

NAME

call_once, cnd_broadcast, cnd_destroy, cnd_init, cnd_signal, cnd_timedwait, cnd_wait, mtx_destroy, mtx_init, mtx_lock, mtx_timedlock, mtx_trylock, mtx_unlock, thrд_create, thrд_current, thrд_detach, thrд_equal, thrд_exit, thrд_join, thrд_sleep, thrд_yield, tss_create, tss_delete, tss_get, tss_set - C11 threads interface

LIBRARY

C11 Threads Library (libstdthreads, -lstdthreads)

SYNOPSIS

```
#include <threads.h>
```

void

```
call_once(once_flag *flag, void (*func)(void));
```

int

```
cnd_broadcast(cnd_t *cnd);
```

void

```
cnd_destroy(cnd_t *cnd);
```

int

```
cnd_init(cnd_t *cnd);
```

int

```
cnd_signal(cnd_t *cnd);
```

int

```
cnd_timedwait(cnd_t * restrict cnd, mtx_t * restrict mtx, const struct timespec * restrict ts);
```

int

```
cnd_wait(cnd_t *cnd, mtx_t *mtx);
```

void

```
mtx_destroy(mtx_t *mtx);
```

int

```
mtx_init(mtx_t *mtx, int type);
```

int

mtx_lock(*mtx_t *mtx*);

int

mtx_timedlock(*mtx_t * restrict mtx, const struct timespec * restrict ts*);

int

mtx_trylock(*mtx_t *mtx*);

int

mtx_unlock(*mtx_t *mtx*);

int

thrd_create(*thrd_t *thr, int (*func)(void *), void *arg*);

thrd_t

thrd_current(*void*);

int

thrd_detach(*thrd_t thr*);

int

thrd_equal(*thrd_t thr0, thrd_t thr1*);

_Noreturn void

thrd_exit(*int res*);

int

thrd_join(*thrd_t thr, int *res*);

int

thrd_sleep(*const struct timespec *duration, struct timespec *remaining*);

void

thrd_yield(*void*);

int

tss_create(*tss_t *key, void (*dtor)(void *)*);

void

tss_delete(*tss_t key*);

*void **

tss_get(*tss_t key*);

int

tss_set(*tss_t key, void *val*);

DESCRIPTION

As of ISO/IEC 9899:2011 ("ISO C11"), the C standard includes an API for writing multithreaded applications. Since POSIX.1 already includes a threading API that is used by virtually any multithreaded application, the interface provided by the C standard can be considered superfluous.

In this implementation, the threading interface is therefore implemented as a light-weight layer on top of existing interfaces. The functions to which these routines are mapped, are listed in the following table.

Please refer to the documentation of the POSIX equivalent functions for more information.

| <i>Function</i> | <i>POSIX equivalent</i> |
|--------------------------|----------------------------|
| call_once () | pthread_once(3) |
| cond_broadcast () | pthread_cond_broadcast(3) |
| cond_destroy () | pthread_cond_destroy(3) |
| cond_init () | pthread_cond_init(3) |
| cond_signal () | pthread_cond_signal(3) |
| cond_timedwait () | pthread_cond_timedwait(3) |
| cond_wait () | pthread_cond_wait(3) |
| mtx_destroy () | pthread_mutex_destroy(3) |
| mtx_init () | pthread_mutex_init(3) |
| mtx_lock () | pthread_mutex_lock(3) |
| mtx_timedlock () | pthread_mutex_timedlock(3) |
| mtx_trylock () | pthread_mutex_trylock(3) |
| mtx_unlock () | pthread_mutex_unlock(3) |
| thrd_create () | pthread_create(3) |
| thrd_current () | pthread_self(3) |
| thrd_detach () | pthread_detach(3) |
| thrd_equal () | pthread_equal(3) |
| thrd_exit () | pthread_exit(3) |
| thrd_join () | pthread_join(3) |
| thrd_sleep () | nanosleep(2) |
| thrd_yield () | pthread_yield(3) |
| tss_create () | pthread_key_create(3) |
| tss_delete () | pthread_key_delete(3) |
| tss_get () | pthread_getspecific(3) |

`tss_set()``pthread_setspecific(3)`

DIFFERENCES WITH POSIX EQUIVALENTS

The `thrd_exit()` function returns an integer value to the thread calling `thrd_join()`, whereas the `pthread_exit()` function uses a pointer.

The mutex created by `mtx_init()` can be of *type* `mtx_plain` or `mtx_timed` to distinguish between a mutex that supports `mtx_timedlock()`. This type can be *or'd* with `mtx_recursive` to create a mutex that allows recursive acquisition. These properties are normally set using `pthread_mutex_init()`'s *attr* parameter.

RETURN VALUES

If successful, the `cnd_broadcast()`, `cnd_init()`, `cnd_signal()`, `cnd_timedwait()`, `cnd_wait()`, `mtx_init()`, `mtx_lock()`, `mtx_timedlock()`, `mtx_trylock()`, `mtx_unlock()`, `thrd_create()`, `thrd_detach()`, `thrd_equal()`, `thrd_join()`, `thrd_sleep()`, `tss_create()` and `tss_set()` functions return `thrd_success`. Otherwise an error code will be returned to indicate the error.

The `thrd_current()` function returns the thread ID of the calling thread.

The `tss_get()` function returns the thread-specific data value associated with the given *key*. If no thread-specific data value is associated with *key*, then the value `NULL` is returned.

ERRORS

The `cnd_init()` and `thrd_create()` functions will fail if:

`thrd_nomem` The system has insufficient memory.

The `cnd_timedwait()` and `mtx_timedlock()` functions will fail if:

`thrd_timedout` The system time has reached or exceeded the time specified in *ts* before the operation could be completed.

The `mtx_trylock()` function will fail if:

`thrd_busy` The mutex is already locked.

In all other cases, these functions may fail by returning general error code `thrd_error`.

SEE ALSO

`nanosleep(2)`, `pthread(3)`

STANDARDS

These functions are expected to conform to ISO/IEC 9899:2011 ("ISO C11").

HISTORY

These functions appeared in FreeBSD 10.0.

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