globus common

14.5

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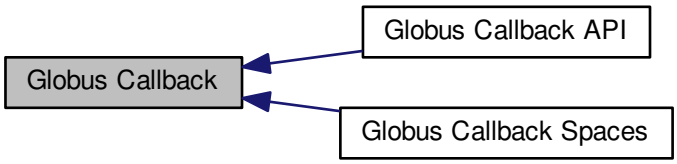
4.1 Globus Callback

Collaboration diagram for Globus Callback:



Modules

- **Globus Callback API**
- **Globus Callback Spaces**

Defines

- #define **GLOBUS_CALLBACK_MODULE**
- #define **GLOBUS_POLL_MODULE**

Typedefs

- typedef int **globus_callback_handle_t**
- typedef int **globus_callback_space_t**
- typedef struct globus_l_callback_space_attr_s * **globus_callback_space_attr_t**

Enumerations

- enum **globus_callback_error_type_t** { **GLOBUS_CALLBACK_ERROR_INVALID_CALLBACK_HANDLE** = 1024, **GLOBUS_CALLBACK_ERROR_INVALID_SPACE**, **GLOBUS_CALLBACK_ERROR_MEMORY_ALLOC**, **GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT**, **GLOBUS_CALLBACK_ERROR_ALREADY_CANCELED**, **GLOBUS_CALLBACK_ERROR_NO_ACTIVE_CALLBACK** }

4.1.1 Detailed Description

4.1.2 Define Documentation

4.1.2.1 #define GLOBUS_CALLBACK_MODULE

Module descriptor.

Module descriptor for for globus_callback module. Must be activated before any of the following api is called.

Note: You would not normally activate this module directly. Activating the GLOBUS_COMMON_MODULE will in turn activate this also.

4.1.2.2 #define GLOBUS_POLL_MODULE

Module descriptor.

Deprecated

Backward compatible name

4.1.3 Typedef Documentation

4.1.3.1 typedef int globus_callback_handle_t

Periodic callback handle.

This handle can be copied or compared, and represented as NULL with GLOBUS_NULL_HANDLE

4.1.3.2 typedef int globus_callback_space_t

Callback space handle.

This handle can be copied or compared and represented as NULL with GLOBUS_NULL_HANDLE

4.1.3.3 typedef struct globus_l_callback_space_attr_s* globus_callback_space_attr_t

Callback space attribute.

This handle can be copied and represented as NULL with GLOBUS_NULL

4.1.4 Enumeration Type Documentation

4.1.4.1 enum globus_callback_error_type_t

Error types.

Possible error types returned by the api in this module. You can use the error API to check results against these types.

See also

Error Handling Helpers (p. 36)

Enumerator:

GLOBUS_CALLBACK_ERROR_INVALID_CALLBACK_HANDLE The callback handle is not valid or it has already been destroyed.

GLOBUS_CALLBACK_ERROR_INVALID_SPACE The space handle is not valid or it has already been destroyed.

GLOBUS_CALLBACK_ERROR_MEMORY_ALLOC Could not allocate memory for an internal structure.

GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT One of the arguments is NULL or out of range.

GLOBUS_CALLBACK_ERROR_ALREADY_CANCELED Attempt to unregister callback again.

GLOBUS_CALLBACK_ERROR_NO_ACTIVE_CALLBACK Attempt to retrieve info about a callback not in callers's stack.

4.2 Globus Callback API

Collaboration diagram for Globus Callback API:

Convenience Macros

- #define **globus_callback_poll**(a)
- #define **globus_poll_blocking**()
- #define **globus_poll_nonblocking**()
- #define **globus_poll**()
- #define **globus_signal_poll**()
- #define **globus_callback_register_oneshot**(callback_handle,delay_time,callback_func,callback_user_arg)
- #define **globus_callback_register_periodic**(callback_handle,delay_time,period,callback_func,callback_user_arg)
- #define **globus_callback_register_signal_handler**(signum,persist,callback_func,callback_user_arg)

Callback Prototypes

- typedef void(∗ **globus_callback_func_t**)(void ∗user_arg)

Oneshot Callbacks

- globus_result_t **globus_callback_space_register_oneshot** (**globus_callback_handle_t** ∗callback_handle, const globus_reltime_t ∗delay_time, **globus_callback_func_t** callback_func, void ∗callback_user_arg, **globus_callback_space_t** space)

Periodic Callbacks

- globus_result_t **globus_callback_space_register_periodic** (**globus_callback_handle_t** ∗callback_handle, const globus_reltime_t ∗delay_time, const globus_reltime_t ∗period, **globus_callback_func_t** callback_func, void ∗callback_user_arg, **globus_callback_space_t** space)
- globus_result_t **globus_callback_unregister** (**globus_callback_handle_t** callback_handle, **globus_callback_func_t** unregister_callback, void ∗unreg_arg, globus_bool_t ∗active)
- globus_result_t **globus_callback_adjust_oneshot** (**globus_callback_handle_t** callback_handle, const globus_reltime_t ∗new_delay)
- globus_result_t **globus_callback_adjust_period** (**globus_callback_handle_t** callback_handle, const globus_reltime_t ∗new_period)

Callback Polling

- void **globus_callback_space_poll** (const globus_abstime_t ∗timestop, **globus_callback_space_t** space)
- void **globus_callback_signal_poll** ()

Miscellaneous

- globus_bool_t **globus_callback_get_timeout** (globus_reltime_t *time_left)
- globus_bool_t **globus_callback_has_time_expired** ()
- globus_bool_t **globus_callback_was_restarted** ()

4.2.1 Detailed Description

4.2.2 Define Documentation

4.2.2.1 #define globus_callback_poll(*a*)

Poll the global callback space.

Specifies the global space for **globus_callback_space_poll()** (p. 11). argument is the timeout

See also

globus_callback_space_poll() (p. 11)

4.2.2.2 #define globus_poll_blocking( )

Blocking poll of the global callback space.

Specifies that **globus_callback_space_poll()** (p. 11) should poll on the global space with an infinite timeout

See also

globus_callback_space_poll() (p. 11)

4.2.2.3 #define globus_poll_nonblocking( )

Nonblocking poll of the global callback space.

Specifies that **globus_callback_space_poll()** (p. 11) should poll on the global space with an immediate timeout

See also

globus_callback_space_poll() (p. 11)

4.2.2.4 #define globus_poll( )

Nonblocking poll of the global callback space.

Specifies that **globus_callback_space_poll()** (p. 11) should poll on the global space with an immediate timeout

See also

globus_callback_space_poll() (p. 11)

4.2.2.5 #define globus_signal_poll( )

Wake up callback polling thread.

Counterpart to **globus_poll()** (p. 7).

See also

globus_callback_signal_poll() (p. 12)

4.2.2.6 #define globus_callback_register_oneshot(*callback_handle, delay_time, callback_func, callback_user_arg*)

Register a oneshot function in the global callback space.

Specifies the global space for **globus_callback_space_register_oneshot()** (p. 9) all other arguments are the same as specified there.

See also

globus_callback_space_register_oneshot() (p. 9)

4.2.2.7 #define globus_callback_register_periodic(*callback_handle, delay_time, period, callback_func, callback_user_arg*)

Register a periodic function in the global callback space.

Specifies the global space for **globus_callback_space_register_periodic()** (p. 9) all other arguments are the same as specified there.

See also

globus_callback_space_register_periodic() (p. 9)

4.2.2.8 #define globus_callback_register_signal_handler(*signum, persist, callback_func, callback_user_arg*)

Register a signal handler in the global callback space.

Specifies the global space for **globus_callback_space_register_signal_handler()** (p. 19) all other arguments are the same as specified there.

See also

globus_callback_space_register_signal_handler() (p. 19)

4.2.3 Typedef Documentation

4.2.3.1 typedef void(* globus_callback_func_t)(void *user_arg)

Globus callback prototype.

This is the signature of the function registered with the globus_callback_register_* calls.

If this is a periodic callback, it is guaranteed that the call canNOT be reentered unless globus_thread_blocking_space_will_block() is called (explicitly, or implicitly via **globus_cond_wait()** (p. 50)). Also, if **globus_callback_unregister()** (p. 10) is called to cancel this periodic from within this callback, it is guaranteed that the callback will NOT be requeued again

If the function will block at all, the user should call **globus_callback_get_timeout()** (p. 12) to see how long this function can safely block or call globus_thread_blocking_space_will_block()

Parameters

user_arg	The user argument registered with this callback

Returns

- void

See also

globus_callback_space_register_oneshot() (p. 9)
globus_callback_space_register_periodic() (p. 9)
globus_thread_blocking_space_will_block()
globus_callback_get_timeout() (p. 12)

4.2.4 Function Documentation

4.2.4.1 globus_result_t globus_callback_space_register_oneshot (globus_callback_handle_t * *callback_handle,* const globus_reltime_t * *delay_time,* globus_callback_func_t *callback_func,* void * *callback_user_arg,* globus_callback_space_t *space*)

Register a oneshot some delay from now.

This function registers the callback_func to start some delay_time from now.

Parameters

callback_handle	Storage for a handle. This may be NULL. If it is NOT NULL, you must unregister the callback to reclaim resources.
delay_time	The relative time from now to fire this callback. If NULL, will fire as soon as possible
callback_func	the user func to call
callback_user_arg	user arg that will be passed to callback
space	The space with which to register this callback

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT
- GLOBUS_CALLBACK_ERROR_MEMORY_ALLOC
- GLOBUS_SUCCESS

See also

globus_callback_func_t (p. 8)
Globus Callback Spaces (p. 14)

4.2.4.2 globus_result_t globus_callback_space_register_periodic (globus_callback_handle_t * *callback_handle,* const globus_reltime_t * *delay_time,* const globus_reltime_t * *period,* globus_callback_func_t *callback_func,* void * *callback_user_arg,* globus_callback_space_t *space*)

Register a periodic callback.

This function registers a periodic callback_func to start some delay_time and run every period from then.

Parameters

callback_handle	Storage for a handle. This may be NULL. If it is NOT NULL, you must cancel the periodic to reclaim resources.
delay_time	The relative time from now to fire this callback. If NULL, will fire the first callback as soon as possible
period	The relative period of this callback
callback_func	the user func to call
callback_user_arg	user arg that will be passed to callback
space	The space with which to register this callback

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT
- GLOBUS_CALLBACK_ERROR_MEMORY_ALLOC
- GLOBUS_SUCCESS

See also

globus_callback_unregister() (p. 10)
globus_callback_func_t (p. 8)
globus_callback_spaces (p. 14)

4.2.4.3 globus_result_t globus_callback_unregister (globus_callback_handle_t *callback_handle,* globus_callback_func_t *unregister_callback,* void * *unreg_arg,* globus_bool_t * *active*)

Unregister a callback.

This function will cancel a callback and free the resources associcated with the callback handle. If the callback was able to be canceled immediately (or if it has already run), GLOBUS_SUCCESS is returned and it is guaranteed that there are no running instances of the callback.

If the callback is currently running (or unstoppably about to be run), then the callback is prevented from being requeued, but, the 'official' cancel is deferred until the last running instance of the callback returns. If you need to know when the callback is guaranteed to have been canceled, pass an unregister callback.

If you would like to know if you unregistered a callback before it ran, pass storage for a boolean 'active'. This will be GLOBUS_TRUE if callback was running. GLOBUS_FALSE otherwise.

Parameters

callback_handle	the handle received from a globus_callback_space_register_*() call
unregister_callback	the function to call when the callback has been canceled and there are no running instances of it. This will be delivered to the same space used in the register call.
unreg_arg	user arg that will be passed to the unregister callback
active	storage for an indication of whether the callback was running when this call was made

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_CALLBACK_HANDLE
- GLOBUS_CALLBACK_ERROR_ALREADY_CANCELED
- GLOBUS_SUCCESS

See also

globus_callback_space_register_periodic() (p. 9)
globus_callback_func_t (p. 8)

4.2.4.4 globus_result_t globus_callback_adjust_oneshot (globus_callback_handle_t *callback_handle,* const globus_reltime_t * *new_delay*)

Adjust the delay of a oneshot callback.

This function allows a user to adjust the delay of a previously registered callback. It is safe to call this within or outside of the callback that is being modified.

Note if the oneshot has already been fired, this function will still return GLOBUS_SUCCESS, but won't affect anything.

Parameters

callback_handle	the handle received from a **globus_callback_space_register_oneshot()** (p. 9) call
new_delay	The new delay from now. If NULL, then callback will be fired as soon as possible.

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_CALLBACK_HANDLE
- GLOBUS_CALLBACK_ERROR_ALREADY_CANCELED
- GLOBUS_SUCCESS

See also

globus_callback_space_register_periodic() (p. 9)

4.2.4.5 globus_result_t globus_callback_adjust_period (globus_callback_handle_t *callback_handle,* const globus_reltime_t * *new_period*)

Adjust the period of a periodic callback.

This function allows a user to adjust the period of a previously registered callback. It is safe to call this within or outside of the callback that is being modified.

This func also allows a user to effectively 'suspend' a periodic callback until another time by passing a period of NULL. The callback can later be resumed by passing in a new period.

Note that the callback will not be fired sooner than 'new_period' from now. A 'suspended' callback must still be unregistered to free its resources.

Parameters

callback_handle	the handle received from a **globus_callback_space_register_periodic()** (p. 9) call
new_period	The new period. If NULL or globus_i_reltime_infinity, then callback will be 'suspended' as soon as the last running instance of it returns.

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_CALLBACK_HANDLE
- GLOBUS_CALLBACK_ERROR_ALREADY_CANCELED
- GLOBUS_SUCCESS

See also

globus_callback_space_register_periodic() (p. 9)

4.2.4.6 void globus_callback_space_poll (const globus_abstime_t * *timestop,* globus_callback_space_t *space*)

Poll for ready callbacks.

This function is used to poll for registered callbacks.

For non-threaded builds, callbacks are not/can not be delivered unless this is called. Any call to this can cause callbacks registered with the 'global' space to be fired. Whereas callbacks registered with a user's space will only be delivered when this is called with that space.

For threaded builds, this only needs to be called to poll user spaces with behavior == GLOBUS_CALLBACK_SPACE_BEHAVIOR_SINGLE. The 'global' space and other user spaces are constantly polled in a separate thread. (If it is called in a threaded build for these spaces, it will just yield its thread)

In general, you never need to call this function directly. It is called (when necessary) by **globus_cond_wait()** (p. 50). The only case in which a user may wish to call this explicitly is if the application has no aspirations of ever being built threaded.

This function (when not yielding) will block up to timestop or until **globus_callback_signal_poll()** (p. 12) is called by one of the fired callbacks. It will always try and kick out ready callbacks, regardless of the timestop.

Parameters

timestop	The time to block until. If this is NULL or less than the cuurent time, an attempt to fire only ready callbacks is made (no blocking).
space	The callback space to poll. Note: regardless of what space is passed here, the 'global' space is also always polled.

Returns

- void

See also

Globus Callback Spaces (p. 14)
globus_condattr_setspace() (p. 52)

4.2.4.7 void globus_callback_signal_poll ( )

Signal the poll.

This function signals **globus_callback_space_poll()** (p. 11) that something has changed and it should return to its caller as soon as possible.

In general, you never need to call this function directly. It is called (when necessary) by **globus_cond_signal()** (p. 51) or globus_cond_broadcast. The only case in which a user may wish to call this explicitly is if the application has no aspirations of ever being built threaded.

Returns

- void

See also

globus_callback_space_poll() (p. 11)

4.2.4.8 globus_bool_t globus_callback_get_timeout (globus_reltime_t * *time_left*)

Get the amount of time left in a callback.

This function retrieves the remaining time a callback is allowed to run. If a callback has already timed out, time_left will be set to zero and GLOBUS_TRUE returned. This function is intended to be called within a callback's stack, but is harmless to call anywhere (will return GLOBUS_FALSE and an infinite time_left)

Parameters

time_left	storage for the remaining time.

Returns

- GLOBUS_FALSE if time remaining
- GLOBUS_TRUE if already timed out

4.2.4.9 globus_bool_t globus_callback_has_time_expired ( )

See if there is remaining time in a callback.

This function returns GLOBUS_TRUE if the running time of a callback has already expired. This function is intended to be called within a callback's stack, but is harmless to call anywhere (will return GLOBUS_FALSE)

Returns

- GLOBUS_FALSE if time remaining
- GLOBUS_TRUE if already timed out

4.2.4.10 globus_bool_t globus_callback_was_restarted ( )

See if a callback has been restarted.

If the callback is a oneshot, this merely means the callback called globus_thread_blocking_space_will_block (or **globus_cond_wait()** (p. 50) at some point.

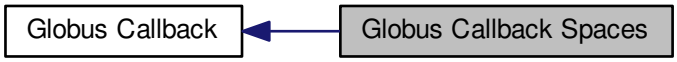
For a periodic, it signifies the same and also that the periodic has been requeued. This means that the callback function may be reentered if the period is short enough (on a threaded build)

Returns

- GLOBUS_FALSE if not restarted
- GLOBUS_TRUE if restarted

4.3 Globus Callback Spaces

Collaboration diagram for Globus Callback Spaces:



Defines

- #define **GLOBUS_CALLBACK_GLOBAL_SPACE**

Enumerations

- enum **globus_callback_space_behavior_t** { **GLOBUS_CALLBACK_SPACE_BEHAVIOR_SINGLE**, **GLOBUS_CALLBACK_SPACE_BEHAVIOR_SERIALIZED**, **GLOBUS_CALLBACK_SPACE_BEHAVIOR_THREADED** }

Functions

- globus_result_t **globus_callback_space_init** (**globus_callback_space_t** *space, **globus_callback_space_attr_t** attr)
- globus_result_t **globus_callback_space_reference** (**globus_callback_space_t** space)
- globus_result_t **globus_callback_space_destroy** (**globus_callback_space_t** space)
- globus_result_t **globus_callback_space_attr_init** (**globus_callback_space_attr_t** *attr)
- globus_result_t **globus_callback_space_attr_destroy** (**globus_callback_space_attr_t** attr)
- globus_result_t **globus_callback_space_attr_set_behavior** (**globus_callback_space_attr_t** attr, **globus_callback_space_behavior_t** behavior)
- globus_result_t **globus_callback_space_attr_get_behavior** (**globus_callback_space_attr_t** attr, **globus_callback_space_behavior_t** *behavior)
- globus_result_t **globus_callback_space_get** (**globus_callback_space_t** *space)
- int **globus_callback_space_get_depth** (**globus_callback_space_t** space)
- globus_bool_t **globus_callback_space_is_single** (**globus_callback_space_t** space)

4.3.1 Detailed Description

4.3.2 Define Documentation

4.3.2.1 #define GLOBUS_CALLBACK_GLOBAL_SPACE

Global callback space.

The 'global' space handle.

This is the default space handle implied if no spaces are explicitly created.

4.3.3 Enumeration Type Documentation

4.3.3.1 enum globus_callback_space_behavior_t

Callback space behaviors describe how a space behaves.

In a non-threaded build all spaces exhibit a behavior == _BEHAVIOR_SINGLE. Setting a specific behavior in this case is ignored.

In a threaded build, _BEHAVIOR_SINGLE retains all the rules and behaviors of a non-threaded build while _BEHAVIOR_THREADED makes the space act as the global space.

Setting a space's behavior to _BEHAVIOR_SINGLE guarantees that the poll protection will always be there and all callbacks are serialized and only kicked out when polled for. In a threaded build, it is still necessary to poll for callbacks in a _BEHAVIOR_SINGLE space. (**globus_cond_wait()** (p. 50) will take care of this for you also)

Setting a space's behavior to _BEHAVIOR_SERIALIZED guarantees that the poll protection will always be there and all callbacks are serialized. In a threaded build, it is NOT necessary to poll for callbacks in a _BEHAVIOR_SERIALIZED space. Callbacks in this space will be delivered as soon as possible, but only one outstanding (and unblocked) callback will be allowed at any time.

Setting a space's behavior to _BEHAVIOR_THREADED allows the user to have the poll protection provided by spaces when built non-threaded, yet, be fully threaded when built threaded (where poll protection is not needed)

Enumerator:

GLOBUS_CALLBACK_SPACE_BEHAVIOR_SINGLE The default behavior. Indicates that you always want poll protection and single threaded behavior (callbacks need to be explicitly polled for

GLOBUS_CALLBACK_SPACE_BEHAVIOR_SERIALIZED Indicates that you want poll protection and all callbacks to be serialized (but they do not need to be polled for in a threaded build)

GLOBUS_CALLBACK_SPACE_BEHAVIOR_THREADED Indicates that you only want poll protection.

4.3.4 Function Documentation

4.3.4.1 globus_result_t globus_callback_space_init (globus_callback_space_t * *space,* globus_callback_space_attr_t *attr*)

Initialize a user space.

This creates a user space.

Parameters

space	storage for the initialized space handle. This must be destroyed with **globus_callback_space_destroy()** (p. 16)
attr	a space attr descibing desired behaviors. If GLOBUS_NULL, the default behavior of GLOBUS_CALLBACK_SPACE_BEHAVIOR_SINGLE is assumed. This attr is copied into the space, so it is acceptable to destroy the attr as soon as it is no longer needed

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT on NULL space
- GLOBUS_CALLBACK_ERROR_MEMORY_ALLOC
- GLOBUS_SUCCESS

See also

globus_condattr_setspace() (p. 52)

4.3.4.2 globus_result_t globus_callback_space_reference (globus_callback_space_t *space*)

Take a reference to a space.

A library which has been 'given' a space to provide callbacks on would use this to take a reference on the user's space. This prevents mayhem should a user destroy a space before the library is done with it. This reference should be destroyed with **globus_callback_space_destroy()** (p. 16) (think dup())

Parameters

space	space to reference

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_SPACE
- GLOBUS_SUCCESS

4.3.4.3 globus_result_t globus_callback_space_destroy (globus_callback_space_t *space*)

Destroy a reference to a user space.

This will destroy a reference to a previously initialized space. Space will not actually be destroyed until all callbacks registered with this space have been run and unregistered (if the user has a handle to that callback) AND all references (from **globus_callback_space_reference()** (p. 16)) have been destroyed.

Parameters

space	space to destroy, previously initialized by **globus_callback_space_init()** (p. 15) or referenced with **globus_callback_space_reference()** (p. 16)

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_SPACE
- GLOBUS_SUCCESS

See also

globus_callback_space_init() (p. 15)
globus_callback_space_reference() (p. 16)

4.3.4.4 globus_result_t globus_callback_space_attr_init (globus_callback_space_attr_t * *attr*)

Initialize a space attr.

Currently, the only attr to set is the behavior. The default behavior associated with this attr is GLOBUS_CALLBACK_SPACE_BEHAVIOR_SINGLE

Parameters

attr	storage for the intialized attr. Must be destroyed with **globus_callback_space_attr_destroy()** (p. 17)

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT on NULL attr
- GLOBUS_CALLBACK_ERROR_MEMORY_ALLOC

- GLOBUS_SUCCESS

4.3.4.5 globus_result_t globus_callback_space_attr_destroy (globus_callback_space_attr_t *attr*)

Destroy a space attr.

Parameters

attr	attr to destroy, previously initialized with **globus_callback_space_attr_init()** (p. 16)

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT on NULL attr
- GLOBUS_SUCCESS

See also

globus_callback_space_attr_init() (p. 16)

4.3.4.6 globus_result_t globus_callback_space_attr_set_behavior (globus_callback_space_attr_t *attr,* globus_callback_space_behavior_t *behavior*)

Set the behavior of a space.

Parameters

attr	attr to associate behavior with
behavior	desired behavior

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT
- GLOBUS_SUCCESS

See also

globus_callback_space_behavior_t (p. 15)

4.3.4.7 globus_result_t globus_callback_space_attr_get_behavior (globus_callback_space_attr_t *attr,* globus_callback_space_behavior_t * *behavior*)

Get the behavior associated with an attr.

Note: for a non-threaded build, this will always pass back a behavior == GLOBUS_CALLBACK_SPACE_BEHAVIOR_SINGLE.

Parameters

attr	attr on which to query behavior
behavior	storage for the behavior

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT
- GLOBUS_SUCCESS

4.3.4.8 globus_result_t globus_callback_space_get (globus_callback_space_t * *space*)

Retrieve the space of a currently running callback.

Parameters

space	storage for the handle to the space currently running

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT on NULL space
- GLOBUS_CALLBACK_ERROR_NO_ACTIVE_CALLBACK
- GLOBUS_SUCCESS

4.3.4.9 int globus_callback_space_get_depth (globus_callback_space_t *space*)

Retrieve the current nesting level of a space.

Parameters

space	The space to query.

Returns

- the current nesting level
- -1 on invalid space

4.3.4.10 globus_bool_t globus_callback_space_is_single (globus_callback_space_t *space*)

See if the specified space is a single threaded behavior space.

Parameters

space	the space to query

Returns

- GLOBUS_TRUE if space's behavior is _BEHAVIOR_SINGLE
- GLOBUS_FALSE otherwise

4.4 Globus Callback Signal Handling

Defines

- #define **GLOBUS_SIGNAL_INTERRUPT**

Functions

- globus_result_t **globus_callback_space_register_signal_handler** (int signum, globus_bool_t persist, **globus_callback_func_t** callback_func, void ∗callback_user_arg, **globus_callback_space_t** space)
- globus_result_t **globus_callback_unregister_signal_handler** (int signum, **globus_callback_func_t** unregister_callback, void ∗unreg_arg)
- void **globus_callback_add_wakeup_handler** (void(∗wakeup)(void ∗), void ∗user_arg)

4.4.1 Detailed Description

4.4.2 Define Documentation

4.4.2.1 #define GLOBUS_SIGNAL_INTERRUPT

Use this to trap interrupts (SIGINT on unix). In the future, this will also map to handle ctrl-C on win32.

4.4.3 Function Documentation

4.4.3.1 globus_result_t globus_callback_space_register_signal_handler (int *signum,* globus_bool_t *persist,* globus_callback_func_t *callback_func,* void ∗ *callback_user_arg,* globus_callback_space_t *space*)

Fire a callback when the specified signal is received.

Note that there is a tiny delay between the time this call returns and the signal is actually handled by this library. It is likely that, if the signal was received the instant the call returned, it will be lost (this is normally not an issue, since you would call this in your startup code anyway)

Parameters

signum	The signal to receive. The following signals are not allowed: SIGKILL, SIGSEGV, SIGABRT, SIGBUS, SIGFPE, SIGILL, SIGIOT, SIGPIPE, SIGEMT, SIGSYS, SIGTRAP, SIGSTOP, SIGCONT, and SIGWAITING
persist	If GLOBUS_TRUE, keep this callback registered for multiple signals. If GLOBUS_FALSE, the signal handler will automatically be unregistered once the signal has been received.
callback_func	the user func to call when a signal is received
callback_user_arg	user arg that will be passed to callback
space	the space to deliver callbacks to.

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_SPACE
- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT
- GLOBUS_SUCCESS otherwise

4.4.3.2 globus_result_t globus_callback_unregister_signal_handler (int *signum,* globus_callback_func_t *unregister_callback,* void * *unreg_arg*)

Unregister a signal handling callback.

Parameters

signum	The signal to unregister.
unregister_callback	the function to call when the callback has been canceled and there are no running instances of it (may be NULL). This will be delivered to the same space used in the register call.
unreg_arg	user arg that will be passed to callback

Returns

- GLOBUS_CALLBACK_ERROR_INVALID_ARGUMENT if this signal was registered with persist == false, then there is a race between a signal actually being caught and therefor automatically unregistered and the attempt to manually unregister it. If that race occurs, you will receive this error just as you would for any signal not registered.
- GLOBUS_SUCCESS otherwise

4.4.3.3 void globus_callback_add_wakeup_handler (void(*)(void *) *wakeup,* void * *user_arg*)

Register a wakeup handler with callback library.

This is really only needed in non-threaded builds, but for cross builds should be used everywhere that a callback may sleep for an extended period of time.

An example use is for an io poller that sleeps indefinitely on select(). If the callback library receives a signal that it needs to deliver asap, it will call the wakeup handler(s), These wakeup handlers must run as though they were called from a signal handler (don't use any thread utilities). The io poll example will likely write a single byte to a pipe that select() is monitoring.

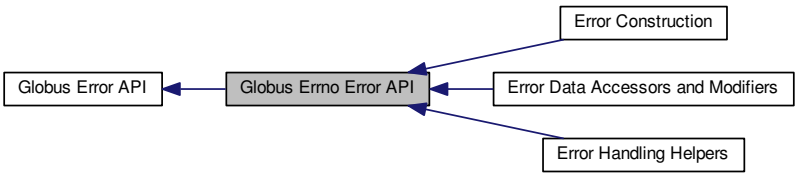
This handler will not be unregistered until the callback library is deactivated (via common).

Parameters

wakeup	function to call when callback library needs you to return asap from any blocked callbacks.
user_arg	user data that will be passed along in the wakeup handler

4.5 Globus Errno Error API

Collaboration diagram for Globus Errno Error API:



Modules

- **Error Construction**
- **Error Data Accessors and Modifiers**
- **Error Handling Helpers**

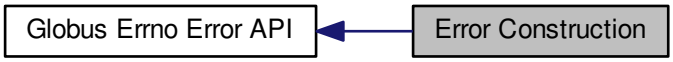
4.5.1 Detailed Description

These globus_error functions are motivated by the desire to provide a easier way of generating new error types, while at the same time preserving all features (e.g. memory management, chaining) of the current error handling framework. The functions in this API are auxiliary to the function in the Globus Generic Error API in the sense that they provide a wraper for representing system errors in terms of a globus_error_t.

Any program that uses Globus Errno Error functions must include "globus_common.h".

4.6 Error Construction

Collaboration diagram for Error Construction:



Defines

- #define **GLOBUS_ERROR_TYPE_ERRNO**

Construct Error

- globus_object_t * **globus_error_construct_errno_error** (globus_module_descriptor_t *base_source, globus_object_t *base_cause, const int system_errno)

Initialize Error

- globus_object_t * **globus_error_initialize_errno_error** (globus_object_t *error, globus_module_descriptor_t *base_source, globus_object_t *base_cause, const int system_errno)

4.6.1 Detailed Description

Create and initialize a Globus Errno Error object. This section defines operations to create and initialize Globus Errno Error objects.

4.6.2 Define Documentation

4.6.2.1 #define GLOBUS_ERROR_TYPE_ERRNO

Error type definition.

4.6.3 Function Documentation

4.6.3.1 globus_object_t* globus_error_construct_errno_error (globus_module_descriptor_t * *base_source,* globus_object_t * *base_cause,* const int *system_errno*)

Allocate and initialize an error of type GLOBUS_ERROR_TYPE_ERRNO.

Parameters

base_source	Pointer to the originating module.
base_cause	The error object causing the error. If this is the original error, this paramater may be NULL.
system_errno	The system errno.

Returns

The resulting error object. It is the user's responsibility to eventually free this object using globus_object_free(). A globus_result_t may be obtained by calling globus_error_put() on this object.

4.6.3.2 globus_object_t* globus_error_initialize_errno_error (globus_object_t * *error*, globus_module_descriptor_t * *base_source*, globus_object_t * *base_cause*, const int *system_errno*)

Initialize a previously allocated error of type GLOBUS_ERROR_TYPE_ERRNO.

Parameters

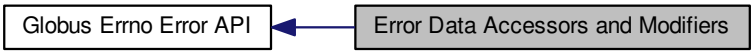
error	The previously allocated error object.
base_source	Pointer to the originating module.
base_cause	The error object causing the error. If this is the original error this paramater may be NULL.
system_errno	The system errno.

Returns

The resulting error object. You may have to call globus_error_put() on this object before passing it on.

4.7 Error Data Accessors and Modifiers

Collaboration diagram for Error Data Accessors and Modifiers:



Get Errno

- int **globus_error_errno_get_errno** (globus_object_t *error)

Set Errno

- void **globus_error_errno_set_errno** (globus_object_t *error, const int system_errno)

4.7.1 Detailed Description

Get and set data in a Globus Errno Error object. This section defines operations for accessing and modifying data in a Globus Errno Error object.

4.7.2 Function Documentation

4.7.2.1 int globus_error_errno_get_errno (globus_object_t * *error*)

Retrieve the system errno from a errno error object.

Parameters

error	The error from which to retrieve the errno

Returns

The errno stored in the object

4.7.2.2 void globus_error_errno_set_errno (globus_object_t * *error,* const int *system_errno*)

Set the errno in a errno error object.

Parameters

error	The error object for which to set the errno
system_errno	The system errno

Returns

void

4.8 Error Handling Helpers

Collaboration diagram for Error Handling Helpers:

Error Match

- globus_bool_t **globus_error_errno_match** (globus_object_t ∗error, globus_module_descriptor_t ∗module, int system_errno)

Wrap Errno Error

- globus_object_t ∗ **globus_error_wrap_errno_error** (globus_module_descriptor_t ∗base_source, int system_errno, int type, const char ∗source_file, const char ∗source_func, int source_line, const char ∗short_desc_format,...)

4.8.1 Detailed Description

Helper functions for dealing with Globus Errno Error objects. This section defines utility functions for dealing with Globus Errno Error objects.

4.8.2 Function Documentation

4.8.2.1 globus_bool_t globus_error_errno_match (globus_object_t ∗ *error,* globus_module_descriptor_t ∗ *module,* int *system_errno*)

Check whether the error originated from a specific module and matches a specific errno.

This function checks whether the error or any of it's causative errors originated from a specific module and contains a specific errno. If the module descriptor is left unspecified this function will check for any error of the specified errno and vice versa.

Parameters

error	The error object for which to perform the check
module	The module descriptor to check for
system_errno	The errno to check for

Returns

GLOBUS_TRUE - the error matched the module and errno GLOBUS_FALSE - the error failed to match the module and errno

4.8.2.2 globus_object_t* globus_error_wrap_errno_error (globus_module_descriptor_t * *base_source,* int *system_errno,* int *type,* const char * *source_file,* const char * *source_func,* int *source_line,* const char * *short_desc_format,* ...)

Allocate and initialize an error of type GLOBUS_ERROR_TYPE_GLOBUS which contains a causal error of type GLOBUS_ERROR_TYPE_ERRNO.

Parameters

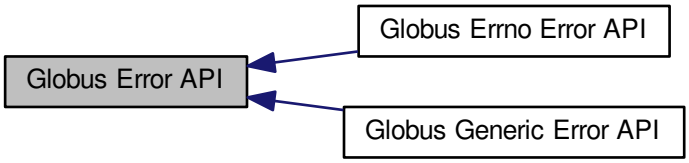
base_source	Pointer to the originating module.
system_errno	The errno to use when generating the causal error.
type	The error type. We may reserve part of this namespace for common errors. Errors not in this space are assumed to be local to the originating module.
source_file	Name of file. Use __FILE__
source_func	Name of function. Use _globus_func_name and declare your func with GlobusFuncName(<name>)
source_line	Line number. Use __LINE__
short_desc_format	Short format string giving a succinct description of the error. To be passed on to the user.
...	Arguments for the format string.

Returns

The resulting error object. It is the user's responsibility to eventually free this object using globus_object_free(). A globus_result_t may be obtained by calling globus_error_put() on this object.

4.9 Globus Error API

Collaboration diagram for Globus Error API:



Modules

- **Globus Errno Error API**
- **Globus Generic Error API**

4.9.1 Detailed Description

Intended use: If a function needs to return an error it should do the following:

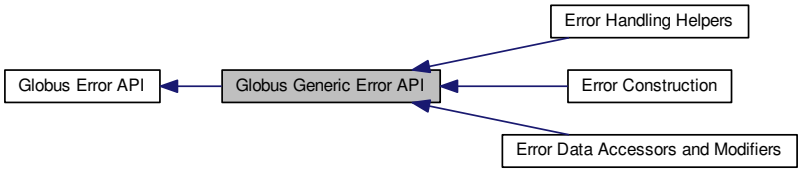
- External errors, such as error returns from system calls and GSSAPI errors, should be wrapped using the appropriate error type.
- The wrapped external error should then be passed as the cause of a globus error.
- External error types are expected to provide a utility function to combine the above two steps.
- The globus error should then be returned from the function.

Notes on how to generate globus errors:

- Module specific error types should be greater or equal to 1024 (to leave some space for global error types).
- You may wish to generate a mapping from error types to format strings for use in short descriptions.
- You may also wish to generate a common prefix for all of the above fromat strings. The suggested prefix is "Function: %s Line: %s ".

4.10 Globus Generic Error API

Collaboration diagram for Globus Generic Error API:



Modules

- **Error Construction**
- **Error Data Accessors and Modifiers**
- **Error Handling Helpers**

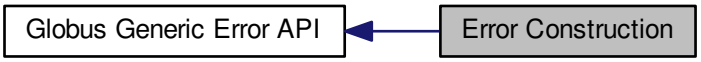
4.10.1 Detailed Description

These globus_error functions are motivated by the desire to provide a easier way of generating new error types, while at the same time preserving all features (e.g. memory management, chaining) of the current error handling framework. It does this by defining a generic error type for globus which in turn contains a integer in it's instance data which is used for carrying the actual error type information.

Any program that uses Globus Generic Error functions must include "globus_common.h".

4.11 Error Construction

Collaboration diagram for Error Construction:



Defines

- #define **GLOBUS_ERROR_TYPE_GLOBUS**

Construct Error

- globus_object_t * **globus_error_construct_error** (globus_module_descriptor_t *base_source, globus_object_t *base_cause, int type, const char *source_file, const char *source_func, int source_line, const char *short_desc_format,...)
- globus_object_t * **globus_error_v_construct_error** (globus_module_descriptor_t *base_source, globus_object_t *base_cause, const int type, const char *source_file, const char *source_func, int source_line, const char *short_desc_format, va_list ap)

Initialize Error

- globus_object_t * **globus_error_initialize_error** (globus_object_t *error, globus_module_descriptor_t *base_source, globus_object_t *base_cause, int type, const char *source_file, const char *source_func, int source_line, const char *short_desc_format, va_list ap)

4.11.1 Detailed Description

Create and initialize a Globus Generic Error object. This section defines operations to create and initialize Globus Generic Error objects.

4.11.2 Define Documentation

4.11.2.1 #define GLOBUS_ERROR_TYPE_GLOBUS

Error type definition.

4.11.3 Function Documentation

4.11.3.1 globus_object_t* globus_error_construct_error (globus_module_descriptor_t * *base_source,* globus_object_t * *base_cause,* int *type,* const char * *source_file,* const char * *source_func,* int *source_line,* const char * *short_desc_format,* ...)

Allocate and initialize an error of type GLOBUS_ERROR_TYPE_GLOBUS.

Parameters

base_source	Pointer to the originating module.
base_cause	The error object causing the error. If this is the original error this paramater may be NULL.
type	The error type. We may reserve part of this namespace for common errors. Errors not in this space are assumed to be local to the originating module.
source_file	Name of file. Use __FILE__
source_func	Name of function. Use _globus_func_name and declare your func with GlobusFuncName(<name>)
source_line	Line number. Use __LINE__
short_desc_format	Short format string giving a succinct description of the error. To be passed on to the user.
...	Arguments for the format string.

Returns

The resulting error object. It is the user's responsibility to eventually free this object using globus_object_free(). A globus_result_t may be obtained by calling globus_error_put() on this object.

4.11.3.2 globus_object_t* globus_error_v_construct_error (globus_module_descriptor_t * *base_source*, globus_object_t * *base_cause*, const int *type*, const char * *source_file*, const char * *source_func*, int *source_line*, const char * *short_desc_format*, va_list *ap*)

Allocate and initialize an error of type GLOBUS_ERROR_TYPE_GLOBUS.

Parameters

base_source	Pointer to the originating module.
base_cause	The error object causing the error. If this is the original error this paramater may be NULL.
type	The error type. We may reserve part of this namespace for common errors. Errors not in this space are assumed to be local to the originating module.
source_file	Name of file. Use __FILE__
source_func	Name of function. Use _globus_func_name and declare your func with GlobusFuncName(<name>)
source_line	Line number. Use __LINE__
short_desc_format	Short format string giving a succinct description of the error. To be passed on to the user.
ap	Arguments for the format string.

Returns

The resulting error object. It is the user's responsibility to eventually free this object using globus_object_free(). A globus_result_t may be obtained by calling globus_error_put() on this object.

4.11.3.3 globus_object_t* globus_error_initialize_error (globus_object_t * *error*, globus_module_descriptor_t * *base_source*, globus_object_t * *base_cause*, int *type*, const char * *source_file*, const char * *source_func*, int *source_line*, const char * *short_desc_format*, va_list *ap*)

Initialize a previously allocated error of type GLOBUS_ERROR_TYPE_GLOBUS.

Parameters

error	The previously allocated error object.
base_source	Pointer to the originating module.
base_cause	The error object causing the error. If this is the original error this paramater may be NULL.

type	The error type. We may reserve part of this namespace for common errors. Errors not in this space are assumed to be local to the originating module.
source_file	Name of file. Use __FILE__
source_func	Name of function. Use _globus_func_name and declare your func with GlobusFuncName(<name>)
source_line	Line number. Use __LINE__
short_desc_format	Short format string giving a succinct description of the error. To be passed on to the user.
ap	Arguments for the format string.

Returns

The resulting error object. You may have to call globus_error_put() on this object before passing it on.

4.12 Error Data Accessors and Modifiers

Collaboration diagram for Error Data Accessors and Modifiers:

Get Source

- globus_module_descriptor_t * **globus_error_get_source** (globus_object_t *error)

Set Source

- void **globus_error_set_source** (globus_object_t *error, globus_module_descriptor_t *source_module)

Get Cause

- globus_object_t * **globus_error_get_cause** (globus_object_t *error)

Set Cause

- void **globus_error_set_cause** (globus_object_t *error, globus_object_t *causal_error)

Get Type

- int **globus_error_get_type** (globus_object_t *error)

Set Type

- void **globus_error_set_type** (globus_object_t *error, const int type)

Get Short Description

- char * **globus_error_get_short_desc** (globus_object_t *error)

Set Short Description

- void **globus_error_set_short_desc** (globus_object_t *error, const char *short_desc_format,...)

Get Long Description

- char * **globus_error_get_long_desc** (globus_object_t *error)

Set Long Description

- void **globus_error_set_long_desc** (globus_object_t *error, const char *long_desc_format,...)

4.12.1 Detailed Description

Get and set data in a Globus Generic Error object. This section defines operations for accessing and modifying data in a Globus Generic Error object.

4.12.2 Function Documentation

4.12.2.1 globus_module_descriptor_t* globus_error_get_source (globus_object_t * *error*)

Retrieve the originating module descriptor from a error object.

Parameters

error	The error from which to retrieve the module descriptor

Returns

The originating module descriptor.

4.12.2.2 void globus_error_set_source (globus_object_t * *error,* globus_module_descriptor_t * *source_module*)

Set the originating module descriptor in a error object.

Parameters

error	The error object for which to set the causative error
source_module	The originating module descriptor

Returns

void

4.12.2.3 globus_object_t* globus_error_get_cause (globus_object_t * *error*)

Retrieve the underlying error from a error object.

Parameters

error	The error from which to retrieve the causative error.

Returns

The underlying error object if it exists, NULL if it doesn't.

4.12.2.4 void globus_error_set_cause (globus_object_t * *error,* globus_object_t * *causal_error*)

Set the causative error in a error object.

Parameters

error	The error object for which to set the causative error.
causal_error	The causative error.

Returns

void

4.12.2.5 int globus_error_get_type (globus_object_t * *error*)

Retrieve the error type from a generic globus error object.

Parameters

error	The error from which to retrieve the error type

Returns

The error type of the object

4.12.2.6 void globus_error_set_type (globus_object_t * *error*, const int *type*)

Set the error type in a generic globus error object.

Parameters

error	The error object for which to set the error type
type	The error type

Returns

void

4.12.2.7 char* globus_error_get_short_desc (globus_object_t * *error*)

Retrieve the short error description from a generic globus error object.

Parameters

error	The error from which to retrieve the description

Returns

The short error description of the object

4.12.2.8 void globus_error_set_short_desc (globus_object_t * *error*, const char * *short_desc_format*, ...)

Set the short error description in a generic globus error object.

Parameters

error	The error object for which to set the description
short_desc_format	Short format string giving a succinct description of the error. To be passed on to the user.
...	Arguments for the format string.

Returns

void

4.12.2.9 char* globus_error_get_long_desc (globus_object_t * *error*)

Retrieve the long error description from a generic globus error object.

Parameters

error	The error from which to retrieve the description

Returns

The long error description of the object

4.12.2.10 void globus_error_set_long_desc (globus_object_t * *error,* const char * *long_desc_format,* ...)

Set the long error description in a generic globus error object.

Parameters

error	The error object for which to set the description
long_desc_format	Longer format string giving a more detailed explanation of the error.

Returns

void

4.13 Error Handling Helpers

Collaboration diagram for Error Handling Helpers:

Error Match

- globus_bool_t **globus_error_match** (globus_object_t ∗error, globus_module_descriptor_t ∗module, int type)

Print Error Chain

- char ∗ **globus_error_print_chain** (globus_object_t ∗error)

Print User Friendly Error Message

- char ∗ **globus_error_print_friendly** (globus_object_t ∗error)

4.13.1 Detailed Description

Helper functions for dealing with Globus Generic Error objects. This section defines utility functions for dealing with Globus Generic Error objects.

4.13.2 Function Documentation

4.13.2.1 globus_bool_t globus_error_match (globus_object_t ∗ *error,* globus_module_descriptor_t ∗ *module,* int *type*)

Check whether the error originated from a specific module and is of a specific type.

This function checks whether the error or any of it's causative errors originated from a specific module and is of a specific type. If the module descriptor is left unspecified this function will check for any error of the specified type and vice versa.

Parameters

error	The error object for which to perform the check
module	The module descriptor to check for
type	The type to check for

Returns

GLOBUS_TRUE - the error matched the module and type GLOBUS_FALSE - the error failed to match the module and type

4.13.2.2 char* globus_error_print_chain (globus_object_t * *error*)

Return a string containing all printable errors found in a error object and it's causative error chain.

If the GLOBUS_ERROR_VERBOSE env is set, file, line and function info will also be printed (where available). Otherwise, only the module name will be printed.

Parameters

error	The error to print

Returns

A string containing all printable errors. This string needs to be freed by the user of this function.

4.13.2.3 char* globus_error_print_friendly (globus_object_t * *error*)

Return a string containing error messages from the top 1 and bottom 3 objects, and, if found, show a friendly error message.

The error chain will be searched from top to bottom until a friendly handler is found and a friendly message is created.

If the GLOBUS_ERROR_VERBOSE env is set, then the result from **globus_error_print_chain()** (p. 37) will be used.

Parameters

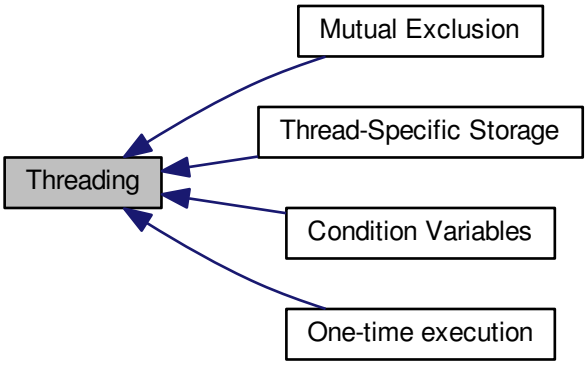
error	The error to print

Returns

A string containing a friendly error message. This string needs to be freed by the user of this function.

4.14 Threading

Collaboration diagram for Threading:



Data Structures

- union **globus_thread_t**
  Thread ID.
- union **globus_threadattr_t**
  Thread attributes.
- union **globus_thread_key_t**
  Thread-specific data key.

Modules

- **Mutual Exclusion**
- **Condition Variables**
- **Thread-Specific Storage**
- **One-time execution**

Defines

- #define **GLOBUS_THREAD_CANCEL_DISABLE** 0
- #define **GLOBUS_THREAD_CANCEL_ENABLE** 1
- #define **GLOBUS_THREAD_MODULE** (&globus_i_thread_module)

Typedefs

- typedef void(∗ **globus_thread_key_destructor_func_t**)(void ∗value)

Functions

- int **globus_thread_set_model** (const char *model)
- int **globus_thread_create** (**globus_thread_t** *thread, **globus_threadattr_t** *attr, globus_thread_func_t func, void *user_arg)
- void **globus_thread_yield** (void)
- void **globus_thread_exit** (void *value)
- int **globus_thread_sigmask** (int how, const sigset_t *new_mask, sigset_t *old_mask)
- int **globus_thread_kill** (**globus_thread_t** thread, int sig)
- **globus_thread_t globus_thread_self** (void)
- globus_bool_t **globus_thread_equal** (**globus_thread_t** thread1, **globus_thread_t** thread2)
- globus_bool_t **globus_thread_preemptive_threads** (void)
- globus_bool_t **globus_i_am_only_thread** (void)
- void * **globus_thread_cancellable_func** (void *(*func)(void *), void *arg, void(*cleanup_func)(void *), void *cleanup_arg, globus_bool_t execute_cleanup)
- int **globus_thread_cancel** (**globus_thread_t** thr)
- void **globus_thread_testcancel** (void)
- int **globus_thread_setcancelstate** (int state, int *oldstate)

4.14.1 Detailed Description

The Globus runtime includes support for portably creating threads on POSIX and Windows systems. It also provides a callback-driven system for applications that may use threads but don't require them. The Globus Thread API is modeled closely after the POSIX threads API.

Applications can choose whether to run as threaded or non-threaded at runtime by either setting the GLOBUS_THREAD_MODEL environment variable or calling the **globus_thread_set_model()** (p. 40) function prior to activating any Globus modules.

The Globus thread system provides primitives for mutual exclusion (**globus_mutex_t** (p. 63), **globus_rmutex_t** (p. 63), globus_rw_mutex_t), event synchronization (**globus_cond_t** (p. 63)), one-time execution (globus_once_t), and threading (**globus_thread_t** (p. 64)).

In non-threaded operation, **globus_cond_wait()** (p. 50) and its variants will poll the callback queue and I/O system to allow event-driven programs to run in the absence of threads. The **globus_thread_create()** (p. 40) function will fail in that model. Other primitive operations will return success but not provide any thread exclusion as there is only one thread.

4.14.2 Define Documentation

4.14.2.1 #define GLOBUS_THREAD_CANCEL_DISABLE 0

Disable thread cancellation value.

See also

globus_thread_setcancelstate() (p. 43)

4.14.2.2 #define GLOBUS_THREAD_CANCEL_ENABLE 1

Enable thread cancellation value.

See also

globus_thread_setcancelstate() (p. 43)

4.14.2.3 #define GLOBUS_THREAD_MODULE (&globus_i_thread_module)

Thread Module.

4.14.3 Typedef Documentation

4.14.3.1 typedef void(* globus_thread_key_destructor_func_t)(void *value)

Thread-specific data destructor.

4.14.4 Function Documentation

4.14.4.1 int globus_thread_set_model (const char * *model*)

Select threading model for an application.

The **globus_thread_set_model()** (p. 40) function selects which runtime model the current application will use. By default, the Globus runtime uses a non-threaded model. Additional models may be available based on system support: pthread, or windows. This function must be called prior to activating any globus module, as it changes how certain functions (like **globus_mutex_lock()** (p. 45) and **globus_cond_wait()** (p. 50)) behave. This function overrides the value set by the GLOBUS_THREAD_MODEL environment variable.

The **globus_thread_set_model()** (p. 40) function will fail if a Globus module has been activated already.

Parameters

model	The name of the thread model to use. Depending on operating system capabilities, this may be "none", "pthread", "windows", or some other custom thread implementation. The corresponding libtool module "libglobus_thread_pthread.la" or "libglobus_thread_windows.la" must be installed on the system for it to be used.

Returns

On success, **globus_thread_set_model()** (p. 40) sets the name of the thread model to use and returns GLOBUS_SUCCESS. If an error occurs, then **globus_thread_set_model()** (p. 40) returns GLOBUS_FAILURE.

4.14.4.2 int globus_thread_create (globus_thread_t * *thread,* globus_threadattr_t * *attr,* globus_thread_func_t *func,* void * *user_arg*)

Create a new thread.

The **globus_thread_create()** (p. 40) function creates a new thread of execution in the current process to run the function pointed to by the *func* parameter passed the *user_arg* value as its only parameter. This new thread will be detached, so that storage associated with the thread will be automatically reclaimed by the operating system. A thread identifier will be copied to the value pointed by the *thread* parameter if it is non-NULL. The caller may use this thread identifier to signal or cancel this thread. The *attr* paramter is ignored by this function. If the "none" threading model is used by an application, then this function will always fail. One alternative that will work both with and without threads is to use the functions in the **Globus Callback API** (p. 3).

Parameters

thread	Pointer to a variable to contain the new thread's identifier.
attr	Ignored
func	Pointer to a function to start in the new thread.
user_arg	Argument to the new thread's function.

Returns

On success, **globus_thread_create()** (p. 40) will start a new thread, invoking (∗func)(user_arg), modify the value pointed to by the *thread* parameter to contain the new thread's identifier and return GLOBUS_SUCCESS. If an error occurs, then the value of *thread* is undefined and **globus_thread_create()** (p. 40) returns an implementation-specific non-zero error value.

4.14.4.3 void globus_thread_yield (void)

Yield execution to another thread.

The **globus_thread_yield()** (p. 41) function yields execution to other threads which are ready for execution. The current thread may continue to execute if there are no other threads in the system's ready queue.

4.14.4.4 void globus_thread_exit (void ∗ *value*)

Terminate the current thread

The **globus_thread_exit()** (p. 41) terminates the current thread with the value passed to it.

This function does not return.

4.14.4.5 int globus_thread_sigmask (int *how,* const sigset_t ∗ *new_mask,* sigset_t ∗ *old_mask*)

Modify the current thread's signal mask.

The **globus_thread_sigmask()** (p. 41) function modifies the current thread's signal mask and returns the old value of the signal mask in the value pointed to by the *old_mask* parameter. The *how* parameter can be one of SIG_BLOCK, SIG_UNBLOCK, or SIG_SETMASK to control how the signal mask is modified.

Parameters

how	Flag indicating how to interpret *new_mask* if it is non-NULL. If *how* is SIG_BLOCK, then all signals in *new_mask* are blocked, as well as any which were previously blocked. If *how* is SIG_UNBLOCK, then all signals in which were previously blocked in *new_mask* are unblocked. If *how* is SIG_SETMASK, then the old signal mask is replaced with the value of *new_mask*.
new_mask	Set of signals to block or unblock, based on the *how* parameter.
old_mask	A pointer to be set to the old signal mask associated with the current thread.

Returns

On success, **globus_thread_sigmask()** (p. 41) modifies the signal mask, modifies the value pointed to by *old_mask* with the signal mask prior to this function's execution and returns GLOBUS_SUCCESS. If an error occurs, **globus_thread_sigmask()** (p. 41) returns an implementation-specific non-zero error value.

4.14.4.6 int globus_thread_kill (globus_thread_t *thread,* int *sig*)

Send a signal to a thread.

The **globus_thread_kill()** (p. 41) function sends the signal specified by the *sig* number to the thread whose ID matches the *thread* parameter. Depending on the signal mask of that thread, this may result in a signal being delivered or not, and depending on the process's signal actions, a signal handler, termination, or no operation will occur in that thread.

Parameters

thread	The thread identifier of the thread to signal.
sig	The signal to send to the thread.

Returns

On success, **globus_thread_kill()** (p. 41) queues the signal for delivery to the specified thread and returns GLOBUS_SUCCESS. If an error occurs, **globus_thread_kill()** (p. 41) returns an implementation-specific non-zero error value.

4.14.4.7 globus_thread_t globus_thread_self (void)

Determine the current thread's ID.

The **globus_thread_self()** (p. 42) function returns the thread identifier of the current thread. This value is unique among all threads which are running at any given time.

4.14.4.8 globus_bool_t globus_thread_equal (globus_thread_t *thread1,* globus_thread_t *thread2*)

Check whether thread identifiers match.

The **globus_thread_equal()** (p. 42) function checks whether the thread identifiers passed as the *thread1* and *thread2* parameters refer to the same thread. If so, **globus_thread_equal()** (p. 42) returns GLOBUS_TRUE; otherwise GLOBUS_FALSE.

Parameters

thread1	Thread identifier to compare.
thread2	Thread identifier to compare.

4.14.4.9 globus_bool_t globus_thread_preemptive_threads (void)

Indicate whether the active thread model supports preemption.

The **globus_thread_preemptive_threads()** (p. 42) function returns GLOBUS_TRUE if the current thread model supports thread preemption; othwerise it returns GLOBUS_FALSE.

4.14.4.10 globus_bool_t globus_i_am_only_thread (void)

Determine if threads are supported.

The **globus_i_am_only_thread()** (p. 42) function returns GLOBUS_TRUE if the current thread model is the "none" thread model; GLOBUS_FALSE otherwise. If running with the "none" thread model, there will only be one Globus thread available and the **globus_thread_create()** (p. 40) function will always fail.

4.14.4.11 void* globus_thread_cancellable_func (void *(*)(void *) *func,* void * *arg,* void(*)(void *) *cleanup_func,* void * *cleanup_arg,* globus_bool_t *execute_cleanup*)

Execute a function with thread cleanup in case of cancellation.

The **globus_thread_cancellable_func()** (p. 42) function provides an interface to POSIX thread cancellation points that does not rely on preprocessor macros. It is roughly equivalent to

```
pthread_cleanup_push(cleanup_func, cleanup_arg);
(*func)(arg);
pthread_cleanup_pop(execute_cleanup)
```

Parameters

func	Pointer to a function which may be cancelled.
arg	Parameter to the *func* function.
cleanup_func	Pointer to a function to execute if thread cancellation occurs during *func*.
cleanup_arg	Parameter to the *cleanup_func* function.
execute_cleanup	Flag indicating whether the function pointed to by *cleanup_func* should be executed after *func* completes even if it is not cancelled.

Returns

globus_thread_cancellable_func() (p. 42) returns the value returned by *func*.

4.14.4.12 int globus_thread_cancel (globus_thread_t *thr*)

Cancel a thread.

The **globus_thread_cancel()** (p. 43) function cancels the thread with the identifier *thr* if it is still executing. If it is running with a cancellation cleanup stack, the functions in that stack are executed. The target thread's cancel state determines when the cancellation is delivered.

Parameters

thr	The id of the thread to cancel

Returns

On success, the **globus_thread_cancel()** (p. 43) function delivers the cancellation to the target thread and returns GLOBUS_SUCCESS. If an error occurs, **globus_thread_cancel()** (p. 43) returns an implementation-specific non-zero error value.

4.14.4.13 void globus_thread_testcancel (void)

Thread cancellation point.

The **globus_thread_testcancel()** (p. 43) function acts as a cancellation point for the current thread. If a thread has called **globus_thread_cancel()** (p. 43) and cancellation is enabled, this will cause the thread to be cancelled and any functions on the thread's cleanup stack to be executed. This function will not return if the thread is cancelled.

4.14.4.14 int globus_thread_setcancelstate (int *state,* int * *oldstate*)

Set the thread's cancellable state.

The **globus_thread_setcancelstate()** (p. 43) function sets the current cancellation state to either GLOBUS_THREAD_CANCEL_DISABLE or GLOBUS_THREAD_CANCEL_ENABLE, do control whether **globus_thread_cancel()** (p. 43) is able to cancel this thread.

Parameters

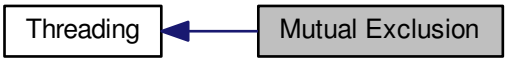
state	The desired cancellation state. If the value is GLOBUS_THREAD_CANCEL_DISABLE, then cancellation will be disabled for this thread. If the value is GLOBUS_THREAD_CANCEL_ENABLE, then cancellation will be enabled for this thread.
oldstate	A pointer to a value which will be set to the value of the thread's cancellation state when this function call began. This may be NULL if the caller is not interested in the previous value.

Returns

On success, the **globus_thread_setcancelstate()** (p. 43) function modifies the thread cancellation state, modifies oldstate (if non-NULL) to the value of its previous state, and returns GLOBUS_SUCCESS. If an error occurs, **globus_thread_setcancelstate()** (p. 43) returns an implementation-specific non-zero error value.

4.15 Mutual Exclusion

Collaboration diagram for Mutual Exclusion:



Data Structures

- union **globus_mutex_t**

  Mutex.
- union **globus_mutexattr_t**

  Mutex attribute.
- struct **globus_rmutex_t**

  Recursive Mutex.

Typedefs

- typedef int **globus_rmutexattr_t**

Functions

- int **globus_mutex_init** (**globus_mutex_t** ∗mutex, **globus_mutexattr_t** ∗attr)
- int **globus_mutex_destroy** (**globus_mutex_t** ∗mutex)
- int **globus_mutex_lock** (**globus_mutex_t** ∗mutex)
- int **globus_mutex_unlock** (**globus_mutex_t** ∗mutex)
- int **globus_mutex_trylock** (**globus_mutex_t** ∗mutex)
- int **globus_mutexattr_init** (**globus_mutexattr_t** ∗attr)
- int **globus_mutexattr_destroy** (**globus_mutexattr_t** ∗attr)

Recursive Mutex

- int **globus_rmutex_init** (**globus_rmutex_t** ∗rmutex, **globus_rmutexattr_t** ∗rattr)
- int **globus_rmutex_lock** (**globus_rmutex_t** ∗rmutex)
- int **globus_rmutex_unlock** (**globus_rmutex_t** ∗rmutex)
- int **globus_rmutex_destroy** (**globus_rmutex_t** ∗rmutex)

4.15.1 Detailed Description

The Globus runtime includes three portable, related mutual exclusion primitives that can be used in applications and libraries. These are

- **globus_mutex_t** (p. 63): a non-recursive, non-shared lock

- **globus_rmutex_t** (p. 63): a recursive non-shared lock
- globus_rw_mutex_t: a reader-writer lock

4.15.2 Typedef Documentation

4.15.2.1 typedef int globus_rmutexattr_t

Recursive mutex attribute.

4.15.3 Function Documentation

4.15.3.1 int globus_mutex_init (globus_mutex_t * *mutex*, globus_mutexattr_t * *attr*)

Initialize a mutex.

The **globus_mutex_init()** (p. 45) function creates a mutex variable that can be used for synchronization. Currently, the *attr* parameter is ignored.

Parameters

mutex	Pointer to the mutex to initialize.
attr	Ignored.

Returns

On success, **globus_mutex_init()** (p. 45) initializes the mutex and returns GLOBUS_SUCCESS. Otherwise, a non-0 value is returned.

4.15.3.2 int globus_mutex_destroy (globus_mutex_t * *mutex*)

Destroy a mutex.

The **globus_mutex_destroy()** (p. 45) function destroys the mutex pointed to by its *mutex* parameter. After a mutex is destroyed it may no longer be used unless it is again initialized by **globus_mutex_init()** (p. 45). Behavior is undefined if **globus_mutex_destroy()** (p. 45) is called with a pointer to a locked mutex.

Parameters

mutex	The mutex to destroy

Returns

On success, **globus_mutex_destroy()** (p. 45) returns GLOBUS_SUCCESS. Otherwise, a non-zero implementation-specific error value is returned.

4.15.3.3 int globus_mutex_lock (globus_mutex_t * *mutex*)

Lock a mutex.

The **globus_mutex_lock()** (p. 45) function locks the mutex pointed to by its *mutex* parameter. Upon successful return, the thread calling **globus_mutex_lock()** (p. 45) has an exclusive lock on the resources protected by *mutex*. Other threads calling **globus_mutex_lock()** (p. 45) will wait until that thread later calls **globus_mutex_unlock()** (p. 46) or **globus_cond_wait()** (p. 50) with that mutex. Depending on the thread model, calling globus_mutex_lock on a mutex locked by the current thread will either return an error or result in deadlock.

Parameters

mutex	The mutex to lock.

Returns

On success, **globus_mutex_lock()** (p. 45) returns GLOBUS_SUCCESS. Otherwise, a non-zero implementation-specific error value is returned.

4.15.3.4 int globus_mutex_unlock (globus_mutex_t * *mutex*)

Unlock a mutex.

The **globus_mutex_unlock()** (p. 46) function unlocks the mutex pointed to by its *mutex* parameter. Upon successful return, the thread calling **globus_mutex_unlock()** (p. 46) no longer has an exclusive lock on the resources protected by *mutex*. Another thread calling **globus_mutex_lock()** (p. 45) may be unblocked so that it may acquire the mutex. Behavior is undefined if globus_mutex_unlock is called with an unlocked mutex.

Parameters

mutex	The mutex to unlock.

Returns

On success, **globus_mutex_unlock()** (p. 46) returns GLOBUS_SUCCESS. Otherwise, a non-zero implementation-specific error value is returned.

4.15.3.5 int globus_mutex_trylock (globus_mutex_t * *mutex*)

Lock a mutex if it is not locked.

The **globus_mutex_trylock()** (p. 46) function locks the mutex pointed to by its *mutex* parameter if no thread has already locked the mutex. If *mutex* is locked, then **globus_mutex_trylock()** (p. 46) returns EBUSY and does not block the current thread or lock the mutex. Upon successful return, the thread calling **globus_mutex_trylock()** (p. 46) has an exclusive lock on the resources protected by *mutex*. Other threads calling **globus_mutex_lock()** (p. 45) will wait until that thread later calls **globus_mutex_unlock()** (p. 46) or **globus_cond_wait()** (p. 50) with that mutex.

Parameters

mutex	The mutex to lock.

Returns

On success, **globus_mutex_trylock()** (p. 46) returns GLOBUS_SUCCESS and locks the mutex. If another thread holds the lock, **globus_mutex_trylock()** (p. 46) returns EBUSY. Otherwise, a non-zero implementation-specific error value is returned.

4.15.3.6 int globus_mutexattr_init (globus_mutexattr_t * *attr*)

Initialize a mutex attribute.

The **globus_mutexattr_init()** (p. 46) function initializes the mutex attribute structure pointed to by its *attr* parameter. Currently there are no attribute values that can be set via this API, so there's no real use to calling this function.

Parameters

attr	Attribute structure to initialize.

Returns

Upon success, **globus_mutexattr_init()** (p. 46) returns GLOBUS_SUCCESS and modifies the attribute pointed to by *attr*. If an error occurs, **globus_mutexattr_init()** (p. 46) returns an implementation-specific non-zero error code.

4.15.3.7 int globus_mutexattr_destroy (globus_mutexattr_t * *attr*)

Destroy a mutex attribute.

The **globus_mutexattr_destroy()** (p. 47) function destroys the mutex attribute structure pointed to by its *attr* parameter.

Parameters

attr	Attribute structure to destroy.

Returns

Upon success, **globus_mutexattr_destroy()** (p. 47) returns GLOBUS_SUCCESS and modifies the attribute pointed to by *attr*. If an error occurs, **globus_mutexattr_destroy()** (p. 47) returns an implementation-specific non-zero error code.

4.15.3.8 int globus_rmutex_init (globus_rmutex_t * *rmutex*, globus_rmutexattr_t * *rattr*)

Initialize a recursive mutex.

The **globus_rmutex_init()** (p. 47) function initializes a recursive mutex, that is, one which may be locked multiple times by a single thread without causing deadlock.

Parameters

rmutex	A pointer to the mutex to initialize
rattr	IGNORED

Returns

On success, **globus_rmutex_init()** (p. 47) initializes the mutex and returns GLOBUS_SUCCESS; otherwise, it returns a non-zero error code.

4.15.3.9 int globus_rmutex_lock (globus_rmutex_t * *rmutex*)

Lock a recursive mutex.

The **globus_rmutex_lock()** (p. 47) function acquires the lock controlled by *rmutex*. This may be called multiple times in a single thread without causing deadlock, provided that a call to **globus_rmutex_unlock()** (p. 48) is called the same number of times as **globus_rmutex_lock()** (p. 47). Once acquired, all other threads calling this function will be blocked until the mutex is completely unlocked.

Parameters

rmutex	A pointer to the mutex to lock

Returns

On success, **globus_rmutex_init()** (p. 47) increases the lock level for the mutex, blocks other threads trying to acquire the same mutex, and returns GLOBUS_SUCCESS; otherwise, it returns a non-zero error code.

4.15.3.10 int globus_rmutex_unlock (globus_rmutex_t * *rmutex*)

Unlock a recursive mutex.

The **globus_rmutex_unlock()** (p. 48) function decrements the lock count for the lock pointed to by *rmutex*. If the lock count is reduced to zero, it also unblocks a thread which is trying to acquire the lock if there is one.

Parameters

rmutex	Mutex to unlock

Returns

GLOBUS_SUCCESS

4.15.3.11 int globus_rmutex_destroy (globus_rmutex_t * *rmutex*)

Destroy a recursive mutex.

The **globus_rmutex_destroy()** (p. 48) function destroys a recursive mutex If the mutex is currently locked, behavior is undefined.

Parameters

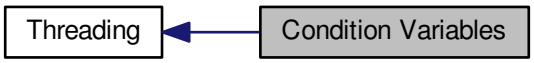
rmutex	Mutex to unlock

Returns

GLOBUS_SUCCESS

4.16 Condition Variables

Collaboration diagram for Condition Variables:



Data Structures

- union **globus_cond_t**
  Condition variable.
- union **globus_condattr_t**
  Condition variable attribute.

Functions

- int **globus_cond_init** (**globus_cond_t** ∗cond, **globus_condattr_t** ∗attr)
- int **globus_cond_destroy** (**globus_cond_t** ∗cond)
- int **globus_cond_wait** (**globus_cond_t** ∗cond, **globus_mutex_t** ∗mutex)
- int **globus_cond_timedwait** (**globus_cond_t** ∗cond, **globus_mutex_t** ∗mutex, globus_abstime_t ∗abstime)
- int **globus_cond_signal** (**globus_cond_t** ∗cond)
- int **globus_cond_broadcast** (**globus_cond_t** ∗cond)
- int **globus_condattr_init** (**globus_condattr_t** ∗cond_attr)
- int **globus_condattr_destroy** (**globus_condattr_t** ∗cond_attr)
- int **globus_condattr_setspace** (**globus_condattr_t** ∗cond_attr, int space)
- int **globus_condattr_getspace** (**globus_condattr_t** ∗cond_attr, int ∗space)

4.16.1 Detailed Description

The **globus_cond_t** (p. 63) provides condition variables for signalling events between threads interested in particular state. One or many threads may wait on a condition variable until it is signalled, at which point they can attempt to lock a mutex related to that condition's state and process the event.

In a non-threaded model, the condition variable wait operations are used to poll the event driver to handle any operations that have been scheduled for execution by the globus_callback system or I/O system. In this way, applications written to use those systems to handle nonblocking operations will work with either a threaded or nonthreaded runtime choice.

4.16.2 Function Documentation

4.16.2.1 int globus_cond_init (globus_cond_t ∗ *cond,* globus_condattr_t ∗ *attr*)

Initialize a condition variable

The **globus_cond_init()** (p. 49) function creates a condition variable that can be used for event signalling between threads.

Parameters

cond	Pointer to the condition variable to initialize.
attr	Condition variable attributes.

Returns

On success, **globus_cond_init()** (p. 49) initializes the condition variable and returns GLOBUS_SUCCESS. Otherwise, a non-0 value is returned.

4.16.2.2 int globus_cond_destroy (globus_cond_t * *cond*)

Destroy a condition variable.

The **globus_cond_destroy()** (p. 50) function destroys the condition variable pointed to by its *cond* parameter. - After a condition variable is destroyed it may no longer be used unless it is again initialized by **globus_cond_init()** (p. 49).

Parameters

cond	The condition variable to destroy.

Returns

On success, **globus_cond_destroy()** (p. 50) returns GLOBUS_SUCCESS. Otherwise, a non-zero implementation-specific error value is returned.

4.16.2.3 int globus_cond_wait (globus_cond_t * *cond,* globus_mutex_t * *mutex*)

Wait for a condition to be signalled.

The **globus_cond_wait()** (p. 50) function atomically unlocks the mutex pointed to by the *mutex* parameter and blocks the current thread until the condition variable pointed to by *cond* is signalled by either **globus_cond_signal()** (p. 51) or **globus_cond_broadcast()** (p. 51). Behavior is undefined if **globus_cond_wait()** (p. 50) is called with the mutex pointed to by the *mutex* variable unlocked.

Parameters

cond	The condition variable to wait for.
mutex	The mutex associated with the condition state.

Returns

On success, **globus_cond_wait()** (p. 50) unlocks the mutex and blocks the current thread until it has been signalled, returning GLOBUS_SUCCES. Otherwise, **globus_cond_wait()** (p. 50) returns an implementation-specific non-zero error value.

4.16.2.4 int globus_cond_timedwait (globus_cond_t * *cond,* globus_mutex_t * *mutex,* globus_abstime_t * *abstime*)

Wait for a condition to be signalled.

The **globus_cond_timedwait()** (p. 50) function atomically unlocks the mutex pointed to by the *mutex* parameter and blocks the current thread until either the condition variable pointed to by *cond* is signalled by another thread or the current time exceeds the value pointed to by the *abstime* parameter. If the timeout occurs before the condition is signalled, **globus_cond_timedwait()** (p. 50) returns ETIMEDOUT. Behavior is undefined if **globus_cond_timedwait()** (p. 50) is called with the mutex pointed to by the *mutex* variable unlocked.

Parameters

cond	The condition variable to wait for.
mutex	The mutex associated with the condition state.
abstime	The absolute time to wait until.

Returns

On success, **globus_cond_timedwait()** (p. 50) unlocks the mutex and blocks the current thread until it has been signalled, returning GLOBUS_SUCCES. If a timeout occurs before signal, **globus_cond_timedwait()** (p. 50) unlocks the mutex and returns ETIMEDOUT. Otherwise, **globus_cond_timedwait()** (p. 50) returns an implementation-specific non-zero error value.

4.16.2.5 int globus_cond_signal (globus_cond_t * *cond*)

Signal a condition to a thread.

The **globus_cond_signal()** (p. 51) function signals a condition as occurring. This will unblock at least one thread waiting for that condition.

Parameters

cond	A pointer to the condition variable to signal.

Returns

Upon success, **globus_cond_signal()** (p. 51) returns GLOBUS_SUCCESS. If an error occurs, **globus_cond_signal()** (p. 51) returns an implementation-specific non-zero error code.

4.16.2.6 int globus_cond_broadcast (globus_cond_t * *cond*)

Signal a condition to multiple threads.

The **globus_cond_signal()** (p. 51) function signals a condition as occurring. This will unblock all threads waiting for that condition.

Parameters

cond	A pointer to the condition variable to signal.

Returns

Upon success, **globus_cond_broadcast()** (p. 51) returns GLOBUS_SUCCESS. If an error occurs, **globus_cond_broadcast()** (p. 51) returns an implementation-specific non-zero error code.

4.16.2.7 int globus_condattr_init (globus_condattr_t * *cond_attr*)

Initialize a condition variable attribute.

The **globus_condattr_init()** (p. 51) function initializes the condition variable attribute structure pointed to by its *cond_attr* parameter to the system default values.

Parameters

cond_attr	Attribute structure to initialize.

Returns

Upon success, **globus_condattr_init()** (p. 51) returns GLOBUS_SUCCESS and modifies the attribute pointed to by *cond_attr*. If an error occurs, **globus_condattr_init()** (p. 51) returns an implementation-specific non-zero error code.

4.16.2.8 int globus_condattr_destroy (globus_condattr_t * *cond_attr*)

Destroy a condition attribute.

The **globus_condattr_destroy()** (p. 52) function destroys the condition variable attribute structure pointed to by its *cond_attr* parameter.

Parameters

cond_attr	Attribute structure to destroy.

Returns

Upon success, **globus_condattr_destroy()** (p. 52) returns GLOBUS_SUCCESS and modifies the attribute pointed to by *cond_attr*. If an error occurs, **globus_condattr_destroy()** (p. 52) returns an implementation-specific non-zero error code.

4.16.2.9 int globus_condattr_setspace (globus_condattr_t * *cond_attr,* int *space*)

Set callback space associated with a condition variable attribute

The **globus_condattr_setspace()** (p. 52) function sets the callback space to use with condition variables created with this attribute.

Callback spaces are used to control how callbacks are issued to different threads. See **Callback Spaces** (p. 14) for more information on callback spaces.

Parameters

cond_attr	Condition variable attribute to modify.
space	Callback space to associate with the attribute.

Returns

On success, **globus_condattr_setspace()** (p. 52) returns GLOBUS_SUCCESS and adds a reference to the callback space to the condition variable attribute. If an error occurs, **globus_condattr_setspace()** (p. 52) returns an implementation-specific non-zero error code.

4.16.2.10 int globus_condattr_getspace (globus_condattr_t * *cond_attr,* int * *space*)

Get callback space associated with a condition variable attribute

The **globus_condattr_getspace()** (p. 52) function copies the value of the callback space associated with a condition variable attribute to the integer pointed to by the *space* parameter.

Parameters

cond_attr	Condition variable attribute to modify.
space	Pointer to an integer to be set to point to the callback space associated with cond_attr.

Returns

On success, **globus_condattr_getspace()** (p. 52) returns GLOBUS_SUCCESS and modifies the value pointed to by *space* to refer to the callback space associated with *cond_attr*. If an error occurs, **globus_condattr_getspace()** (p. 52) returns an implementation-specific non-zero error code.

4.17 Thread-Specific Storage

Collaboration diagram for Thread-Specific Storage:

Functions

- int **globus_thread_key_create** (**globus_thread_key_t** *key, **globus_thread_key_destructor_func_t** destructor)
- int **globus_thread_key_delete** (**globus_thread_key_t** key)
- void * **globus_thread_getspecific** (**globus_thread_key_t** key)
- int **globus_thread_setspecific** (**globus_thread_key_t** key, void *value)

4.17.1 Detailed Description

The **globus_thread_key_t** (p. 63) data type acts as a key to thread-specific storage. For each key created by **globus_thread_key_create()** (p. 54), each thread may store and retrieve its own value.

4.17.2 Function Documentation

4.17.2.1 int globus_thread_key_create (globus_thread_key_t * *key,* globus_thread_key_destructor_func_t *destructor*)

Create a key for thread-specific storage.

The **globus_thread_key_create()** (p. 54) function creates a new key for thread-specific data. The new key will be available for all threads to store a distinct value. If the function pointer *destructor* is non-NULL, then that function will be invoked when a thread exits that has a non-NULL value associated with the key.

Parameters

key	Pointer to be set to the new key.
destructor	Pointer to a function to call when a thread exits to free the key's value.

Returns

On success, globus_thread_create_key() will create a new key to thread-local storage and return GLOBUS_SUCCESS. If an error occurs, then the value of *key* is undefined and globus_thread_create_key() returns an implementation-specific non-zero error value.

4.17.2.2 int globus_thread_key_delete (globus_thread_key_t *key*)

Delete a thread-local storage key.

The **globus_thread_key_delete()** (p. 54) function deletes the key used for a thread-local storage association. The

destructor function for this key will no longer be called after this function returns. The behavior of subsequent calls to **globus_thread_getspecific()** (p. 55) or **globus_thread_setspecific()** (p. 55) with this key will be undefined.

Parameters

key	Key to destroy.

Returns

On success, **globus_thread_key_delete()** (p. 54) will delete a thread-local storage key and return GLOBUS_SUCCESS. If an error occurs, then the value of *key* is undefined and globus_thread_create_key() returns an implementation-specific non-zero error value.

4.17.2.3 void* globus_thread_getspecific (globus_thread_key_t *key*)

Get a thread-specific data value.

The **globus_thread_getspecific()** (p. 55) function returns the value associated with the thread-specific data key passed as its first parameter. This function returns NULL if the value has not been set by the current thread. The return value is undefined if the key is not valid.

Parameters

key	Thread-specific data key to look up.

Returns

The value passed to a previous call to **globus_thread_setspecific()** (p. 55) in the current thread for this key.

4.17.2.4 int globus_thread_setspecific (globus_thread_key_t *key,* void * *value*)

Set a thread-specific data value.

The **globus_thread_setspecific()** (p. 55) function associates a thread-specific value with a data key. If the key had a previous value set in the current thread, it is replaced, but the destructor function is not called for the old value.

Parameters

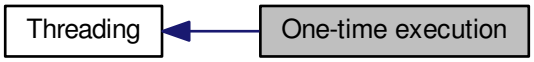
key	Thread-specific data key to store.
value	A pointer to data to store as the thread-specific data for this thread.

Returns

On success, **globus_thread_setspecific()** (p. 55) stores value in the thread-specific data for the specified key and returns GLOBUS_SUCCESS. If an error occurs, **globus_thread_setspecific()** (p. 55) returns an implementation-specific non-zero error code and does not modify the key's value for this thread.

4.18 One-time execution

Collaboration diagram for One-time execution:



Data Structures

- union **globus_thread_once_t**

  Thread once structure.

Defines

- #define **GLOBUS_THREAD_ONCE_INIT** { .none = 0 }

Functions

- int **globus_thread_once** (**globus_thread_once_t** ∗once, void(∗init_routine)(void))

4.18.1 Detailed Description

The **globus_thread_once_t** (p. 63) provides a way for applications and libraries to execute some code exactly one time, independent of the number of threads which attempt to execute it. To use this, statically initialize a **globus_thread_once_t** (p. 63) control with the value GLOBUS_THREAD_ONCE_INIT, and pass a pointer to a function to execute once, along with the control, to **globus_thread_once()** (p. 56).

4.18.2 Define Documentation

4.18.2.1 #define GLOBUS_THREAD_ONCE_INIT { .none = 0 }

Thread once initializer value.

4.18.3 Function Documentation

4.18.3.1 int globus_thread_once (globus_thread_once_t ∗ *once,* void(∗)(void) *init_routine*)

Execute a function one time.

The **globus_thread_once()** (p. 56) function will execute the function pointed to by its *init_routine* parameter one time for each unique **globus_thread_once_t** (p. 63) object passed to it, independent of the number of threads calling it. The *once* value must be a static value initialized to GLOBUS_THREAD_ONCE_INIT.

Parameters

once	A pointer to the value used to govern whether the function passed via the *init_routine* parameter has executed.
init_routine	Function to execute one time. It is called with no parameters.

Returns

On success, **globus_thread_once()** (p. 56) guarantees that the function pointed to by *init_routine* has run, and that subsequent calls to **globus_thread_once()** (p. 56) with the same value of *once* will not execute that function, and returns GLOBUS_SUCCESS. If an error occurs, **globus_thread_once()** (p. 56) returns an implementation-specific non-zero error value.

4.19 URL String Parser

Data Structures

- struct **globus_url_t**
  Parsed URLs.

Enumerations

- enum **globus_url_scheme_t** { **GLOBUS_URL_SCHEME_FTP** = 0, **GLOBUS_URL_SCHEME_GSIFTP**, **GLOBUS_URL_SCHEME_HTTP**, **GLOBUS_URL_SCHEME_HTTPS**, **GLOBUS_URL_SCHEME_LDAP**, **GLOBUS_URL_SCHEME_FILE**, **GLOBUS_URL_SCHEME_X_NEXUS**, **GLOBUS_URL_SCHEME_X_GASS_CACHE**, **GLOBUS_URL_SCHEME_UNKNOWN** , **GLOBUS_URL_NUM_SCHEMES** }

Functions

- int **globus_url_parse** (const char ∗url_string, **globus_url_t** ∗url)
- int **globus_url_parse_rfc1738** (const char ∗url_string, **globus_url_t** ∗url)
- int **globus_url_parse_loose** (const char ∗url_string, **globus_url_t** ∗url)
- int **globus_url_destroy** (**globus_url_t** ∗url)
- int **globus_url_get_scheme** (const char ∗url_string, **globus_url_scheme_t** ∗scheme_type)
- int **globus_url_copy** (**globus_url_t** ∗dst, const **globus_url_t** ∗src)

4.19.1 Detailed Description

The Globus URL functions provide a simple mechanism for parsing a URL string into a data structure, and for determining the scheme of an URL string. These functions are part of the Globus common library. The GLOBUS_COMMON module must be activated in order to use them.

4.19.2 Enumeration Type Documentation

4.19.2.1 enum globus_url_scheme_t

URL Schemes.

The Globus URL library supports a set of URL schemes (protocols). This enumeration can be used to quickly dispatch a parsed URL based on a constant value.

See also

globus_url_t::scheme_type (p. 64)

Enumerator:

GLOBUS_URL_SCHEME_FTP File Transfer Protocol.
GLOBUS_URL_SCHEME_GSIFTP GSI-enhanced File Transfer Protocol.
GLOBUS_URL_SCHEME_HTTP HyperText Transfer Protocol.
GLOBUS_URL_SCHEME_HTTPS Secure HyperText Transfer Protocol.
GLOBUS_URL_SCHEME_LDAP Lightweight Directory Access Protocol.
GLOBUS_URL_SCHEME_FILE File Location.
GLOBUS_URL_SCHEME_X_NEXUS Nexus endpoint.
GLOBUS_URL_SCHEME_X_GASS_CACHE GASS Cache Entry.
GLOBUS_URL_SCHEME_UNKNOWN Any other URL of the form **scheme**://**something**
GLOBUS_URL_NUM_SCHEMES Total number of URL schemes supported.

4.19.3 Function Documentation

4.19.3.1 int globus_url_parse (const char * *url_string*, globus_url_t * *url*)

Parse a string containing a URL into a **globus_url_t** (p. 64).

Parameters

url_string	String to parse
url	Pointer to **globus_url_t** (p. 64) to be filled with the fields of the url

Return values

GLOBUS_SUCCESS	The string was successfully parsed.
GLOBUS_URL_ERROR_NULL_STRING	The url_string was GLOBUS_NULL.
GLOBUS_URL_ERROR_NULL_URL	The URL pointer was GLOBUS_NULL.
GLOBUS_URL_ERROR_BAD_SCHEME	The URL scheme (protocol) contained invalid characters.
GLOBUS_URL_ERROR_BAD_USER	The user part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PASSWORD	The password part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_HOST	The host part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PORT	The port part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PATH	The path part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_DN	-9 The DN part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_ATTRIBUTES	-10 The attributes part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_SCOPE	-11 The scope part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_FILTER	-12 The filter part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_OUT_OF_MEMORY	-13 The library was unable to allocate memory to create the the **globus_url_t** (p. 64) contents.
GLOBUS_URL_ERROR_INTERNAL_ERROR	-14 Some unexpected error occurred parsing the URL.

4.19.3.2 int globus_url_parse_rfc1738 (const char * *url_string*, globus_url_t * *url*)

Parse a string containing a URL into a **globus_url_t** (p. 64).

Parameters

url_string	String to parse
url	Pointer to **globus_url_t** (p. 64) to be filled with the fields of the url

Return values

GLOBUS_SUCCESS	The string was successfully parsed.

GLOBUS_URL_ERROR_NULL_STRING	The url_string was GLOBUS_NULL.
GLOBUS_URL_ERROR_NULL_URL	The URL pointer was GLOBUS_NULL.
GLOBUS_URL_ERROR_BAD_SCHEME	The URL scheme (protocol) contained invalid characters.
GLOBUS_URL_ERROR_BAD_USER	The user part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PASSWORD	The password part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_HOST	The host part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PORT	The port part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PATH	The path part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_DN	-9 The DN part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_ATTRIBUTES	-10 The attributes part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_SCOPE	-11 The scope part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_FILTER	-12 The filter part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_OUT_OF_MEMORY	-13 The library was unable to allocate memory to create the the **globus_url_t** (p. 64) contents.
GLOBUS_URL_ERROR_INTERNAL_ERROR	-14 Some unexpected error occurred parsing the URL.

4.19.3.3 int globus_url_parse_loose (const char * *url_string*, globus_url_t * *url*)

Parse a string containing a URL into a **globus_url_t** (p. 64) Looser restrictions on characters allowed in the path part of the URL.

Parameters

url_string	String to parse
url	Pointer to **globus_url_t** (p. 64) to be filled with the fields of the url

Return values

GLOBUS_SUCCESS	The string was successfully parsed.
GLOBUS_URL_ERROR_NULL_STRING	The url_string was GLOBUS_NULL.
GLOBUS_URL_ERROR_NULL_URL	The URL pointer was GLOBUS_NULL.
GLOBUS_URL_ERROR_BAD_SCHEME	The URL scheme (protocol) contained invalid characters.
GLOBUS_URL_ERROR_BAD_USER	The user part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PASSWORD	The password part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_HOST	The host part of the URL contained invalid characters.

GLOBUS_URL_ERROR_BAD_PORT	The port part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_PATH	The path part of the URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_DN	-9 The DN part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_ATTRIBUTES	-10 The attributes part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_SCOPE	-11 The scope part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_BAD_FILTER	-12 The filter part of an LDAP URL contained invalid characters.
GLOBUS_URL_ERROR_OUT_OF_MEMORY	-13 The library was unable to allocate memory to create the the **globus_url_t** (p. 64) contents.
GLOBUS_URL_ERROR_INTERNAL_ERROR	-14 Some unexpected error occurred parsing the URL.

4.19.3.4 int globus_url_destroy (globus_url_t * *url*)

Destroy a **globus_url_t** (p. 64) structure.

This function frees all memory associated with a **globus_url_t** (p. 64) structure.

Parameters

url	The url structure to destroy

Return values

GLOBUS_SUCCESS	The URL was successfully destroyed.

4.19.3.5 int globus_url_get_scheme (const char * *url_string*, globus_url_scheme_t * *scheme_type*)

Get the scheme of an URL.

This function determines the scheme type of the url string, and populates the variable pointed to by second parameter with that value. This performs a less expensive parsing than **globus_url_parse()** (p. 59) and is suitable for applications which need only to choose a handler based on the URL scheme.

Parameters

url_string	The string containing the URL.
scheme_type	A pointer to a globus_url_scheme_t which will be set to the scheme.

Return values

GLOBUS_SUCCESS	The URL scheme was recogized, and scheme_type has been updated.
GLOBUS_URL_ERROR_BAD_SCHEME	The URL scheme was not recogized.

4.19.3.6 int globus_url_copy (globus_url_t * *dst*, const globus_url_t * *src*)

Create a copy of an URL structure.

This function copies the contents of a url structure into another.

Parameters

dst	The URL structure to be populated with a copy of the contents of src.
src	The original URL.

Return values

GLOBUS_SUCCESS	The URL was successfully copied.
GLOBUS_URL_ERROR_NULL_URL	One of the URLs was GLOBUS_NULL.
GLOBUS_URL_ERROR_OUT_OF_MEMORY;	The library was unable to allocate memory to create the the **globus_url_t** (p. 64) contents.

5 Data Structure Documentation

5.1 globus_cond_t Union Reference

5.1.1 Detailed Description

Condition variable.

5.2 globus_condattr_t Union Reference

5.2.1 Detailed Description

Condition variable attribute.

5.3 globus_mutex_t Union Reference

5.3.1 Detailed Description

Mutex.

5.4 globus_mutexattr_t Union Reference

5.4.1 Detailed Description

Mutex attribute.

5.5 globus_rmutex_t Struct Reference

5.5.1 Detailed Description

Recursive Mutex.

See also

globus_rmutex_init() (p. 47), **globus_rmutex_destroy()** (p. 48), **globus_rmutex_lock()** (p. 47), **globus_rmutex_unlock()** (p. 48)

5.6 globus_thread_key_t Union Reference

5.6.1 Detailed Description

Thread-specific data key.

5.7 globus_thread_once_t Union Reference

5.7.1 Detailed Description

Thread once structure.

5.8 globus_thread_t Union Reference

5.8.1 Detailed Description

Thread ID.

5.9 globus_threadattr_t Union Reference

5.9.1 Detailed Description

Thread attributes.

5.10 globus_url_t Struct Reference

Data Fields

- char * **scheme**
- **globus_url_scheme_t scheme_type**
- char * **user**
- char * **password**
- char * **host**
- unsigned short **port**
- char * **url_path**
- char * **dn**
- char * **attributes**
- char * **scope**
- char * **filter**
- char * **url_specific_part**

5.10.1 Detailed Description

Parsed URLs.

This structure contains the fields which were parsed from an string representation of an URL. There are no methods to access fields of this structure.

5.10.2 Field Documentation

5.10.2.1 char* globus_url_t::scheme

A string containing the URL's scheme (http, ftp, etc)

5.10.2.2 globus_url_scheme_t globus_url_t::scheme_type

An enumerated scheme type.

This is derived from the scheme string

5.10.2.3 char* globus_url_t::user

The username portion of the URL.

[ftp, gsiftp]

5.10.2.4 char* globus_url_t::password

The user's password from the URL.

[ftp, gsiftp]

5.10.2.5 char* globus_url_t::host

The host name or IP address of the URL.

[ftp, gsiftp, http, https, ldap, x-nexus

5.10.2.6 unsigned short globus_url_t::port

The TCP port number of the service providing the URL [ftp, gsiftp, http, https, ldap, x-nexus].

5.10.2.7 char* globus_url_t::url_path

The path name of the resource on the service providing the URL.

[ftp, gsiftp, http, https]

5.10.2.8 char* globus_url_t::dn

The distinguished name for the base of an LDAP search.

[ldap]

5.10.2.9 char* globus_url_t::attributes

The list of attributes which should be returned from an LDAP search.

[ldap]

5.10.2.10 char* globus_url_t::scope

The scope of an LDAP search.

[ldap]

5.10.2.11 char* globus_url_t::filter

The filter to be applied to an LDAP search [ldap].

5.10.2.12 char* globus_url_t::url_specific_part

An unparsed string containing the remaining text after the optional host and port of an unknown URL, or the contents of a x-gass-cache URL [x-gass-cache, unknown].