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Rocky Enterprise Linux 9.2 Manual Pages on command 'pthread_attr_init.3'

\$ man pthread_attr_init.3

PTHREAD_ATTR_INIT(3) Linux Programmer's Manual PTHREAD_ATTR_INIT(3)

NAME

pthread_attr_init, pthread_attr_destroy - initialize and destroy thread attributes object

SYNOPSIS

```
#include <pthread.h>

int pthread_attr_init(pthread_attr_t *attr);

int pthread_attr_destroy(pthread_attr_t *attr);

Compile and link with -pthread.
```

DESCRIPTION

The pthread_attr_init() function initializes the thread attributes object pointed to by attr with default attribute values. After this call, individual attributes of the object can be set using various related functions (listed under SEE ALSO), and then the object can be used in one or more pthread_create(3) calls that create threads.

Calling pthread_attr_init() on a thread attributes object that has already been initialized results in undefined behavior.

When a thread attributes object is no longer required, it should be destroyed using the pthread_attr_destroy() function. Destroying a thread attributes object has no effect on threads that were created using that object.

Once a thread attributes object has been destroyed, it can be reinitialized using pthread_attr_init(). Any other use of a destroyed thread attributes object has undefined results.

RETURN VALUE

On success, these functions return 0; on error, they return a nonzero error number.

ERRORS

POSIX.1 documents an ENOMEM error for pthread_attr_init(); on Linux these functions always succeed (but portable and future-proof applications should nevertheless handle a possible error return).

ATTRIBUTES

For an explanation of the terms used in this section, see attributes(7).

??

?Interface ? Attribute ? Value ?

??

?pthread_attr_init(), ? Thread safety ? MT-Safe ?

?pthread_attr_destroy() ? ? ?

??

CONFORMING TO

POSIX.1-2001, POSIX.1-2008.

NOTES

The pthread_attr_t type should be treated as opaque: any access to the object other than via pthreads functions is nonportable and produces undefined results.

EXAMPLES

The program below optionally makes use of pthread_attr_init() and various related functions to initialize a thread attributes object that is used to create a single thread. Once created, the thread uses the pthread_getattr_np(3) function (a nonstandard GNU extension) to retrieve the thread's attributes, and then displays those attributes. If the program is run with no command-line argument, then it passes NULL as the attr argument of pthread_create(3), so that the thread is created with default attributes. Running the program on Linux/x86-32 with the NPTL threading implementation, we see the following:

```
$ ulimit -s   # No stack limit ==> default stack size is 2 MB
unlimited
$ ./a.out
```

Thread attributes:

- Detach state = PTHREAD_CREATE_JOINABLE
- Scope = PTHREAD_SCOPE_SYSTEM
- Inherit scheduler = PTHREAD_INHERIT_SCHED
- Scheduling policy = SCHED_OTHER

```
Scheduling priority = 0
Guard size      = 4096 bytes
Stack address   = 0x40196000
Stack size     = 0x201000 bytes
```

When we supply a stack size as a command-line argument, the program initializes a thread attributes object, sets various attributes in that object, and passes a pointer to the object in the call to `pthread_create(3)`. Running the program on Linux/x86-32 with the NPTL threading implementation, we see the following:

```
$ ./a.out 0x3000000
posix_memalign() allocated at 0x40197000
Thread attributes:
  Detach state    = PTHREAD_CREATE_DETACHED
  Scope          = PTHREAD_SCOPE_SYSTEM
  Inherit scheduler = PTHREAD_EXPLICIT_SCHED
  Scheduling policy = SCHED_OTHER
  Scheduling priority = 0
  Guard size     = 0 bytes
  Stack address  = 0x40197000
  Stack size    = 0x3000000 bytes
```

Program source

```
#define _GNU_SOURCE /* To get pthread_getattr_np() declaration */
#include <pthread.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <errno.h>
#define handle_error_en(en, msg) \
    do { errno = en; perror(msg); exit(EXIT_FAILURE); } while (0)
static void
display_thread_attr(pthread_attr_t *attr, char *prefix)
{
    int s, i;
    size_t v;
```

```

void *stkaddr;

struct sched_param sp;

s = pthread_attr_getdetachstate(attr, &i);

if (s != 0)

    handle_error_en(s, "pthread_attr_getdetachstate");

printf("%sDetach state      = %s\n", prefix,

        (i == PTHREAD_CREATE_DETACHED) ? "PTHREAD_CREATE_DETACHED" :

        (i == PTHREAD_CREATE_JOINABLE) ? "PTHREAD_CREATE_JOINABLE" :

        "???");

s = pthread_attr_getscope(attr, &i);

if (s != 0)

    handle_error_en(s, "pthread_attr_getscope");

printf("%sScope          = %s\n", prefix,

        (i == PTHREAD_SCOPE_SYSTEM) ? "PTHREAD_SCOPE_SYSTEM" :

        (i == PTHREAD_SCOPE_PROCESS) ? "PTHREAD_SCOPE_PROCESS" :

        "???");

s = pthread_attr_getinheritsched(attr, &i);

if (s != 0)

    handle_error_en(s, "pthread_attr_getinheritsched");

printf("%sInherit scheduler = %s\n", prefix,

        (i == PTHREAD_INHERIT_SCHED) ? "PTHREAD_INHERIT_SCHED" :

        (i == PTHREAD_EXPLICIT_SCHED) ? "PTHREAD_EXPLICIT_SCHED" :

        "???");

s = pthread_attr_getschedpolicy(attr, &i);

if (s != 0)

    handle_error_en(s, "pthread_attr_getschedpolicy");

printf("%sScheduling policy = %s\n", prefix,

        (i == SCHED_OTHER) ? "SCHED_OTHER" :

        (i == SCHED_FIFO) ? "SCHED_FIFO" :

        (i == SCHED_RR) ? "SCHED_RR" :

        "???");

s = pthread_attr_getschedparam(attr, &sp);

if (s != 0)

```

```

    handle_error_en(s, "pthread_attr_getschedparam");
printf("%sScheduling priority = %d\n", prefix, sp.sched_priority);
s = pthread_attr_getguardsize(attr, &v);
if (s != 0)
    handle_error_en(s, "pthread_attr_getguardsize");
printf("%sGuard size      = %zu bytes\n", prefix, v);
s = pthread_attr_getstack(attr, &stkaddr, &v);
if (s != 0)
    handle_error_en(s, "pthread_attr_getstack");
printf("%sStack address   = %p\n", prefix, stkaddr);
printf("%sStack size     = %#zx bytes\n", prefix, v);
}
static void *
thread_start(void *arg)
{
    int s;
    pthread_attr_t gattr;
    /* pthread_getattr_np() is a non-standard GNU extension that
       retrieves the attributes of the thread specified in its
       first argument */
    s = pthread_getattr_np(pthread_self(), &gattr);
    if (s != 0)
        handle_error_en(s, "pthread_getattr_np");
    printf("Thread attributes:\n");
    display_pthread_attr(&gattr, "\t");
    exit(EXIT_SUCCESS);    /* Terminate all threads */
}
int
main(int argc, char *argv[])
{
    pthread_t thr;
    pthread_attr_t attr;
    pthread_attr_t *attrp;    /* NULL or &attr */

```

```

int s;

attrp = NULL;

/* If a command-line argument was supplied, use it to set the
   stack-size attribute and set a few other thread attributes,
   and set attrp pointing to thread attributes object */
if (argc > 1) {
    size_t stack_size;

    void *sp;

    attrp = &attr;

    s = pthread_attr_init(&attr);

    if (s != 0)
        handle_error_en(s, "pthread_attr_init");

    s = pthread_attr_setdetachstate(&attr, PTHREAD_CREATE_DETACHED);

    if (s != 0)
        handle_error_en(s, "pthread_attr_setdetachstate");

    s = pthread_attr_setinheritsched(&attr, PTHREAD_EXPLICIT_SCHED);

    if (s != 0)
        handle_error_en(s, "pthread_attr_setinheritsched");

    stack_size = strtoul(argv[1], NULL, 0);

    s = posix_memalign(&sp, sysconf(_SC_PAGESIZE), stack_size);

    if (s != 0)
        handle_error_en(s, "posix_memalign");

    printf("posix_memalign() allocated at %p\n", sp);

    s = pthread_attr_setstack(&attr, sp, stack_size);

    if (s != 0)
        handle_error_en(s, "pthread_attr_setstack");
}

s = pthread_create(&thr, attrp, &thread_start, NULL);

if (s != 0)
    handle_error_en(s, "pthread_create");

if (attrp != NULL) {
    s = pthread_attr_destroy(attrp);

    if (s != 0)

```

```
        handle_error_en(s, "pthread_attr_destroy");
    }
    pause(); /* Terminates when other thread calls exit() */
}
```

SEE ALSO

pthread_attr_setaffinity_np(3), pthread_attr_setdetachstate(3),
pthread_attr_setguardsize(3), pthread_attr_setinheritsched(3),
pthread_attr_setschedparam(3), pthread_attr_setschedpolicy(3), pthread_attr_setscope(3),
pthread_attr_setsigmask_np(3), pthread_attr_setstack(3), pthread_attr_setstackaddr(3),
pthread_attr_setstacksize(3), pthread_create(3), pthread_getattr_np(3),
pthread_setattr_default_np(3), pthreads(7)

COLOPHON

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