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

\$ man pthread_cleanup_pop.3

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

NAME

pthread_cleanup_push, pthread_cleanup_pop - push and pop thread cancellation clean-up handlers

SYNOPSIS

```
#include <pthread.h>

void pthread_cleanup_push(void (*routine)(void *),
                          void *arg);

void pthread_cleanup_pop(int execute);

Compile and link with -pthread.
```

DESCRIPTION

These functions manipulate the calling thread's stack of thread-cancellation clean-up handlers. A clean-up handler is a function that is automatically executed when a thread is canceled (or in various other circumstances described below); it might, for example, unlock a mutex so that it becomes available to other threads in the process.

The pthread_cleanup_push() function pushes routine onto the top of the stack of clean-up handlers. When routine is later invoked, it will be given arg as its argument.

The pthread_cleanup_pop() function removes the routine at the top of the stack of clean-up handlers, and optionally executes it if execute is nonzero.

A cancellation clean-up handler is popped from the stack and executed in the following circumstances:

1. When a thread is canceled, all of the stacked clean-up handlers are popped and executed in the reverse of the order in which they were pushed onto the stack.

2. When a thread terminates by calling `pthread_exit(3)`, all clean-up handlers are executed as described in the preceding point. (Clean-up handlers are not called if the thread terminates by performing a return from the thread start function.)

3. When a thread calls `pthread_cleanup_pop()` with a nonzero execute argument, the top-most clean-up handler is popped and executed.

POSIX.1 permits `pthread_cleanup_push()` and `pthread_cleanup_pop()` to be implemented as macros that expand to text containing '{' and '}', respectively. For this reason, the caller must ensure that calls to these functions are paired within the same function, and at the same lexical nesting level. (In other words, a clean-up handler is established only during the execution of a specified section of code.)

Calling `longjmp(3)` (`siglongjmp(3)`) produces undefined results if any call has been made to `pthread_cleanup_push()` or `pthread_cleanup_pop()` without the matching call of the pair since the jump buffer was filled by `setjmp(3)` (`sigsetjmp(3)`). Likewise, calling `longjmp(3)` (`siglongjmp(3)`) from inside a clean-up handler produces undefined results unless the jump buffer was also filled by `setjmp(3)` (`sigsetjmp(3)`) inside the handler.

RETURN VALUE

These functions do not return a value.

ERRORS

There are no errors.

ATTRIBUTES

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

??

?Interface ? Attribute ? Value ?

??

?`pthread_cleanup_push()`, ? Thread safety ? MT-Safe ?

?`pthread_cleanup_pop()` ? ? ?

??

CONFORMING TO

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

NOTES

On Linux, the `pthread_cleanup_push()` and `pthread_cleanup_pop()` functions are implemented as macros that expand to text containing '{' and '}', respectively. This means that variables declared within the scope of paired calls to these functions will be visible within

only that scope.

POSIX.1 says that the effect of using `return`, `break`, `continue`, or `goto` to prematurely leave a block bracketed `pthread_cleanup_push()` and `pthread_cleanup_pop()` is undefined.

Portable applications should avoid doing this.

EXAMPLES

The program below provides a simple example of the use of the functions described in this page. The program creates a thread that executes a loop bracketed by `pthread_cleanup_push()` and `pthread_cleanup_pop()`. This loop increments a global variable, `cnt`, once each second. Depending on what command-line arguments are supplied, the main thread sends the other thread a cancellation request, or sets a global variable that causes the other thread to exit its loop and terminate normally (by doing a `return`).

In the following shell session, the main thread sends a cancellation request to the other thread:

```
$ ./a.out
New thread started
cnt = 0
cnt = 1
Canceling thread
Called clean-up handler
Thread was canceled; cnt = 0
```

From the above, we see that the thread was canceled, and that the cancellation clean-up handler was called and it reset the value of the global variable `cnt` to 0.

In the next run, the main program sets a global variable that causes other thread to terminate normally:

```
$ ./a.out x
New thread started
cnt = 0
cnt = 1
Thread terminated normally; cnt = 2
```

From the above, we see that the clean-up handler was not executed (because `cleanup_pop_arg` was 0), and therefore the value of `cnt` was not reset.

In the next run, the main program sets a global variable that causes the other thread to terminate normally, and supplies a nonzero value for `cleanup_pop_arg`:

```
$ ./a.out x 1
```

```
New thread started
```

```
cnt = 0
```

```
cnt = 1
```

```
Called clean-up handler
```

```
Thread terminated normally; cnt = 0
```

In the above, we see that although the thread was not canceled, the clean-up handler was executed, because the argument given to `pthread_cleanup_pop()` was nonzero.

Program source

```
#include <pthread.h>
#include <sys/types.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 int done = 0;
static int cleanup_pop_arg = 0;
static int cnt = 0;
static void
cleanup_handler(void *arg)
{
    printf("Called clean-up handler\n");
    cnt = 0;
}
static void *
thread_start(void *arg)
{
    time_t start, curr;
    printf("New thread started\n");
    pthread_cleanup_push(cleanup_handler, NULL);
    curr = start = time(NULL);
```

```

while (!done) {
    pthread_testcancel();      /* A cancellation point */
    if (curr < time(NULL)) {
        curr = time(NULL);
        printf("cnt = %d\n", cnt); /* A cancellation point */
        cnt++;
    }
}

pthread_cleanup_pop(cleanup_pop_arg);

return NULL;
}

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

    s = pthread_create(&thr, NULL, thread_start, NULL);
    if (s != 0)
        handle_error_en(s, "pthread_create");

    sleep(2);      /* Allow new thread to run a while */

    if (argc > 1) {
        if (argc > 2)
            cleanup_pop_arg = atoi(argv[2]);

        done = 1;
    } else {
        printf("Canceling thread\n");
        s = pthread_cancel(thr);
        if (s != 0)
            handle_error_en(s, "pthread_cancel");
    }

    s = pthread_join(thr, &res);
    if (s != 0)

```

```
    handle_error_en(s, "pthread_join");
if (res == PTHREAD_CANCELED)
    printf("Thread was canceled; cnt = %d\n", cnt);
else
    printf("Thread terminated normally; cnt = %d\n", cnt);
exit(EXIT_SUCCESS);
}
```

SEE ALSO

pthread_cancel(3), pthread_cleanup_push_defer_np(3), pthread_setcancelstate(3),
pthread_testcancel(3), pthreads(7)

COLOPHON

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