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

$ man pthread_mutexattr_getrobust.3

NAME

   pthread_mutexattr_getrobust, pthread_mutexattr_setrobust - get and set the robustness at?

   tribute of a mutex attributes object

SYNOPSIS

   #include <pthread.h>

   int pthread_mutexattr_getrobust(const pthread_mutexattr_t *attr,

                   int *robustness);

   int pthread_mutexattr_setrobust(const pthread_mutexattr_t *attr,

                   int robustness);

   Compile and link with -pthread.

  Feature Test Macro Requirements for glibc (see feature_test_macros(7)):

   pthread_mutexattr_getrobust(), pthread_mutexattr_setrobust():

      _POSIX_C_SOURCE >= 200809L

DESCRIPTION

   The pthread_mutexattr_getrobust() function places the value of the robustness attribute of

   the mutex attributes object referred to by attr in *robustness. The pthread_mutex?

   attr_setrobust() function sets the value of the robustness attribute of the mutex at?

   tributes object referred to by attr to the value specified in *robustness.

   The robustness attribute specifies the behavior of the mutex when the owning thread dies

   without unlocking the mutex. The following values are valid for robustness:

PTHREAD_MUTEX_STALLED

      This is the default value for a mutex attributes object. If a mutex is initialized

with the PTHREAD_MUTEX_STALLED attribute and its owner dies without unlocking it, the mutex remains locked afterwards and any future attempts to call pthread_mu‐ tex_lock(3) on the mutex will block indefinitely.

PTHREAD_MUTEX_ROBUST

If a mutex is initialized with the PTHREAD_MUTEX_ROBUST attribute and its owner dies without unlocking it, any future attempts to call pthread_mutex_lock(3) on this mutex will succeed and return EOWNERDEAD to indicate that the original owner no longer exists and the mutex is in an inconsistent state. Usually after EOWN‐ ERDEAD is returned, the next owner should call pthread_mutex_consistent(3) on the acquired mutex to make it consistent again before using it any further.

If the next owner unlocks the mutex using pthread_mutex_unlock(3) before making it consistent, the mutex will be permanently unusable and any subsequent attempts to lock it using pthread_mutex_lock(3) will fail with the error ENOTRECOVERABLE. The only permitted operation on such a mutex is pthread_mutex_destroy(3).

If the next owner terminates before calling pthread_mutex_consistent(3), further pthread_mutex_lock(3) operations on this mutex will still return EOWNERDEAD.

Note that the attr argument of pthread_mutexattr_getrobust() and pthread_mutexattr_setro‐ bust() should refer to a mutex attributes object that was initialized by pthread_mutex‐ attr_init(3), otherwise the behavior is undefined.

RETURN VALUE

On success, these functions return 0. On error, they return a positive error number.

In the glibc implementation, pthread_mutexattr_getrobust() always return zero.

ERRORS

EINVAL A value other than PTHREAD_MUTEX_STALLED or PTHREAD_MUTEX_ROBUST was passed to pthread_mutexattr_setrobust().

VERSIONS

pthread_mutexattr_getrobust() and pthread_mutexattr_setrobust() were added to glibc in version 2.12.

CONFORMING TO

POSIX.1-2008.

NOTES

In the Linux implementation, when using process-shared robust mutexes, a waiting thread also receives the EOWNERDEAD notification if the owner of a robust mutex performs an ex‐

ecve(2) without first unlocking the mutex. POSIX.1 does not specify this detail, but the same behavior also occurs in at least some other implementations.

Before the addition of pthread_mutexattr_getrobust() and pthread_mutexattr_setrobust() to POSIX, glibc defined the following equivalent nonstandard functions if _GNU_SOURCE was de‐ fined:

```
int pthread_mutexattr_getrobust_np(const pthread_mutexattr_t *attr,
                    int *robustness);
int pthread_mutexattr_setrobust_np(const pthread_mutexattr_t *attr,
                    int robustness);
```

Correspondingly, the constants PTHREAD_MUTEX_STALLED_NP and PTHREAD_MUTEX_ROBUST_NP were also defined.

These GNU-specific APIs, which first appeared in glibc 2.4, are nowadays obsolete and should not be used in new programs.

EXAMPLES

The program below demonstrates the use of the robustness attribute of a mutex attributes object. In this program, a thread holding the mutex dies prematurely without unlocking the mutex. The main thread subsequently acquires the mutex successfully and gets the er‐ ror EOWNERDEAD, after which it makes the mutex consistent.

The following shell session shows what we see when running this program:

```
$ ./a.out
[original owner] Setting lock...
[original owner] Locked. Now exiting without unlocking.
[main] Attempting to lock the robust mutex.
[main] pthread_mutex_lock() returned EOWNERDEAD
[main] Now make the mutex consistent
[main] Mutex is now consistent; unlocking
```

Program source

```
#include <stdlib.h>
#include <stdio.h>
#include <unistd.h>
#include <pthread.h>
#include <errno.h>

#define handle_error_en(en, msg) \
```

```c
        do { errno = en; perror(msg); exit(EXIT_FAILURE); } while (0)

static pthread_mutex_t mtx;

static void *
original_owner_thread(void *ptr)
{
    printf("[original owner] Setting lock...\n");

    pthread_mutex_lock(&mtx);

    printf("[original owner] Locked. Now exiting without unlocking.\n");

    pthread_exit(NULL);
}

int
main(int argc, char *argv[])
{
    pthread_t thr;

    pthread_mutexattr_t attr;

    int s;

    pthread_mutexattr_init(&attr);
                        /* initialize the attributes object */

    pthread_mutexattr_setrobust(&attr, PTHREAD_MUTEX_ROBUST);
                        /* set robustness */

    pthread_mutex_init(&mtx, &attr);   /* initialize the mutex */

    pthread_create(&thr, NULL, original_owner_thread, NULL);

    sleep(2);

    /* "original_owner_thread" should have exited by now */

    printf("[main] Attempting to lock the robust mutex.\n");

    s = pthread_mutex_lock(&mtx);

    if (s == EOWNERDEAD) {

        printf("[main] pthread_mutex_lock() returned EOWNERDEAD\n");

        printf("[main] Now make the mutex consistent\n");

        s = pthread_mutex_consistent(&mtx);

        if (s != 0)

            handle_error_en(s, "pthread_mutex_consistent");

        printf("[main] Mutex is now consistent; unlocking\n");
```

```
        s = pthread_mutex_unlock(&mtx);

        if (s != 0)

            handle_error_en(s, "pthread_mutex_unlock");

        exit(EXIT_SUCCESS);

    } else if (s == 0) {

        printf("[main] pthread_mutex_lock() unexpectedly succeeded\n");

        exit(EXIT_FAILURE);

    } else {

        printf("[main] pthread_mutex_lock() unexpectedly failed\n");

        handle_error_en(s, "pthread_mutex_lock");

    }

}
```

SEE ALSO

get_robust_list(2), set_robust_list(2), pthread_mutex_consistent(3),

pthread_mutex_init(3), pthread_mutex_lock(3), pthreads(7)

COLOPHON

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