 * 1024 * 1024; /* 40MiBi by default. */
static size_t stack_cache_actsize;

/* Mutex protecting this variable. */
static int stack_cache_lock = LLL_LOCK_INITIALIZER;

/* List of queued stack frames. */
static LIST_HEAD (stack_cache);

/* List of the stacks in use. */
static LIST_HEAD (stack_used);

/* We need to record what list operations we are going to do so that,
   in case of an asynchronous interruption due to a fork() call, we
   can correct for the work. */
static uintptr_t in_flight_stack;

/* List of the threads with user provided stacks in use. No need to
   initialize this, since it's done in __pthread_initialize_minimal. */
list_t __stack_user __attribute__((nocommon));
hidden_data_def (__stack_user)

/* Check whether the stack is still used or not. */
#define FREE_P(descr) ((descr)->tid <= 0)

static void
stack_list_del (list_t *elem)
{
    in_flight_stack = (uintptr_t) elem;

    atomic_write_barrier ();

    list_del (elem);

    atomic_write_barrier ();

    in_flight_stack = 0;
}

static void
stack_list_add (list_t *elem, list_t *list)

```

```

{
in_flight_stack = (uintptr_t) elem | 1;

atomic_write_barrier ();

list_add (elem, list);

atomic_write_barrier ();

in_flight_stack = 0;
}

/* We create a double linked list of all cache entries. Double linked
because this allows removing entries from the end. */

/* Get a stack frame from the cache. We have to match by size since
some blocks might be too small or far too large. */
static struct pthread *
get_cached_stack (size_t *sizep, void **memp)
{
size_t size = *sizep;
struct pthread *result = NULL;
list_t *entry;

lll_lock (stack_cache_lock, LLL_PRIVATE);

/* Search the cache for a matching entry. We search for the
smallest stack which has at least the required size. Note that
in normal situations the size of all allocated stacks is the
same. As the very least there are only a few different sizes.
Therefore this loop will exit early most of the time with an
exact match. */
list_for_each (entry, &stack_cache)
{
struct pthread *curr;

curr = list_entry (entry, struct pthread, list);
if (FREE_P (curr) && curr->stackblock_size >= size)
{
if (curr->stackblock_size == size)
{
result = curr;
break;
}
}

if (result == NULL

```

```

    || result->stackblock_size > curr->stackblock_size)
    result = curr;
}
}

if (__builtin_expect (result == NULL, 0)
    /* Make sure the size difference is not too excessive. In that
    case we do not use the block. */
    || __builtin_expect (result->stackblock_size > 4 * size, 0))
{
    /* Release the lock. */
    ll_unlock (stack_cache_lock, LLL_PRIVATE);

    return NULL;
}

/* Don't allow setxid until cloned. */
result->setxid_futex = -1;

/* Dequeue the entry. */
stack_list_del (&result->list);

/* And add to the list of stacks in use. */
stack_list_add (&result->list, &stack_used);

/* And decrease the cache size. */
stack_cache_actsize -= result->stackblock_size;

/* Release the lock early. */
ll_unlock (stack_cache_lock, LLL_PRIVATE);

/* Report size and location of the stack to the caller. */
*sizep = result->stackblock_size;
*memp = result->stackblock;

/* Cancellation handling is back to the default. */
result->cancelhandling = 0;
result->cleanup = NULL;

/* No pending event. */
result->nextevent = NULL;

/* Clear the DTV. */
dtv_t *dtv = GET_DTV (TLS_TPADJ (result));
for (size_t cnt = 0; cnt < dtv[-1].counter; ++cnt)
    free (dtv[1 + cnt].pointer.to_free);
memset (dtv, '\0', (dtv[-1].counter + 1) * sizeof (dtv_t));

```

```

/* Re-initialize the TLS. */
_dl_allocate_tls_init (TLS_TPADJ (result));

return result;
}

/* Free stacks until cache size is lower than LIMIT. */
static void
free_stacks (size_t limit)
{
/* We reduce the size of the cache. Remove the last entries until
the size is below the limit. */
list_t *entry;
list_t *prev;

/* Search from the end of the list. */
list_for_each_prev_safe (entry, prev, &stack_cache)
{
struct pthread *curr;

curr = list_entry (entry, struct pthread, list);
if (FREE_P (curr))
{
/* Unlink the block. */
stack_list_del (entry);

/* Account for the freed memory. */
stack_cache_actsize -= curr->stackblock_size;

/* Free the memory associated with the ELF TLS. */
_dl_deallocate_tls (TLS_TPADJ (curr), false);

/* Remove this block. This should never fail. If it does
something is really wrong. */
if (__munmap (curr->stackblock, curr->stackblock_size) != 0)
abort ();

/* Maybe we have freed enough. */
if (stack_cache_actsize <= limit)
break;
}
}
}

/* Free all the stacks on cleanup. */
void
__nptl_stacks_freeres (void)

```



```

{
free_stacks (0);
}

/* Add a stack frame which is not used anymore to the stack. Must be
called with the cache lock held. */
static inline void
__attribute ((always_inline))
queue_stack (struct pthread *stack)
{
/* We unconditionally add the stack to the list. The memory may
still be in use but it will not be reused until the kernel marks
the stack as not used anymore. */
stack_list_add (&stack->list, &stack_cache);

stack_cache_actsize += stack->stackblock_size;
if (__glibc_unlikely (stack_cache_actsize > stack_cache_maxsize))
free_stacks (stack_cache_maxsize);
}

static int
change_stack_perm (struct pthread *pd
#ifdef NEED_SEPARATE_REGISTER_STACK
, size_t pagemask
#endif
)
{
#ifdef NEED_SEPARATE_REGISTER_STACK
void *stack = (pd->stackblock
+ (((pd->stackblock_size - pd->guardsize) / 2)
& pagemask) + pd->guardsize) & pagemask);
size_t len = pd->stackblock + pd->stackblock_size - stack;
#elif _STACK_GROWS_DOWN
void *stack = pd->stackblock + pd->guardsize;
size_t len = pd->stackblock_size - pd->guardsize;
#elif _STACK_GROWS_UP
void *stack = pd->stackblock;
size_t len = (uintptr_t) pd - pd->guardsize - (uintptr_t) pd->stackblock;
#else
# error "Define either _STACK_GROWS_DOWN or _STACK_GROWS_UP"
#endif
if (__mprotect (stack, len, PROT_READ | PROT_WRITE | PROT_EXEC) != 0)
return errno;

return 0;
}

```

```

/* Return the guard page position on allocated stack. */
static inline char *
__attribute ((always_inline))
guard_position (void *mem, size_t size, size_t guardsize, struct pthread *pd,
size_t pagesize_m1)
{
#ifdef NEED_SEPARATE_REGISTER_STACK
return mem + (((size - guardsize) / 2) & ~pagesize_m1);
#elif _STACK_GROWS_DOWN
return mem;
#elif _STACK_GROWS_UP
return (char *) (((uintptr_t) pd - guardsize) & ~pagesize_m1);
#endif
}

/* Based on stack allocated with PROT_NONE, setup the required portions with
'prot' flags based on the guard page position. */
static inline int
setup_stack_prot (char *mem, size_t size, char *guard, size_t guardsize,
const int prot)
{
char *guardend = guard + guardsize;
#ifdef _STACK_GROWS_DOWN && !defined(NEED_SEPARATE_REGISTER_STACK)
/* As defined at guard_position, for architectures with downward stack
the guard page is always at start of the allocated area. */
if (__mprotect (guardend, size - guardsize, prot) != 0)
return errno;
#else
size_t mprot1 = (uintptr_t) guard - (uintptr_t) mem;
if (__mprotect (mem, mprot1, prot) != 0)
return errno;
size_t mprot2 = ((uintptr_t) mem + size) - (uintptr_t) guardend;
if (__mprotect (guardend, mprot2, prot) != 0)
return errno;
#endif
return 0;
}

/* Mark the memory of the stack as usable to the kernel. It frees everything
except for the space used for the TCB itself. */
static inline void
__always_inline
advise_stack_range (void *mem, size_t size, uintptr_t pd, size_t guardsize)
{
uintptr_t sp = (uintptr_t) CURRENT_STACK_FRAME;
size_t pagesize_m1 = __getpagesize () - 1;
#ifdef _STACK_GROWS_DOWN && !defined(NEED_SEPARATE_REGISTER_STACK)
size_t freesize = (sp - (uintptr_t) mem) & ~pagesize_m1;

```

```

assert (freesize < size);
if (freesize > PTHREAD_STACK_MIN)
    __madvise (mem, freesize - PTHREAD_STACK_MIN, MADV_DONTNEED);
#else
/* Page aligned start of memory to free (higher than or equal
   to current sp plus the minimum stack size). */
uintptr_t freeblock = (sp + PTHREAD_STACK_MIN + pagesize_m1) & ~pagesize_m1;
uintptr_t free_end = (pd - guardsize) & ~pagesize_m1;
if (free_end > freeblock)
{
    size_t freesize = free_end - freeblock;
    assert (freesize < size);
    __madvise ((void*) freeblock, freesize, MADV_DONTNEED);
}
#endif
}

/* Returns a usable stack for a new thread either by allocating a
   new stack or reusing a cached stack of sufficient size.
   ATTR must be non-NULL and point to a valid pthread_attr.
   PDP must be non-NULL. */
static int
allocate_stack (const struct pthread_attr *attr, struct pthread **pdp,
               ALLOCATE_STACK_PARAMS)
{
    struct pthread *pd;
    size_t size;
    size_t pagesize_m1 = __getpagesize () - 1;

    assert (powerof2 (pagesize_m1 + 1));
    assert (TCB_ALIGNMENT >= STACK_ALIGN);

    /* Get the stack size from the attribute if it is set. Otherwise we
       use the default we determined at start time. */
    if (attr->stacksize != 0)
        size = attr->stacksize;
    else
    {
        ll_llock (__default_pthread_attr_lock, LLL_PRIVATE);
        size = __default_pthread_attr.stacksize;
        ll_unlock (__default_pthread_attr_lock, LLL_PRIVATE);
    }

    /* Get memory for the stack. */
    if (__glibc_unlikely (attr->flags & ATTR_FLAG_STACKADDR))
    {
        uintptr_t adj;
        char *stackaddr = (char *) attr->stackaddr;

```

```

    /* Assume the same layout as the _STACK_GROWS_DOWN case, with struct
    pthread at the top of the stack block. Later we adjust the guard
    location and stack address to match the _STACK_GROWS_UP case. */
    if (_STACK_GROWS_UP)
stackaddr += attr->stacksize;

    /* If the user also specified the size of the stack make sure it
    is large enough. */
    if (attr->stacksize != 0
        && attr->stacksize < (__static_tls_size + MINIMAL_REST_STACK))
return EINVAL;

    /* Adjust stack size for alignment of the TLS block. */
#ifdef TLS_TCB_AT_TP
    adj = ((uintptr_t) stackaddr - TLS_TCB_SIZE)
        & __static_tls_align_m1;
    assert (size > adj + TLS_TCB_SIZE);
#elif TLS_DTV_AT_TP
    adj = ((uintptr_t) stackaddr - __static_tls_size)
        & __static_tls_align_m1;
    assert (size > adj);
#endif

    /* The user provided some memory. Let's hope it matches the
    size... We do not allocate guard pages if the user provided
    the stack. It is the user's responsibility to do this if it
    is wanted. */
#ifdef TLS_TCB_AT_TP
    pd = (struct pthread *) ((uintptr_t) stackaddr
        - TLS_TCB_SIZE - adj);
#elif TLS_DTV_AT_TP
    pd = (struct pthread *) (((uintptr_t) stackaddr
        - __static_tls_size - adj)
        - TLS_PRE_TCB_SIZE);
#endif

    /* The user provided stack memory needs to be cleared. */
    memset (pd, '\0', sizeof (struct pthread));

    /* The first TSD block is included in the TCB. */
    pd->specific[0] = pd->specific_1stblock;

    /* Remember the stack-related values. */
    pd->stackblock = (char *) stackaddr - size;
    pd->stackblock_size = size;

    /* This is a user-provided stack. It will not be queued in the

```

```

stack cache nor will the memory (except the TLS memory) be freed. */
pd->user_stack = true;

/* This is at least the second thread. */
pd->header.multiple_threads = 1;
#ifdef TLS_MULTIPLE_THREADS_IN_TCB
__pthread_multiple_threads = *__libc_multiple_threads_ptr = 1;
#endif

#ifdef NEED_DL_SYSINFO
SETUP_THREAD_SYSINFO (pd);
#endif

/* Don't allow setxid until cloned. */
pd->setxid_futex = -1;

/* Allocate the DTV for this thread. */
if (_dl_allocate_tls (TLS_TPADJ (pd)) == NULL)
{
/* Something went wrong. */
assert (errno == ENOMEM);
return errno;
}

/* Prepare to modify global data. */
lll_lock (stack_cache_lock, LLL_PRIVATE);

/* And add to the list of stacks in use. */
list_add (&pd->list, &__stack_user);

lll_unlock (stack_cache_lock, LLL_PRIVATE);
}
else
{
/* Allocate some anonymous memory. If possible use the cache. */
size_t guardsize;
size_t reqsize;
void *mem;
const int prot = (PROT_READ | PROT_WRITE
| ((GL(dl_stack_flags) & PF_X) ? PROT_EXEC : 0));

/* Adjust the stack size for alignment. */
size &= ~__static_tls_align_m1;
assert (size != 0);

/* Make sure the size of the stack is enough for the guard and
eventually the thread descriptor. */

```

```

    guardsize = (attr->guardsize + pagesize_m1) & ~pagesize_m1;
    if (guardsize < attr->guardsize || size + guardsize < guardsize)
/* Arithmetic overflow. */
return EINVAL;
    size += guardsize;
    if (__builtin_expect (size < ((guardsize + __static_tls_size
        + MINIMAL_REST_STACK + pagesize_m1)
        & ~pagesize_m1),
        0))
/* The stack is too small (or the guard too large). */
return EINVAL;

/* Try to get a stack from the cache. */
reqsize = size;
pd = get_cached_stack (&size, &mem);
if (pd == NULL)
{
/* To avoid aliasing effects on a larger scale than pages we
    adjust the allocated stack size if necessary. This way
    allocations directly following each other will not have
    aliasing problems. */
#if MULTI_PAGE_ALIASING != 0
    if ((size % MULTI_PAGE_ALIASING) == 0)
        size += pagesize_m1 + 1;
#endif

/* If a guard page is required, avoid committing memory by first
    allocate with PROT_NONE and then reserve with required permission
    excluding the guard page. */
mem = __mmap (NULL, size, (guardsize == 0) ? prot : PROT_NONE,
MAP_PRIVATE | MAP_ANONYMOUS | MAP_STACK, -1, 0);

if (__glibc_unlikely (mem == MAP_FAILED))
    return errno;

/* SIZE is guaranteed to be greater than zero.
    So we can never get a null pointer back from mmap. */
assert (mem != NULL);

/* Place the thread descriptor at the end of the stack. */
#if TLS_TCB_AT_TP
    pd = (struct pthread *) ((char *) mem + size) - 1;
#elif TLS_DTV_AT_TP
    pd = (struct pthread *) (((uintptr_t) mem + size
        - __static_tls_size)
        & ~__static_tls_align_m1)
        - TLS_PRE_TCB_SIZE);
#endif

```

```

/* Now mprotect the required region excluding the guard area. */
if (__glibc_likely (guardsize > 0))
{
    char *guard = guard_position (mem, size, guardsize, pd,
        pagesize_m1);
    if (setup_stack_prot (mem, size, guard, guardsize, prot) != 0)
{
    __munmap (mem, size);
    return errno;
}
}

/* Remember the stack-related values. */
pd->stackblock = mem;
pd->stackblock_size = size;
/* Update guardsize for newly allocated guardsize to avoid
    an mprotect in guard resize below. */
pd->guardsize = guardsize;

/* We allocated the first block thread-specific data array.
    This address will not change for the lifetime of this
    descriptor. */
pd->specific[0] = pd->specific_1stblock;

/* This is at least the second thread. */
pd->header.multiple_threads = 1;
#ifdef TLS_MULTIPLE_THREADS_IN_TCB
    __pthread_multiple_threads = *__libc_multiple_threads_ptr = 1;
#endif

#ifdef NEED_DL_SYSINFO
    SETUP_THREAD_SYSINFO (pd);
#endif

/* Don't allow setxid until cloned. */
pd->setxid_futex = -1;

/* Allocate the DTV for this thread. */
if (_dl_allocate_tls (TLS_TPADJ (pd)) == NULL)
{
    /* Something went wrong. */
    assert (errno == ENOMEM);

    /* Free the stack memory we just allocated. */
    (void) __munmap (mem, size);

    return errno;
}

```

```

}

/* Prepare to modify global data. */
lll_lock (stack_cache_lock, LLL_PRIVATE);

/* And add to the list of stacks in use. */
stack_list_add (&pd->list, &stack_used);

lll_unlock (stack_cache_lock, LLL_PRIVATE);

/* There might have been a race. Another thread might have
   caused the stacks to get exec permission while this new
   stack was prepared. Detect if this was possible and
   change the permission if necessary. */
if (__builtin_expect ((GL(dl_stack_flags) & PF_X) != 0
&& (prot & PROT_EXEC) == 0, 0))
{
    int err = change_stack_perm (pd
#ifdef NEED_SEPARATE_REGISTER_STACK
        , ~pagesize_m1
#endif
    );
    if (err != 0)
    {
        /* Free the stack memory we just allocated. */
        (void) __munmap (mem, size);

        return err;
    }
}

/* Note that all of the stack and the thread descriptor is
   zeroed. This means we do not have to initialize fields
   with initial value zero. This is specifically true for
   the 'tid' field which is always set back to zero once the
   stack is not used anymore and for the 'guardsize' field
   which will be read next. */
}

/* Create or resize the guard area if necessary. */
if (__glibc_unlikely (guardsize > pd->guardsize))
{
    char *guard = guard_position (mem, size, guardsize, pd,
        pagesize_m1);
    if (__mprotect (guard, guardsize, PROT_NONE) != 0)

```



```

{
mprot_error:
    ll_lock (stack_cache_lock, LLL_PRIVATE);

    /* Remove the thread from the list. */
    stack_list_del (&pd->list);

    ll_unlock (stack_cache_lock, LLL_PRIVATE);

    /* Get rid of the TLS block we allocated. */
    _dl_deallocate_tls (TLS_TPADJ (pd), false);

    /* Free the stack memory regardless of whether the size
of the cache is over the limit or not. If this piece
of memory caused problems we better do not use it
anymore. Uh, and we ignore possible errors. There
is nothing we could do. */
    (void) __munmap (mem, size);

    return errno;
}

pd->guardsize = guardsize;
}
else if (__builtin_expect (pd->guardsize - guardsize > size - reqsize,
0))
{
    /* The old guard area is too large. */

#ifdef NEED_SEPARATE_REGISTER_STACK
    char *guard = mem + (((size - guardsize) / 2) & ~pagesize_m1);
    char *oldguard = mem + (((size - pd->guardsize) / 2) & ~pagesize_m1);

    if (oldguard < guard
        && __mprotect (oldguard, guard - oldguard, prot) != 0)
        goto mprot_error;

    if (__mprotect (guard + guardsize,
oldguard + pd->guardsize - guard - guardsize,
prot) != 0)
        goto mprot_error;
#endif
#ifdef _STACK_GROWS_DOWN
    if (__mprotect ((char *) mem + guardsize, pd->guardsize - guardsize,
prot) != 0)
        goto mprot_error;
#endif
#ifdef _STACK_GROWS_UP
    char *new_guard = (char *)(((uintptr_t) pd - guardsize)
& ~pagesize_m1);

```

```

char *old_guard = (char *)(((uintptr_t) pd - pd->guardsize)
                        & ~pagesize_m1);
/* The guard size difference might be > 0, but once rounded
   to the nearest page the size difference might be zero. */
if (new_guard > old_guard
    && __mprotect (old_guard, new_guard - old_guard, prot) != 0)
    goto mprot_error;
#endif

pd->guardsize = guardsize;
}
/* The pthread_getattr_np() calls need to get passed the size
   requested in the attribute, regardless of how large the
   actually used guardsize is. */
pd->reported_guardsize = guardsize;
}

/* Initialize the lock. We have to do this unconditionally since the
   stillborn thread could be canceled while the lock is taken. */
pd->lock = LLL_LOCK_INITIALIZER;

/* The robust mutex lists also need to be initialized
   unconditionally because the cleanup for the previous stack owner
   might have happened in the kernel. */
pd->robust_head.futex_offset = (offsetof (pthread_mutex_t, __data.__lock)
    - offsetof (pthread_mutex_t,
        __data.__list.__next));
pd->robust_head.list_op_pending = NULL;
#if __PTHREAD_MUTEX_HAVE_PREV
pd->robust_prev = &pd->robust_head;
#endif
pd->robust_head.list = &pd->robust_head;

/* We place the thread descriptor at the end of the stack. */
*pdp = pd;

#if _STACK_GROWS_DOWN
void *stacktop;

# if TLS_TCB_AT_TP
/* The stack begins before the TCB and the static TLS block. */
stacktop = ((char *) (pd + 1) - __static_tls_size);
# elif TLS_DTV_AT_TP
stacktop = (char *) (pd - 1);
# endif

# ifdef NEED_SEPARATE_REGISTER_STACK
*stack = pd->stackblock;

```

```

*stacksize = stacktop - *stack;
# else
*stack = stacktop;
# endif
#else
*stack = pd->stackblock;
#endif

return 0;
}

void
__deallocate_stack (struct pthread *pd)
{
    ll_lck (stack_cache_lock, LLL_PRIVATE);

    /* Remove the thread from the list of threads with user defined
       stacks. */
    stack_list_del (&pd->list);

    /* Not much to do. Just free the mmap()ed memory. Note that we do
       not reset the 'used' flag in the 'tid' field. This is done by
       the kernel. If no thread has been created yet this field is
       still zero. */
    if (__glibc_likely (! pd->user_stack))
        (void) queue_stack (pd);
    else
        /* Free the memory associated with the ELF TLS. */
        _dl_deallocate_tls (TLS_TPADJ (pd), false);

    ll_unlock (stack_cache_lock, LLL_PRIVATE);
}

int
__make_stacks_executable (void **stack_endp)
{
    /* First the main thread's stack. */
    int err = _dl_make_stack_executable (stack_endp);
    if (err != 0)
        return err;

#ifdef NEED_SEPARATE_REGISTER_STACK
    const size_t pagemask = ~(__getpagesize () - 1);
#endif

    ll_lck (stack_cache_lock, LLL_PRIVATE);

```

```

list_t *runp;
list_for_each (runp, &stack_used)
{
    err = change_stack_perm (list_entry (runp, struct pthread, list)
#ifdef NEED_SEPARATE_REGISTER_STACK
        , pagemask
#endif
    );
    if (err != 0)
break;
}

/* Also change the permission for the currently unused stacks. This
   might be wasted time but better spend it here than adding a check
   in the fast path. */
if (err == 0)
    list_for_each (runp, &stack_cache)
    {
        err = change_stack_perm (list_entry (runp, struct pthread, list)
#ifdef NEED_SEPARATE_REGISTER_STACK
            , pagemask
#endif
        );
        if (err != 0)
            break;
    }

lll_unlock (stack_cache_lock, LLL_PRIVATE);

return err;
}

/* In case of a fork() call the memory allocation in the child will be
   the same but only one thread is running. All stacks except that of
   the one running thread are not used anymore. We have to recycle
   them. */
void
__reclaim_stacks (void)
{
    struct pthread *self = (struct pthread *) THREAD_SELF;

    /* No locking necessary. The caller is the only stack in use. But
       we have to be aware that we might have interrupted a list
       operation. */

    if (in_flight_stack != 0)

```

```

{
    bool add_p = in_flight_stack & 1;
    list_t *elem = (list_t *) (in_flight_stack & ~(uintptr_t) 1);

    if (add_p)
    {
        /* We always add at the beginning of the list. So in this case we
           only need to check the beginning of these lists to see if the
           pointers at the head of the list are inconsistent. */
        list_t *l = NULL;

        if (stack_used.next->prev != &stack_used)
            l = &stack_used;
        else if (stack_cache.next->prev != &stack_cache)
            l = &stack_cache;

        if (l != NULL)
        {
            assert (l->next->prev == elem);
            elem->next = l->next;
            elem->prev = l;
            l->next = elem;
        }
        else
        {
            /* We can simply always replay the delete operation. */
            elem->next->prev = elem->prev;
            elem->prev->next = elem->next;
        }
    }

    /* Mark all stacks except the still running one as free. */
    list_t *runp;
    list_for_each (runp, &stack_used)
    {
        struct pthread *curp = list_entry (runp, struct pthread, list);
        if (curp != self)
        {
            /* This marks the stack as free. */
            curp->tid = 0;

            /* Account for the size of the stack. */
            stack_cache_actsize += curp->stackblock_size;

            if (curp->specific_used)
            {
                /* Clear the thread-specific data. */

```

```

memset (curp->specific_1stblock, '\0',
        sizeof (curp->specific_1stblock));

curp->specific_used = false;

for (size_t cnt = 1; cnt < PTHREAD_KEY_1STLEVEL_SIZE; ++cnt)
if (curp->specific[cnt] != NULL)
{
    memset (curp->specific[cnt], '\0',
            sizeof (curp->specific_1stblock));

    /* We have allocated the block which we do not
       free here so re-set the bit. */
    curp->specific_used = true;
}
}
}

/* Add the stack of all running threads to the cache. */
list_splice (&stack_used, &stack_cache);

/* Remove the entry for the current thread to from the cache list
   and add it to the list of running threads. Which of the two
   lists is decided by the user_stack flag. */
stack_list_del (&self->list);

/* Re-initialize the lists for all the threads. */
INIT_LIST_HEAD (&stack_used);
INIT_LIST_HEAD (&__stack_user);

if (__glibc_unlikely (THREAD_GETMEM (self, user_stack)))
    list_add (&self->list, &__stack_user);
else
    list_add (&self->list, &stack_used);

/* There is one thread running. */
__nptl_nthreads = 1;

in_flight_stack = 0;

/* Initialize locks. */
stack_cache_lock = LLL_LOCK_INITIALIZER;
__default_pthread_attr_lock = LLL_LOCK_INITIALIZER;
}

#ifdef HP_TIMING_AVAIL

```

```

# undef __find_thread_by_id
/* Find a thread given the thread ID. */
attribute_hidden
struct pthread *
__find_thread_by_id (pid_t tid)
{
    struct pthread *result = NULL;

    ll_lock (stack_cache_lock, LLL_PRIVATE);

    /* Iterate over the list with system-allocated threads first. */
    list_t *runp;
    list_for_each (runp, &stack_used)
    {
        struct pthread *curp;

        curp = list_entry (runp, struct pthread, list);

        if (curp->tid == tid)
        {
            result = curp;
            goto out;
        }
    }

    /* Now the list with threads using user-allocated stacks. */
    list_for_each (runp, &__stack_user)
    {
        struct pthread *curp;

        curp = list_entry (runp, struct pthread, list);

        if (curp->tid == tid)
        {
            result = curp;
            goto out;
        }
    }

out:
    ll_unlock (stack_cache_lock, LLL_PRIVATE);

    return result;
}
#endif

#ifdef SIGSETXID

```

```

static void
setxid_mark_thread (struct xid_command *cmdp, struct pthread *t)
{
    int ch;

    /* Wait until this thread is cloned. */
    if (t->setxid_futex == -1
        && ! atomic_compare_and_exchange_bool_acq (&t->setxid_futex, -2, -1))
    do
        futex_wait_simple (&t->setxid_futex, -2, FUTEX_PRIVATE);
    while (t->setxid_futex == -2);

    /* Don't let the thread exit before the setxid handler runs. */
    t->setxid_futex = 0;

    do
    {
        ch = t->cancelhandling;

        /* If the thread is exiting right now, ignore it. */
        if ((ch & EXITING_BITMASK) != 0)
        {
            /* Release the futex if there is no other setxid in
               progress. */
            if ((ch & SETXID_BITMASK) == 0)
            {
                t->setxid_futex = 1;
                futex_wake (&t->setxid_futex, 1, FUTEX_PRIVATE);
            }
            return;
        }
    }
    while (atomic_compare_and_exchange_bool_acq (&t->cancelhandling,
        ch | SETXID_BITMASK, ch));
}

```

```

static void
setxid_unmark_thread (struct xid_command *cmdp, struct pthread *t)
{
    int ch;

    do
    {
        ch = t->cancelhandling;
        if ((ch & SETXID_BITMASK) == 0)
            return;
    }
}

```



```

while (atomic_compare_and_exchange_bool_acq (&t->cancelhandling,
      ch & ~SETXID_BITMASK, ch));

/* Release the futex just in case. */
t->setxid_futex = 1;
futex_wake (&t->setxid_futex, 1, FUTEX_PRIVATE);
}

static int
setxid_signal_thread (struct xid_command *cmdp, struct pthread *t)
{
    if ((t->cancelhandling & SETXID_BITMASK) == 0)
        return 0;

    int val;
    pid_t pid = __getpid ();
    INTERNAL_SYSCALL_DECL (err);
    val = INTERNAL_SYSCALL_CALL (tgkill, err, pid, t->tid, SIGSETXID);

    /* If this failed, it must have had not started yet or else exited. */
    if (!INTERNAL_SYSCALL_ERROR_P (val, err))
    {
        atomic_increment (&cmdp->cntr);
        return 1;
    }
    else
        return 0;
}

/* Check for consistency across set*id system call results. The abort
   should not happen as long as all privileges changes happen through
   the glibc wrappers. ERROR must be 0 (no error) or an errno
   code. */
void
attribute_hidden
__nptl_setxid_error (struct xid_command *cmdp, int error)
{
    do
    {
        int olderror = cmdp->error;
        if (olderror == error)
            break;
        if (olderror != -1)
        {
            /* Mismatch between current and previous results. Save the
               error value to memory so that is not clobbered by the
               abort function and preserved in coredumps. */

```

```

volatile int xid_err __attribute__((unused)) = error;
abort ();
}
}
while (atomic_compare_and_exchange_bool_acq (&cmdp->error, error, -1));
}

```

```
int
```

```
attribute_hidden
```

```
__nptl_setxid (struct xid_command *cmdp)
```

```
{
```

```
int signalled;
```

```
int result;
```

```
lll_lock (stack_cache_lock, LLL_PRIVATE);
```

```
__xidcmd = cmdp;
```

```
cmdp->cntr = 0;
```

```
cmdp->error = -1;
```

```
struct pthread *self = THREAD_SELF;
```

```
/* Iterate over the list with system-allocated threads first. */
```

```
list_t *runp;
```

```
list_for_each (runp, &stack_used)
```

```
{
```

```
struct pthread *t = list_entry (runp, struct pthread, list);
```

```
if (t == self)
```

```
continue;
```

```
setxid_mark_thread (cmdp, t);
```

```
}
```

```
/* Now the list with threads using user-allocated stacks. */
```

```
list_for_each (runp, &__stack_user)
```

```
{
```

```
struct pthread *t = list_entry (runp, struct pthread, list);
```

```
if (t == self)
```

```
continue;
```

```
setxid_mark_thread (cmdp, t);
```

```
}
```

```
/* Iterate until we don't succeed in signalling anyone. That means
```

```
we have gotten all running threads, and their children will be
```

```
automatically correct once started. */
```

```
do
```

```
{
```

```
signalled = 0;
```

```

list_for_each (runp, &stack_used)
{
struct pthread *t = list_entry (runp, struct pthread, list);
if (t == self)
continue;

signalled += setxid_signal_thread (cmdp, t);
}

list_for_each (runp, &__stack_user)
{
struct pthread *t = list_entry (runp, struct pthread, list);
if (t == self)
continue;

signalled += setxid_signal_thread (cmdp, t);
}

int cur = cmdp->cntr;
while (cur != 0)
{
futex_wait_simple ((unsigned int *) &cmdp->cntr, cur,
FUTEX_PRIVATE);
cur = cmdp->cntr;
}
}
while (signalled != 0);

/* Clean up flags, so that no thread blocks during exit waiting
for a signal which will never come. */
list_for_each (runp, &stack_used)
{
struct pthread *t = list_entry (runp, struct pthread, list);
if (t == self)
continue;

setxid_unmark_thread (cmdp, t);
}

list_for_each (runp, &__stack_user)
{
struct pthread *t = list_entry (runp, struct pthread, list);
if (t == self)
continue;

setxid_unmark_thread (cmdp, t);
}

```

```

/* This must be last, otherwise the current thread might not have
   permissions to send SIGSETXID syscall to the other threads. */
INTERNAL_SYSCALL_DECL (err);
result = INTERNAL_SYSCALL_NCS (cmdp->syscall_no, err, 3,
                               cmdp->id[0], cmdp->id[1], cmdp->id[2]);
int error = 0;
if (__glibc_unlikely (INTERNAL_SYSCALL_ERROR_P (result, err)))
  {
    error = INTERNAL_SYSCALL_ERRNO (result, err);
    __set_errno (error);
    result = -1;
  }
__nptl_setxid_error (cmdp, error);

lll_unlock (stack_cache_lock, LLL_PRIVATE);
return result;
}
#endif /* SIGSETXID. */

static inline void __attribute__((always_inline))
init_one_static_tls (struct pthread *curp, struct link_map *map)
{
  # if TLS_TCB_AT_TP
    void *dest = (char *) curp - map->l_tls_offset;
  # elif TLS_DTV_AT_TP
    void *dest = (char *) curp + map->l_tls_offset + TLS_PRE_TCB_SIZE;
  # else
    # error "Either TLS_TCB_AT_TP or TLS_DTV_AT_TP must be defined"
  # endif

  /* Initialize the memory. */
  memset (__mempcpy (dest, map->l_tls_initimage, map->l_tls_initimage_size),
          '\0', map->l_tls_blocksize - map->l_tls_initimage_size);
}

void
attribute_hidden
__pthread_init_static_tls (struct link_map *map)
{
  lll_lock (stack_cache_lock, LLL_PRIVATE);

  /* Iterate over the list with system-allocated threads first. */
  list_t *runp;
  list_for_each (runp, &stack_used)
    init_one_static_tls (list_entry (runp, struct pthread, list), map);
}

```

```

/* Now the list with threads using user-allocated stacks. */
list_for_each (runp, &__stack_user)
    init_one_static_tls (list_entry (runp, struct pthread, list), map);

lll_unlock (stack_cache_lock, LLL_PRIVATE);
}

void
attribute_hidden
__wait_lookup_done (void)
{
    lll_lock (stack_cache_lock, LLL_PRIVATE);

    struct pthread *self = THREAD_SELF;

    /* Iterate over the list with system-allocated threads first. */
    list_t *runp;
    list_for_each (runp, &stack_used)
    {
        struct pthread *t = list_entry (runp, struct pthread, list);
        if (t == self || t->header.gscope_flag == THREAD_GSCOPE_FLAG_UNUSED)
            continue;

        int *const gscope_flagp = &t->header.gscope_flag;

        /* We have to wait until this thread is done with the global
        scope. First tell the thread that we are waiting and
        possibly have to be woken. */
        if (atomic_compare_and_exchange_bool_acq (gscope_flagp,
            THREAD_GSCOPE_FLAG_WAIT,
            THREAD_GSCOPE_FLAG_USED))
            continue;

        do
            futex_wait_simple ((unsigned int *) gscope_flagp,
                THREAD_GSCOPE_FLAG_WAIT, FUTEX_PRIVATE);
        while (*gscope_flagp == THREAD_GSCOPE_FLAG_WAIT);
    }

    /* Now the list with threads using user-allocated stacks. */
    list_for_each (runp, &__stack_user)
    {
        struct pthread *t = list_entry (runp, struct pthread, list);
        if (t == self || t->header.gscope_flag == THREAD_GSCOPE_FLAG_UNUSED)
            continue;

        int *const gscope_flagp = &t->header.gscope_flag;

```

```

/* We have to wait until this thread is done with the global
scope. First tell the thread that we are waiting and
possibly have to be woken. */
if (atomic_compare_and_exchange_bool_acq (gscope_flagp,
    THREAD_GSCOPE_FLAG_WAIT,
    THREAD_GSCOPE_FLAG_USED))
continue;

do
futex_wait_simple ((unsigned int *) gscope_flagp,
    THREAD_GSCOPE_FLAG_WAIT, FUTEX_PRIVATE);
while (*gscope_flagp == THREAD_GSCOPE_FLAG_WAIT);
}

lll_unlock (stack_cache_lock, LLL_PRIVATE);
}

```

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1.7 ESR-Linux32-shared-libs-nptl-db 1.0

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```

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```
#include "thread_dbP.h"
```

```
td_err_e  
td_thr_getxregs (const td_thrhandle_t *th, void *xregs)  
{  
  /* XXX This might be platform specific. */  
  LOG ("td_thr_getxregs");  
  return TD_NOXREGS;  
}
```

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```

```
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```

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```
#include <errno.h>
```

```
#include <mqueue.h>

/* Receive the oldest from highest priority messages in message queue
MQDES. */
ssize_t
mq_receive (mqd_t mqdes, char *msg_ptr, size_t msg_len,
            unsigned int *msg_prio)
{
    __set_errno (ENOSYS);
    return -1;
}
stub_warning (mq_receive)
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```

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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.

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

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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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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.

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