



Helios
Kernel 0.3.5

Helios Developer's Guide

| | |
|--|-----------|
| 1 Data Structure Index | 1 |
| 1 Data Structure Index | 1 |
| 1.1 Data Structures | 1 |
| 2 File Index | 2 |
| 2.1 File List | 2 |
| 3 Data Structure Documentation | 2 |
| 3.1 MemoryRegionStats_s Struct Reference | 2 |
| 3.1.1 Detailed Description | 3 |
| 3.2 QueueMessage_s Struct Reference | 3 |
| 3.2.1 Detailed Description | 3 |
| 3.2.2 Field Documentation | 3 |
| 3.3 SystemInfo_s Struct Reference | 4 |
| 3.3.1 Detailed Description | 4 |
| 3.3.2 Field Documentation | 4 |
| 3.4 TaskInfo_s Struct Reference | 5 |
| 3.4.1 Detailed Description | 5 |
| 3.4.2 Field Documentation | 6 |
| 3.5 TaskNotification_s Struct Reference | 6 |
| 3.5.1 Detailed Description | 7 |
| 3.5.2 Field Documentation | 7 |
| 3.6 TaskRunTimeStats_s Struct Reference | 7 |
| 3.6.1 Detailed Description | 8 |
| 3.6.2 Field Documentation | 8 |
| 4 File Documentation | 8 |
| 4.1 config.h File Reference | 8 |
| 4.1.1 Detailed Description | 9 |
| 4.1.2 Macro Definition Documentation | 9 |
| 4.2 HeliOS.h File Reference | 12 |
| 4.2.1 Detailed Description | 16 |
| 4.2.2 Macro Definition Documentation | 17 |
| 4.2.3 Typedef Documentation | 17 |
| 4.2.4 Enumeration Type Documentation | 26 |
| 4.2.5 Function Documentation | 27 |
| Index | 51 |

1 Data Structure Index

1.1 Data Structures

Here are the data structures with brief descriptions:

| | |
|--|---|
| MemoryRegionStats_s | |
| Data structure for statistics on a memory region | 2 |
| QueueMessage_s | |
| Data structure for a message queue message | 3 |
| SystemInfo_s | |
| Data structure for system informaiton | 4 |
| TaskInfo_s | |
| Data structure for information about a task | 5 |
| TaskNotification_s | |
| Data structure for direct to task notifications | 6 |
| TaskRunTimeStats_s | |
| Data structure for task runtime statistics | 7 |

2 File Index

2.1 File List

Here is a list of all documented files with brief descriptions:

| | |
|--|----|
| config.h | |
| Kernel header file for user definable settings | 8 |
| HeliOS.h | |
| Header file for end-user application code | 12 |

3 Data Structure Documentation

3.1 MemoryRegionStats_s Struct Reference

Data structure for statistics on a memory region.

Data Fields

- [Word_t](#) largestFreeEntryInBytes
- [Word_t](#) smallestFreeEntryInBytes
- [Word_t](#) numberOfFreeBlocks
- [Word_t](#) availableSpaceInBytes
- [Word_t](#) successfulAllocations
- [Word_t](#) successfulFrees
- [Word_t](#) minimumEverFreeBytesRemaining

3.1.1 Detailed Description

The MemoryRegionStats_t data structure is used to store statistics about a HeliOS memory region. Statistics can be obtained for the heap and kernel memory regions.

See also

[xMemGetHeapStats\(\)](#)
[xMemGetKernelStats\(\)](#)
[xMemoryRegionStats](#)

The documentation for this struct was generated from the following file:

- [HeliOS.h](#)

3.2 QueueMessage_s Struct Reference

Data structure for a message queue message.

Data Fields

- [Base_t](#) messageBytes
- char [messageValue](#) [CONFIG_MESSAGE_VALUE_BYTES]

3.2.1 Detailed Description

The QueueMessage_t data structure contains the message queue message returned by [xQueuePeek\(\)](#) and [xQueueReceive\(\)](#). The QueueMessage_t type should be declared as xQueueMessage.

See also

[xQueueMessage](#)
[xQueuePeek\(\)](#)
[xQueueReceive\(\)](#)
[xMemFree\(\)](#)
[CONFIG_MESSAGE_VALUE_BYTES](#)

Warning

The memory allocated for an instance of xQueueMessage must be freed using [xMemFree\(\)](#).

3.2.2 Field Documentation

3.2.2.1 **messageBytes** `Base_t QueueMessage_s::messageBytes`

The number of bytes in the `messageValue` member that makes up the message value. This cannot exceed `CONFIG_MESSAGE_VALUE_BYTES`.

3.2.2.2 **messageValue** `char QueueMessage_s::messageValue[CONFIG_MESSAGE_VALUE_BYTES]`

the char array that contains the actual message value. This is NOT a null terminated string.

The documentation for this struct was generated from the following file:

- [HeliOS.h](#)

3.3 **SystemInfo_s Struct Reference**

Data structure for system information.

Data Fields

- char `productName` [`OS_PRODUCT_NAME_SIZE`]
- `Base_t` `majorVersion`
- `Base_t` `minorVersion`
- `Base_t` `patchVersion`
- `Base_t` `numberOfTasks`

3.3.1 Detailed Description

The `SystemInfo_t` data structure contains information about the HeliOS system and is returned by [xSystemGetSystemInfo\(\)](#). The `SystemInfo_t` type should be declared as `xSystemInfo`.

See also

[xSystemInfo](#)
[xSystemGetSystemInfo\(\)](#)
[xMemFree\(\)](#)

Warning

The memory allocated for an instance of `xSystemInfo` must be freed using [xMemFree\(\)](#).

3.3.2 Field Documentation

3.3.2.1 **majorVersion** `Base_t SystemInfo_s::majorVersion`

The major version number of HeliOS and is Symantec Versioning Specification (SemVer) compliant.

3.3.2.2 minorVersion `Base_t SystemInfo_s::minorVersion`

The minor version number of HeliOS and is Symantec Versioning Specification (SemVer) compliant.

3.3.2.3 numberOfTasks `Base_t SystemInfo_s::numberOfTasks`

The number of tasks presently in a suspended, running or waiting state.

3.3.2.4 patchVersion `Base_t SystemInfo_s::patchVersion`

The patch version number of HeliOS and is Symantec Versioning Specification (SemVer) compliant.

3.3.2.5 productName `char SystemInfo_s::productName[OS_PRODUCT_NAME_SIZE]`

The name of the operating system or product. Its length is defined by OS_PRODUCT_NAME_SIZE. This is NOT a null terminated string.

The documentation for this struct was generated from the following file:

- [HeliOS.h](#)

3.4 TaskInfo_s Struct Reference

Data structure for information about a task.

Data Fields

- [Base_t id](#)
- [char name \[CONFIG_TASK_NAME_BYTES\]](#)
- [TaskState_t state](#)
- [Ticks_t lastRunTime](#)
- [Ticks_t totalRunTime](#)

3.4.1 Detailed Description

The TaskInfo_t structure is similar to xTaskRuntimeStats_t in that it contains runtime statistics for a task. However, TaskInfo_t also contains additional details about a task such as its identifier, ASCII name and state. The TaskInfo_t structure is returned by [xTaskGetTaskInfo\(\)](#). If only runtime statistics are needed, TaskRunTimeStats_t should be used because of its lower memory footprint. The TaskInfo_t type should be declared as xTaskInfo.

See also

[xTaskInfo](#)
[xTaskGetTaskInfo\(\)](#)
[xMemFree\(\)](#)
[CONFIG_TASK_NAME_BYTES](#)

Warning

The memory allocated for an instance of xTaskInfo must be freed using [xMemFree\(\)](#).

3.4.2 Field Documentation

3.4.2.1 **id** `Base_t TaskInfo_s::id`

The task identifier which is used by `xTaskGetHandleById()` to return the task handle.

3.4.2.2 **lastRunTime** `Ticks_t TaskInfo_s::lastRunTime`

The runtime duration in ticks the last time the task was executed by the scheduler.

3.4.2.3 **name** `char TaskInfo_s::name[CONFIG_TASK_NAME_BYTES]`

The name of the task which is used by `xTaskGetHandleByName()` to return the task handle. This is NOT a null terminated string.

3.4.2.4 **state** `TaskState_t TaskInfo_s::state`

The state the task is in which is one of four states specified in the `TaskState_t` enumerated data type.

3.4.2.5 **totalRunTime** `Ticks_t TaskInfo_s::totalRunTime`

The total runtime duration in ticks the task has been executed by the scheduler.

The documentation for this struct was generated from the following file:

- [HeliOS.h](#)

3.5 TaskNotification_s Struct Reference

Data structure for direct to task notifications.

Data Fields

- `Base_t notificationBytes`
- `char notificationValue[CONFIG_NOTIFICATION_VALUE_BYTES]`

3.5.1 Detailed Description

The TaskNotification_t data structure contains the direct to task notification returned by [xTaskNotifyTake\(\)](#). The TaskNotification_t type should be declared as xTaskNotification.

See also

[xTaskNotification](#)
[xTaskNotifyTake\(\)](#)
[xMemFree\(\)](#)
[CONFIG_NOTIFICATION_VALUE_BYTES](#)

Warning

The memory allocated for an instance of xTaskNotification must be freed using [xMemFree\(\)](#).

3.5.2 Field Documentation

3.5.2.1 notificationBytes [Base_t](#) TaskNotification_s::notificationBytes

The number of bytes in the notificationValue member that makes up the notification value. This cannot exceed CONFIG_NOTIFICATION_VALUE_BYTES.

3.5.2.2 notificationValue [char](#) TaskNotification_s::notificationValue[[CONFIG_NOTIFICATION_VALUE_BYTES](#)]

The char array that contains the actual notification value. This is NOT a null terminated string.

The documentation for this struct was generated from the following file:

- [HeliOS.h](#)

3.6 TaskRunTimeStats_s Struct Reference

Data structure for task runtime statistics.

Data Fields

- [Base_t](#) id
- [Ticks_t](#) lastRunTime
- [Ticks_t](#) totalRunTime

3.6.1 Detailed Description

The `TaskRunTimeStats_t` structure contains task runtime statistics and is returned by [xTaskGetAllRunTimeStats\(\)](#) and [xTaskGetTaskRunTimeStats\(\)](#). The `TaskRunTimeStats_t` type should be declared as `xTaskRunTimeStats`.

See also

[xTaskRunTimeStats](#)
[xTaskGetTaskRunTimeStats\(\)](#)
[xTaskGetAllRunTimeStats\(\)](#)
[xMemFree\(\)](#)

Warning

The memory allocated for an instance of `xTaskRunTimeStats` must be freed using [xMemFree\(\)](#).

3.6.2 Field Documentation

3.6.2.1 `id` `Base_t` `TaskRunTimeStats_s::id`

The task identifier which is used by [xTaskGetHandleById\(\)](#) to return the task handle.

3.6.2.2 `lastRunTime` `Ticks_t` `TaskRunTimeStats_s::lastRunTime`

The runtime duration in ticks the last time the task was executed by the scheduler.

3.6.2.3 `totalRunTime` `Ticks_t` `TaskRunTimeStats_s::totalRunTime`

The total runtime duration in ticks the task has been executed by the scheduler.

The documentation for this struct was generated from the following file:

- [HeliOS.h](#)

4 File Documentation

4.1 `config.h` File Reference

Kernel header file for user definable settings.

Macros

- #define `CONFIG_MESSAGE_VALUE_BYTES` 0x8u /* 8 */
Define to enable the Arduino API C++ interface.
- #define `CONFIG_NOTIFICATION_VALUE_BYTES` 0x8u /* 8 */
Define the size in bytes of the direct to task notification value.
- #define `CONFIG_TASK_NAME_BYTES` 0x8u /* 8 */
Define the size in bytes of the ASCII task name.
- #define `CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS` 0x18u /* 24 */
Define the number of memory blocks available in all memory regions.
- #define `CONFIG_MEMORY_REGION_BLOCK_SIZE` 0x20u /* 32 */
Define the memory block size in bytes for all memory regions.
- #define `CONFIG_QUEUE_MINIMUM_LIMIT` 0x5u /* 5 */
Define the minimum value for a message queue limit.

4.1.1 Detailed Description

Author

Manny Peterson (mannymsp@gmail.com)

Version

0.3.5

Date

2022-01-31

Copyright

HeliOS Embedded Operating System Copyright (C) 2020-2022 Manny Peterson mannymsp@gmail.com

This program is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program. If not, see <https://www.gnu.org/licenses/>.

4.1.2 Macro Definition Documentation

4.1.2.1 CONFIG_MEMORY_REGION_BLOCK_SIZE `#define CONFIG_MEMORY_REGION_BLOCK_SIZE 0x20u`
`/* 32 */`

Setting `CONFIG_MEMORY_REGION_BLOCK_SIZE` allows the end-user to define the size of a memory region block in bytes. The memory region block size should be set to achieve the best possible utilization of the available memory. The `CONFIG_MEMORY_REGION_BLOCK_SIZE` setting effects both the heap and kernel memory regions. The default value is 32 bytes. The literal must be appended with a "u" to maintain MISRA C:2012 compliance.

See also

[xMemAlloc\(\)](#)
[xMemFree\(\)](#)
[CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS](#)

4.1.2.2 CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS `#define CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS 0x18u` `/* 24 */`

The heap memory region is used by tasks. Whereas the kernel memory region is used solely by the kernel for kernel objects. The `CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS` setting allows the end-user to define the size, in blocks, of all memory regions thus effecting both the heap and kernel memory regions. The size of a memory block is defined by the `CONFIG_MEMORY_REGION_BLOCK_SIZE` setting. The size of all memory regions needs to be adjusted to fit the memory requirements of the end-user's application. By default the `CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS` is defined on a per platform and/or tool-chain basis therefor it is not defined here by default. The literal must be appended with a "u" to maintain MISRA C:2012 compliance.

4.1.2.3 CONFIG_MESSAGE_VALUE_BYTES `#define CONFIG_MESSAGE_VALUE_BYTES 0x8u` `/* 8 */`

Because HeliOS kernel is written in C, the Arduino API cannot be called directly from the kernel. For example, assertions are unable to be written to the serial bus in applications using the Arduino platform/tool-chain. The `CONFIG_ENABLE_ARDUINO_CPP_INTERFACE` builds the included `arduino.cpp` file to allow the kernel to call the Arduino API through wrapper functions such as `ArduinoAssert()`. The `arduino.cpp` file can be found in the `/extras` directory. It must be copied into the `/src` directory to be built.

Note

On some MCU's like the 8-bit AVR's, it is necessary to undefine the `DISABLE_INTERRUPTS()` macro because interrupts must be enabled to write to the serial bus.

Define to enable system assertions.

The `CONFIG_ENABLE_SYSTEM_ASSERT` setting allows the end-user to enable system assertions in HeliOS. Once enabled, the end-user must define `CONFIG_SYSTEM_ASSERT_BEHAVIOR` for there to be an effect. By default the `CONFIG_ENABLE_SYSTEM_ASSERT` setting is not defined.

See also

`CONFIG_SYSTEM_ASSERT_BEHAVIOR`

Define the system assertion behavior.

The `CONFIG_SYSTEM_ASSERT_BEHAVIOR` setting allows the end-user to specify the behavior (code) of the assertion which is called when `CONFIG_ENABLE_SYSTEM_ASSERT` is defined. Typically some sort of output is generated over a serial or other interface. By default the `CONFIG_SYSTEM_ASSERT_BEHAVIOR` is not defined.

Note

In order to use the *ArduinoAssert()* functionality, the CONFIG_ENABLE_ARDUINO_CPP_INTERFACE setting must be enabled.

See also

CONFIG_ENABLE_SYSTEM_ASSERT

CONFIG_ENABLE_ARDUINO_CPP_INTERFACE

```
#define CONFIG_SYSTEM_ASSERT_BEHAVIOR(f, l) _ArduinoAssert_( f , l )
```

Define the size in bytes of the message queue message value.

Setting the CONFIG_MESSAGE_VALUE_BYTES allows the end-user to define the size of the message queue message value. The larger the size of the message value, the greater impact there will be on system performance. The default size is 8 bytes. The literal must be appended with "u" to maintain MISRA C:2012 compliance.

See also

[xQueueMessage](#)

4.1.2.4 CONFIG_NOTIFICATION_VALUE_BYTES `#define CONFIG_NOTIFICATION_VALUE_BYTES 0x8u /* 8 */`

Setting the CONFIG_NOTIFICATION_VALUE_BYTES allows the end-user to define the size of the direct to task notification value. The larger the size of the notification value, the greater impact there will be on system performance. The default size is 8 bytes. The literal must be appended with "u" to maintain MISRA C:2012 compliance.

See also

[xTaskNotification](#)

4.1.2.5 CONFIG_QUEUE_MINIMUM_LIMIT `#define CONFIG_QUEUE_MINIMUM_LIMIT 0x5u /* 5 */`

Setting the CONFIG_QUEUE_MINIMUM_LIMIT allows the end-user to define the MINIMUM length limit a message queue can be created with [xQueueCreate\(\)](#). When a message queue length equals its limit, the message queue will be considered full and return true when [xQueueIsQueueFull\(\)](#) is called. A full queue will also not accept messages from [xQueueSend\(\)](#). The default value is 5. The literal must be appended with "u" to maintain MISRA C:2012 compliance.

See also

[xQueueIsQueueFull\(\)](#)

[xQueueSend\(\)](#)

[xQueueCreate\(\)](#)

4.1.2.6 CONFIG_TASK_NAME_BYTES `#define CONFIG_TASK_NAME_BYTES 0x8u /* 8 */`

Setting the CONFIG_TASK_NAME_BYTES allows the end-user to define the size of the ASCII task name. The larger the size of the task name, the greater impact there will be on system performance. The default size is 8 bytes. The literal must be appended with "u" to maintain MISRA C:2012 compliance.

See also

[xTaskInfo](#)

4.2 HeliOS.h File Reference

Header file for end-user application code.

Data Structures

- struct [TaskRunTimeStats_s](#)
Data structure for task runtime statistics.
- struct [TaskInfo_s](#)
Data structure for information about a task.
- struct [TaskNotification_s](#)
Data structure for direct to task notifications.
- struct [QueueMessage_s](#)
Data structure for a message queue message.
- struct [SystemInfo_s](#)
Data structure for system informaiton.
- struct [MemoryRegionStats_s](#)
Data structure for statistics on a memory region.

Macros

- `#define Deref_TaskParm(t, p) *((t *) p)`
A C macro to simplify casting and dereferencing a task paramater.

Typedefs

- typedef uint8_t [Base_t](#)
Type definition for the base data type.
- typedef uint32_t [Word_t](#)
Type defintion for the word data type.
- typedef uint32_t [Ticks_t](#)
The type definition for time expressed in ticks.
- typedef size_t [Size_t](#)
The type defintion for storing the size of some object in memory.
- typedef [Size_t](#) [xSize](#)
The type defintion for storing the size of some object in memory.
- typedef struct [TaskRunTimeStats_s](#) [TaskRunTimeStats_t](#)
Data structure for task runtime statistics.
- typedef struct [TaskInfo_s](#) [TaskInfo_t](#)

- Data structure for information about a task.*

 - typedef struct [TaskNotification_s](#) TaskNotification_t

Data structure for direct to task notifications.
- typedef struct [QueueMessage_s](#) QueueMessage_t

Data structure for a message queue message.
- typedef struct [SystemInfo_s](#) SystemInfo_t

Data structure for system informaiton.
- typedef struct [MemoryRegionStats_s](#) MemoryRegionStats_t

Data structure for statistics on a memory region.
- typedef void [Task_t](#)

Stub type definition for the task type.
- typedef void [TaskParm_t](#)

Type definition for the task parameter.
- typedef void [Queue_t](#)

Stub type definition for the message queue type.
- typedef void [Timer_t](#)

Stub type definition for the timer type.
- typedef void [Addr_t](#)

Type definition for the memory address data type.
- typedef [Addr_t](#) * xAddr

Type definition for the memory address data type.
- typedef [Base_t](#) xBase

Type definition for the base data type.
- typedef [Word_t](#) xWord

Type definition for the word data type.
- typedef [Timer_t](#) * xTimer

Stub type definition for the timer type.
- typedef [Queue_t](#) * xQueue

Stub type definition for the message queue type.
- typedef [QueueMessage_t](#) * xQueueMessage

Data structure for a message queue message.
- typedef [TaskNotification_t](#) * xTaskNotification

Data structure for direct to task notifications.
- typedef [TaskInfo_t](#) * xTaskInfo

Data structure for information about a task.
- typedef [TaskRunTimeStats_t](#) * xTaskRunTimeStats

Data structure for task runtime statistics.
- typedef [MemoryRegionStats_t](#) * xMemoryRegionStats

Data structure for statistics on a memory region.
- typedef [Task_t](#) * xTask

Stub type definition for the task type.
- typedef [TaskParm_t](#) * xTaskParm

Type definition for the task parameter.
- typedef [Ticks_t](#) xTicks

The type definition for time expressed in ticks.
- typedef [TaskState_t](#) xTaskState

Enumerated type for task states.
- typedef [SchedulerState_t](#) xSchedulerState

Enumerated type for scheduler states.
- typedef [SystemInfo_t](#) * xSystemInfo

Data structure for system informaiton.

Enumerations

- enum `TaskState_t` { `TaskStateError` , `TaskStateSuspended` , `TaskStateRunning` , `TaskStateWaiting` }
Enumerated type for task states.
- enum `SchedulerState_t` { `SchedulerStateError` , `SchedulerStateSuspended` , `SchedulerStateRunning` }
Enumerated type for scheduler states.

Functions

- void `xSystemInit` (void)
System call to initialize the system.
- void `_SystemAssert_` (const char *file_, int line_)
System call to handle assertions.
- `xAddr` `xMemAlloc` (const `xSize` size_)
System call to allocate memory from the heap.
- void `xMemFree` (const `xAddr` addr_)
System call to free memory allocated from the heap.
- `xSize` `xMemGetUsed` (void)
System call to return the amount of allocated heap memory.
- `xSize` `xMemGetSize` (const `xAddr` addr_)
System call to return the amount of heap memory allocated for a given address.
- `xMemoryRegionStats` `xMemGetHeapStats` (void)
System call to obtain statistics on the heap.
- `xMemoryRegionStats` `xMemGetKernelStats` (void)
System call to obtain statistics on the kernel memory region.
- `xQueue` `xQueueCreate` (`xBase` limit_)
System call to create a new message queue.
- void `xQueueDelete` (`xQueue` queue_)
System call to delete a message queue.
- `xBase` `xQueueGetLength` (`xQueue` queue_)
System call to get the length of the message queue.
- `xBase` `xQueueIsQueueEmpty` (`xQueue` queue_)
System call to check if the message queue is empty.
- `xBase` `xQueueIsQueueFull` (`xQueue` queue_)
System call to check if the message queue is full.
- `xBase` `xQueueMessagesWaiting` (`xQueue` queue_)
System call to check if there are message queue messages waiting.
- `xBase` `xQueueSend` (`xQueue` queue_, `xBase` messageBytes_, const char *messageValue_)
System call to send a message using a message queue.
- `xQueueMessage` `xQueuePeek` (`xQueue` queue_)
System call to peek at the next message in a message queue.
- void `xQueueDropMessage` (`xQueue` queue_)
System call to drop the next message in a message queue.
- `xQueueMessage` `xQueueReceive` (`xQueue` queue_)
System call to receive the next message in the message queue.
- void `xQueueLockQueue` (`xQueue` queue_)
System call to LOCK the message queue.
- void `xQueueUnLockQueue` (`xQueue` queue_)
System call to UNLOCK the message queue.
- void `xTaskStartScheduler` (void)

- System call to pass control to the HeliOS scheduler.*

 - void `xTaskResumeAll` (void)
- System call to set scheduler state to running.*

 - void `xTaskSuspendAll` (void)
- System call to set the scheduler state to suspended.*

 - `xSystemInfo` `xSystemGetSystemInfo` (void)

The `xSystemGetSystemInfo()` system call will return the type `xSystemInfo` containing information about the system including the OS (product) name, its version and how many tasks are currently in the running, suspended or waiting states.
- `xTask` `xTaskCreate` (const char *name_, void(*callback_)(xTask, xTaskParm), xTaskParm taskParameter_)

System call to create a new task.
- void `xTaskDelete` (xTask task_)

System call to delete a task.
- `xTask` `xTaskGetHandleByName` (const char *name_)

System call to get a task's handle by its ASCII name.
- `xTask` `xTaskGetHandleById` (xBase id_)

System call to get a task's handle by its task identifier.
- `xTaskRunTimeStats` `xTaskGetAllRunTimeStats` (xBase *tasks_)

System call to return task runtime statistics for all tasks.
- `xTaskRunTimeStats` `xTaskGetTaskRunTimeStats` (xTask task_)

System call to return task runtime statistics for the specified task.
- xBase `xTaskGetNumberOfTasks` (void)

System call to return the number of tasks regardless of their state.
- `xTaskInfo` `xTaskGetTaskInfo` (xTask task_)

System call to return the details of a task.
- `xTaskInfo` `xTaskGetAllTaskInfo` (xBase *tasks_)

System call to return the details of all tasks.
- `xTaskState` `xTaskGetTaskState` (xTask task_)

System call to return the state of a task.
- char * `xTaskGetName` (xTask task_)

System call to return the ASCII name of a task.
- xBase `xTaskGetId` (xTask task_)

System call to return the task identifier for a task.
- void `xTaskNotifyStateClear` (xTask task_)

System call to clear a waiting direct to task notification.
- xBase `xTaskNotificationIsWaiting` (xTask task_)

System call to check if a direct to task notification is waiting.
- `Base_t` `xTaskNotifyGive` (xTask task_, xBase notificationBytes_, const char *notificationValue_)

System call to give another task a direct to task notification.
- `xTaskNotification` `xTaskNotifyTake` (xTask task_)

System call to take a direct to task notification from another task.
- void `xTaskResume` (xTask task_)

System call to resume a task.
- void `xTaskSuspend` (xTask task_)

System call to suspend a task.
- void `xTaskWait` (xTask task_)

System call to place a task in a waiting state.
- void `xTaskChangePeriod` (xTask task_, xTicks timerPeriod_)

System call to set the task timer period.
- `xTicks` `xTaskGetPeriod` (xTask task_)

System call to get the task timer period.

- void `xTaskResetTimer` (`xTask` task_)
System call to reset the task timer.
- `xSchedulerState` `xTaskGetSchedulerState` (void)
System call to get the state of the scheduler.
- `xTimer` `xTimerCreate` (`xTicks` timerPeriod_)
System call to create a new timer.
- void `xTimerDelete` (`xTimer` timer_)
System call will delete a timer.
- void `xTimerChangePeriod` (`xTimer` timer_, `xTicks` timerPeriod_)
System call to change the period of a timer.
- `xTicks` `xTimerGetPeriod` (`xTimer` timer_)
System call to get the period of a timer.
- `xBase` `xTimerIsTimerActive` (`xTimer` timer_)
System call to check if a timer is active.
- `xBase` `xTimerHasTimerExpired` (`xTimer` timer_)
System call to check if a timer has expired.
- void `xTimerReset` (`xTimer` timer_)
System call to reset a timer.
- void `xTimerStart` (`xTimer` timer_)
System call to start a timer.
- void `xTimerStop` (`xTimer` timer_)
The `xTimerStop()` system call will place the timer in the stopped state. Neither `xTimerStart()` nor `xTimerStop()` will reset the timer. Timers can only be reset with `xTimerReset()`.
- void `xSystemHalt` (void)
The `xSystemHalt()` system call will halt HeliOS.

4.2.1 Detailed Description

Author

Manny Peterson (mannymsp@gmail.com)

Version

0.3.5

Date

2022-01-31

Copyright

HeliOS Embedded Operating System Copyright (C) 2020-2022 Manny Peterson mannymsp@gmail.com

This program is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program. If not, see <https://www.gnu.org/licenses/>.

4.2.2 Macro Definition Documentation

4.2.2.1 Deref_TaskParm `#define Deref_TaskParm(
 t,
 p) *((t *) p)`

When a task paramater is passed to a task, it is passed as a pointer of type void. To use the paramater, it must first be cast to the correct type and dereferenced. The following is an example of how the [Deref_TaskParm\(\)](#) C macro simplifies that process.

```
void myTask_main(xTask task_, xTaskParm parm_) {
    int i;
    i = Deref_TaskParm(int, parm_);
    i++;
    Deref_TaskParm(int, parm_) = i;
    return;
}
```

Parameters

| | |
|----------|--|
| <i>t</i> | The data type to cast the task paramater to (e.g., int). |
| <i>p</i> | The task pointer, typically named parm_. |

4.2.3 Typedef Documentation

4.2.3.1 Addr_t `typedef void Addr_t`

The xAddr type is used to store a memory address and is used to pass memory addresses back and forth between system calls and the end-user application. It is not necessary to use the xAddr type within the end-user application as long as the type is not used to interact with the HeliOS kernel through system calls.

4.2.3.2 Base_t `typedef uint8_t Base_t`

A simple data type is often needed as an argument for a system call or a return type. The Base_t type is used in such a case where there are no other structural data requirements and is typically an unsigned 8-bit integer. The Base_t type should be declared as xBase.

See also

[xBase](#)

4.2.3.3 **MemoryRegionStats_t** `typedef struct MemoryRegionStats_s MemoryRegionStats_t`

The `MemoryRegionStats_t` data structure is used to store statistics about a HeliOS memory region. Statistics can be obtained for the heap and kernel memory regions.

See also

[xMemGetHeapStats\(\)](#)
[xMemGetKernelStats\(\)](#)
[xMemoryRegionStats](#)

4.2.3.4 **Queue_t** `typedef void Queue_t`

The `Queue_t` type is a stub type definition for the internal message queue structure and is treated as a message queue handle by most of the message queue related system calls. The members of the data structure are not accessible. The `Queue_t` type should be declared as `xQueue`.

See also

[xQueue](#)
[xQueueDelete\(\)](#)

Warning

The memory allocated for an instance of `xQueue` must be freed using [xQueueDelete\(\)](#).

4.2.3.5 **QueueMessage_t** `typedef struct QueueMessage_s QueueMessage_t`

The `QueueMessage_t` data structure contains the message queue message returned by [xQueuePeek\(\)](#) and [xQueueReceive\(\)](#). The `QueueMessage_t` type should be declared as `xQueueMessage`.

See also

[xQueueMessage](#)
[xQueuePeek\(\)](#)
[xQueueReceive\(\)](#)
[xMemFree\(\)](#)
[CONFIG_MESSAGE_VALUE_BYTES](#)

Warning

The memory allocated for an instance of `xQueueMessage` must be freed using [xMemFree\(\)](#).

4.2.3.6 **Size_t** `typedef size_t Size_t`

The `Size_t` type is used to store the size of an object in memory and is always represented in bytes. `Size_t` should always be declared as `xSize`.

See also

[xSize](#)

4.2.3.7 **SystemInfo_t** `typedef struct SystemInfo_s SystemInfo_t`

The `SystemInfo_t` data structure contains information about the HeliOS system and is returned by [xSystemGetSystemInfo\(\)](#). The `SystemInfo_t` type should be declared as `xSystemInfo`.

See also

[xSystemInfo](#)

[xSystemGetSystemInfo\(\)](#)

[xMemFree\(\)](#)

Warning

The memory allocated for an instance of `xSystemInfo` must be freed using [xMemFree\(\)](#).

4.2.3.8 **Task_t** `typedef void Task_t`

The `Task_t` type is a stub type definition for the internal task data structure and is treated as a task handle by most of the task related system calls. The members of the data structure are not accessible. The `Task_t` type should be declared as `xTask`.

See also

[xTask](#)

[xTaskDelete\(\)](#)

Warning

The memory allocated for an instance of `xTask` must be freed by [xTaskDelete\(\)](#)

4.2.3.9 TaskInfo_t `typedef struct TaskInfo_s TaskInfo_t`

The TaskInfo_t structure is similar to xTaskRuntimeStats_t in that it contains runtime statistics for a task. However, TaskInfo_t also contains additional details about a task such as its identifier, ASCII name and state. The TaskInfo_t structure is returned by [xTaskGetTaskInfo\(\)](#). If only runtime statistics are needed, TaskRunTimeStats_t should be used because of its lower memory footprint. The TaskInfo_t type should be declared as xTaskInfo.

See also

[xTaskInfo](#)
[xTaskGetTaskInfo\(\)](#)
[xMemFree\(\)](#)
[CONFIG_TASK_NAME_BYTES](#)

Warning

The memory allocated for an instance of xTaskInfo must be freed using [xMemFree\(\)](#).

4.2.3.10 TaskNotification_t `typedef struct TaskNotification_s TaskNotification_t`

The TaskNotification_t data structure contains the direct to task notification returned by [xTaskNotifyTake\(\)](#). The TaskNotification_t type should be declared as xTaskNotification.

See also

[xTaskNotification](#)
[xTaskNotifyTake\(\)](#)
[xMemFree\(\)](#)
[CONFIG_NOTIFICATION_VALUE_BYTES](#)

Warning

The memory allocated for an instance of xTaskNotification must be freed using [xMemFree\(\)](#).

4.2.3.11 TaskParm_t `typedef void TaskParm_t`

The TaskParm_t type is used to pass a parameter to a task at the time of creation using [xTaskCreate\(\)](#). A task parameter is a pointer of type void and can point to any number of intrinsic types, arrays and/or user defined structures which can be passed to a task. It is up to the end-user to manage, allocate and free the memory related to these objects using [xMemAlloc\(\)](#) and [xMemFree\(\)](#). The TaskParm_t should be declared as xTaskParm.

See also

[xTaskParm](#)
[xMemAlloc\(\)](#)
[xMemFree\(\)](#)

Warning

The memory allocated for an instance of xTaskParm must be freed using [xMemFree\(\)](#).

4.2.3.12 TaskRunTimeStats_t `typedef struct TaskRunTimeStats_s TaskRunTimeStats_t`

The TaskRunTimeStats_t structure contains task runtime statistics and is returned by [xTaskGetAllRunTimeStats\(\)](#) and [xTaskGetTaskRunTimeStats\(\)](#). The TaskRunTimeStats_t type should be declared as xTaskRunTimeStats.

See also

[xTaskRunTimeStats](#)
[xTaskGetTaskRunTimeStats\(\)](#)
[xTaskGetAllRunTimeStats\(\)](#)
[xMemFree\(\)](#)

Warning

The memory allocated for an instance of xTaskRunTimeStats must be freed using [xMemFree\(\)](#).

4.2.3.13 Ticks_t `typedef uint32_t Ticks_t`

The xTicks type is used by several of the task and timer related system calls to express time. The unit of measure for time is always ticks.

See also

[xTicks](#)

4.2.3.14 Timer_t `typedef void Timer_t`

The Timer_t type is a stub type definition for the internal timer data structure and is treated as a timer handle by most of the timer related system calls. The members of the data structure are not accessible. The Timer_t type should be declared as xTimer.

See also

[xTimer](#)
[xTimerDelete\(\)](#)

Warning

The memory allocated for an instance of xTimer must be freed using [xTimerDelete\(\)](#).

4.2.3.15 Word_t `typedef uint32_t Word_t`

A word is a 32-bit data type in HeliOS.

See also

[xWord](#)

4.2.3.16 xAddr `typedef Addr_t* xAddr`

The xAddr type is used to store a memory address and is used to pass memory addresses back and forth between system calls and the end-user application. It is not necessary to use the xAddr type within the end-user application as long as the type is not used to interact with the HeliOS kernel through system calls.

4.2.3.17 xBase `typedef Base_t xBase`

A simple data type is often needed as an argument for a system call or a return type. The xBase type is used in such a case where there are no other structural data requirements is typically an unsigned 8-bit integer.

See also

[Base_t](#)

4.2.3.18 xMemoryRegionStats `typedef MemoryRegionStats_t* xMemoryRegionStats`

The xMemoryRegionStats data structure is used to store statistics about a HeliOS memory region. Statistics can be obtained for the heap and kernel memory regions.

See also

[xMemGetHeapStats\(\)](#)

[xMemGetKernelStats\(\)](#)

[MemoryRegionStats_t](#)

4.2.3.19 xQueue `typedef Queue_t* xQueue`

The xQueue type is a stub type definition for the internal message queue structure and is treated as a message queue handle by most of the message queue related system calls. The members of the data structure are not accessible.

See also

[Queue_t](#)

[xQueueDelete\(\)](#)

Warning

The memory allocated for an instance of xQueue must be freed using [xQueueDelete\(\)](#).

4.2.3.20 xQueueMessage `typedef QueueMessage_t* xQueueMessage`

The xQueueMessage data structure contains the message queue message returned by [xQueuePeek\(\)](#) and [xQueueReceive\(\)](#). See QueueMessage_t for information about the data structure's members.

See also

[QueueMessage_t](#)
[xQueuePeek\(\)](#)
[xQueueReceive\(\)](#)
[xMemFree\(\)](#)
[CONFIG_MESSAGE_VALUE_BYTES](#)

Warning

The memory allocated for an instance of xQueueMessage must be freed using [xMemFree\(\)](#).

4.2.3.21 xSchedulerState `typedef SchedulerState_t xSchedulerState`

The scheduler can be in one of four possible states defined in the SchedulerState_t enumerated type. The state of the scheduler is changed by calling [xTaskSuspendAll\(\)](#) and [xTaskResumeAll\(\)](#). The state can be obtained by calling [xTaskGetSchedulerState\(\)](#).

See also

[xSchedulerState](#)
[xTaskSuspendAll\(\)](#)
[xTaskResumeAll\(\)](#)
[xTaskGetSchedulerState\(\)](#)

4.2.3.22 xSize `typedef Size_t xSize`

The xSize type is used to store the size of an object in memory and is always represented in bytes.

4.2.3.23 xSystemInfo `typedef SystemInfo_t* xSystemInfo`

The xSystemInfo data structure contains information about the HeliOS system and is returned by [xSystemGetSystemInfo\(\)](#). See xSystemInfo_t for information about the data structure's members.

See also

[SystemInfo_t](#)
[xSystemGetSystemInfo\(\)](#)
[xMemFree\(\)](#)

Warning

The memory allocated for an instance of xSystemInfo must be freed using [xMemFree\(\)](#).

4.2.3.24 **xTask** `typedef Task_t* xTask`

The xTask type is a stub type definition for the internal task data structure and is treated as a task handle by most of the task related system calls. The members of the data structure are not accessible.

See also

[Task_t](#)
[xTaskCreate\(\)](#)
[xTaskDelete\(\)](#)

Warning

The memory allocated for an instance of xTask must be freed by [xTaskDelete\(\)](#)

4.2.3.25 **xTaskInfo** `typedef TaskInfo_t* xTaskInfo`

The xTaskInfo structure is similar to xTaskRunTimeStats in that it contains runtime statistics for a task. However, xTaskInfo also contains additional details about a task such as its identifier, ASCII name and state. The xTaskInfo structure is returned by [xTaskGetTaskInfo\(\)](#). If only runtime statistics are needed, xTaskRunTimeStats should be used because of its lower memory footprint. See TaskInfo_t for information about the data structure's members.

See also

[TaskInfo_t](#)
[xTaskGetTaskInfo\(\)](#)
[xMemFree\(\)](#)
[CONFIG_TASK_NAME_BYTES](#)

Warning

The memory allocated for an instance of xTaskInfo must be freed using [xMemFree\(\)](#).

4.2.3.26 **xTaskNotification** `typedef TaskNotification_t* xTaskNotification`

The xTaskNotification data structure contains the direct to task notification returned by [xTaskNotifyTake\(\)](#). See TaskNotification_t for information about the data structure's members.

See also

[TaskNotification_t](#)
[xTaskNotifyTake\(\)](#)
[xMemFree\(\)](#)
[CONFIG_NOTIFICATION_VALUE_BYTES](#)

Warning

The memory allocated for an instance of xTaskNotification must be freed using [xMemFree\(\)](#).

4.2.3.27 xTaskParm `typedef TaskParm_t* xTaskParm`

The xTaskParm type is used to pass a parameter to a task at the time of creation using [xTaskCreate\(\)](#). A task parameter is a pointer of type void and can point to any number of intrinsic types, arrays and/or user defined structures which can be passed to a task. It is up to the end-user to manage allocate and free the memory related to these objects using [xMemAlloc\(\)](#) and [xMemFree\(\)](#).

See also

[TaskParm_t](#)
[xMemAlloc\(\)](#)
[xMemFree\(\)](#)

Warning

The memory allocated for an instance of xTaskParm must be freed using [xMemFree\(\)](#).

4.2.3.28 xTaskRunTimeStats `typedef TaskRunTimeStats_t* xTaskRunTimeStats`

The xTaskRunTimeStats structure contains task runtime statistics and is returned by [xTaskGetAllRunTimeStats\(\)](#) and [xTaskGetTaskRunTimeStats\(\)](#). See TaskRunTimeStats_t for information about the data structure's members.

See also

[TaskRunTimeStats_t](#)
[xTaskGetTaskRunTimeStats\(\)](#)
[xTaskGetAllRunTimeStats\(\)](#)
[xMemFree\(\)](#)

Warning

The memory allocated for an instance of xTaskRunTimeStats must be freed using [xMemFree\(\)](#).

4.2.3.29 xTaskState `typedef TaskState_t xTaskState`

A task can be in one of the four possible states defined in the TaskState_t enumerated type. The state of a task is changed by calling [xTaskResume\(\)](#), [xTaskSuspend\(\)](#) or [xTaskWait\(\)](#).

See also

[TaskState_t](#)
[xTaskResume\(\)](#)
[xTaskSuspend\(\)](#)
[xTaskWait\(\)](#)

4.2.3.30 xTicks `typedef Ticks_t xTicks`

The xTicks type is used by several of the task and timer related system calls to express time. The unit of measure for time is always ticks.

See also

[Ticks_t](#)

4.2.3.31 xTimer `typedef Timer_t* xTimer`

The xTimer type is a stub type definition for the internal timer data structure and is treated as a timer handle by most of the timer related system calls. The members of the data structure are not accessible.

See also

[Timer_t](#)

[xTimerDelete\(\)](#)

Warning

The memory allocated for an instance of xTimer must be freed using [xTimerDelete\(\)](#).

4.2.3.32 xWord `typedef Word_t xWord`

A word is a 32-bit data type in HeliOS.

See also

[Word_t](#)

4.2.4 Enumeration Type Documentation**4.2.4.1 SchedulerState_t** `enum SchedulerState_t`

The scheduler can be in one of four possible states defined in the SchedulerState_t enumerated type. The state of the scheduler is changed by calling [xTaskSuspendAll\(\)](#) and [xTaskResumeAll\(\)](#). The state can be obtained by calling [xTaskGetSchedulerState\(\)](#).

See also

[xSchedulerState](#)

[xTaskSuspendAll\(\)](#)

[xTaskResumeAll\(\)](#)

Enumerator

| | |
|-------------------------|--|
| SchedulerStateError | Not used. |
| SchedulerStateSuspended | State the scheduler is in after xTaskSuspendAll() is called. |
| SchedulerStateRunning | State the scheduler is in after xTaskResumeAll() is called. |

4.2.4.2 TaskState_t `enum TaskState_t`

A task can be in one of the four possible states defined in the `TaskState_t` enumerated type. The state of a task is changed by calling [xTaskResume\(\)](#), [xTaskSuspend\(\)](#) or [xTaskWait\(\)](#). The `TaskState_t` enumerated type should be declared as `xTaskState`.

See also

[xTaskState](#)
[xTaskResume\(\)](#)
[xTaskSuspend\(\)](#)
[xTaskWait\(\)](#)

Enumerator

| | |
|--------------------|---|
| TaskStateError | Returned by xTaskGetTaskState() when task cannot be found. |
| TaskStateSuspended | State a task is in when it is first created by xTaskCreate() or suspended by xTaskSuspend() . |
| TaskStateRunning | State a task is in after xTaskResume() is called. |
| TaskStateWaiting | State a task is in after xTaskWait() is called. |

4.2.5 Function Documentation

4.2.5.1 `_SystemAssert_()` `void _SystemAssert_ (`
`const char * file_,`
`int line_)`

The `SystemAssert()` system call handles assertions. The `SystemAssert()` system call should not be called directly. Instead, the `SYSASSERT()` macro should be used. The system assertion functionality will only work when the `CONFIG_ENABLE_SYSTEM_ASSERT` and `CONFIG_SYSTEM_ASSERT_BEHAVIOR` settings are defined.

See also

`SYSASSERT`
`CONFIG_ENABLE_SYSTEM_ASSERT`
`CONFIG_SYSTEM_ASSERT_BEHAVIOR`

Parameters

| | |
|--------------------|---|
| <i>file</i> ↔ — | This is automatically defined by the compiler's definition of <i>FILE</i> |
| <i>line</i> ↔ — | This is automatically defined by the compiler's definition of <i>LINE</i> |

4.2.5.2 xMemAlloc()

```
xAddr xMemAlloc (
    const xSize size_ )
```

The [xMemAlloc\(\)](#) system call allocates memory from the heap for HeliOS system calls and end-user tasks. The size of the heap, in bytes, is dependent on the CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS and CONFIG_↔ MEMORY_REGION_BLOCK_SIZE settings. [xMemAlloc\(\)](#) functions similarly to `calloc()` in that it clears the memory it allocates.

See also

[CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS](#)
[CONFIG_MEMORY_REGION_BLOCK_SIZE](#)
[xMemFree\(\)](#)

Parameters

| | |
|--------------------|---|
| <i>size</i> ↔ — | The amount (size) of the memory to be allocated from the heap in bytes. |
|--------------------|---|

Returns

xAddr If successful, [xMemAlloc\(\)](#) returns the address of the newly allocated memory. If unsuccessful, the system call will return null.

Note

HeliOS technically does not allocate memory from what is traditionally heap memory. HeliOS uses a private "heap" which is actually static memory allocated at compile time. This is done to maintain MISRA C:2012 compliance since standard library functions like `malloc()`, `calloc()` and `free()` are not permitted.

4.2.5.3 xMemFree()

```
void xMemFree (
    const xAddr addr_ )
```

The [xMemFree\(\)](#) system call will free heap memory allocated by [xMemAlloc\(\)](#) and other HeliOS system calls such as [xSystemGetSystemInfo\(\)](#).

See also

[xMemAlloc\(\)](#)

Parameters

| | |
|--------------------|---|
| <code>addr↔</code> | The address of the allocated heap memory to be freed. |
| — | |

Warning

[xMemFree\(\)](#) cannot be used to free memory allocated for kernel objects. Memory allocated by [xTaskCreate\(\)](#), [xTimerCreate\(\)](#) or [xQueueCreate\(\)](#) must be freed by their respective delete system calls (i.e., [xTaskDelete\(\)](#)).

4.2.5.4 xMemGetHeapStats() `xMemoryRegionStats xMemGetHeapStats (void)`

The [xMemGetHeapStats\(\)](#) system call will return statistics about the heap so the end-user can better understand the state of the heap.

See also

[xMemoryRegionStats](#)

Returns

`xMemoryRegionStats` Returns the `xMemoryRegionStats` structure or null if unsuccessful.

Warning

The memory allocated by [xMemGetHeapStats\(\)](#) must be freed by [xMemFree\(\)](#).

4.2.5.5 xMemGetKernelStats() `xMemoryRegionStats xMemGetKernelStats (void)`

The [xMemGetKernelStats\(\)](#) system call will return statistics about the kernel memory region so the end-user can better understand the state of kernel memory.

See also

[xMemoryRegionStats](#)

Returns

`xMemoryRegionStats` Returns the `xMemoryRegionStats` structure or null if unsuccessful.

Warning

The memory allocated by [xMemGetKernelStats\(\)](#) must be freed by [xMemFree\(\)](#).

4.2.5.6 xMemGetSize() `xSize xMemGetSize (const xAddr addr_)`

The [xMemGetSize\(\)](#) system call returns the amount of heap memory in bytes that is currently allocated to a specific address. If the address is null or invalid, [xMemGetSize\(\)](#) will return zero bytes.

Parameters

| | |
|-------------------------|---|
| <code>addr↔</code> — | The address of the allocated heap memory to obtain the size of the memory, in bytes, that is allocated. |
|-------------------------|---|

Returns

`Size_t` The amount of memory currently allocated to the specific address in bytes. If the address is invalid or null, `xMemGetSize()` will return zero.

Note

If the address `addr_` points to a structure that, for example, is 48 bytes in size base on `sizeof()`, `xMemGetSize()` will return the number of bytes allocated by the block(s) that contain the structure. Assuming the default block size of 32, a 48 byte structure would require TWO blocks so `xMemGetSize()` would return 64 - not 48. `xMemGetSize()` also checks the health of the heap and will return zero if it detects a consistency issue with the heap. Thus, `xMemGetSize()` can be used to validate addresses before the objects they reference are accessed.

4.2.5.7 `xMemGetUsed()` `xSize` `xMemGetUsed` (`void`)

The `xMemGetUsed()` system call returns the amount of heap memory, in bytes, that is currently allocated. Calls to `xMemAlloc()` increases and `xMemFree()` decreases the amount of memory in use.

Returns

`Size_t` The amount of memory currently allocated in bytes. If no heap memory is currently allocated, `xMemGetUsed()` will return zero.

Note

`xMemGetUsed()` returns the amount of heap memory that is currently allocated to end-user objects AND kernel objects. However, only end-user objects may be freed using `xMemFree()`. Kernel objects must be freed using their respective delete system call (e.g., `xTaskDelete()`).

4.2.5.8 `xQueueCreate()` `xQueue` `xQueueCreate` (`xBase` `limit_`)

The `xQueueCreate()` system call creates a message queue for inter-task communication.

See also

`xQueue`
`xQueueDelete()`
`CONFIG_QUEUE_MINIMUM_LIMIT`

Parameters

| | |
|---------------------|---|
| <i>limit</i> ↔ — | The message limit for the queue. When this number is reach, the queue is considered full and xQueueSend() will fail. The minimum limit for queues is dependent on the setting CONFIG_QUEUE_MINIMUM_LIMIT. |
|---------------------|---|

Returns

[xQueue](#) A queue is returned if successful, otherwise null is returned if unsuccessful.

Warning

The message queue memory can only be freed by [xQueueDelete\(\)](#).

4.2.5.9 xQueueDelete() `void xQueueDelete (`
 [xQueue](#) *queue_* `)`

The [xQueueDelete\(\)](#) system call will delete a message queue created by [xQueueCreate\(\)](#). [xQueueDelete\(\)](#) will delete a queue regardless of how many messages the queue contains at the time [xQueueDelete\(\)](#) is called. Any messages the message queue contains will be deleted in the process of deleting the message queue.

See also

[xQueueCreate\(\)](#)

Parameters

| | |
|---------------------|--------------------------|
| <i>queue</i> ↔ — | The queue to be deleted. |
|---------------------|--------------------------|

4.2.5.10 xQueueDropMessage() `void xQueueDropMessage (`
 [xQueue](#) *queue_* `)`

The [xQueueDropMessage\(\)](#) system call will drop the next message from the message queue without returning the message.

Parameters

| | |
|---------------------|--|
| <i>queue</i> ↔ — | The queue to drop the next message from. |
|---------------------|--|

4.2.5.11 xQueueGetLength() `xBase` [xQueueGetLength](#) (
 [xQueue](#) *queue_* `)`

The `xQueueGetLength()` system call returns the length of the queue (the number of messages the queue currently contains).

Parameters

| | |
|----------------------|------------------------------------|
| <code>queue</code> ↔ | The queue to return the length of. |
| — | |

Returns

`xBase` The number of messages in the queue. If unsuccessful or if the queue is empty, `xQueueGetLength()` returns zero.

4.2.5.12 `xQueueIsQueueEmpty()` `xBase` `xQueueIsQueueEmpty` (`xQueue` `queue_`)

The `xQueueIsQueueEmpty()` system call will return a true or false dependent on whether the queue is empty (message queue length is zero) or contains one or more messages.

Parameters

| | |
|----------------------|---|
| <code>queue</code> ↔ | The queue to determine whether it is empty. |
| — | |

Returns

`xBase` True if the queue is empty. False if the queue has one or more messages. `xQueueIsQueueEmpty()` will also return false if the queue parameter is invalid.

4.2.5.13 `xQueueIsQueueFull()` `xBase` `xQueueIsQueueFull` (`xQueue` `queue_`)

The `xQueueIsQueueFull()` system call will return a true or false dependent on whether the queue is full or contains zero messages. A queue is considered full if the number of messages in the queue is equal to the queue's length limit.

Parameters

| | |
|----------------------|--|
| <code>queue</code> ↔ | The queue to determine whether it is full. |
| — | |

Returns

`xBase` True if the queue is full. False if the queue has zero. `xQueueIsQueueFull()` will also return false if the queue parameter is invalid.

4.2.5.14 xQueueLockQueue() `void xQueueLockQueue (`
`xQueue queue_)`

The `xQueueLockQueue()` system call will lock the message queue. Locking a message queue will prevent `xQueueSend()` from sending messages to the queue.

Parameters

| | |
|----------------|--------------------|
| <i>queue</i> ↔ | The queue to lock. |
| — | |

4.2.5.15 xQueueMessagesWaiting() `xBase xQueueMessagesWaiting (`
`xQueue queue_)`

The `xQueueMessagesWaiting()` system call returns true or false dependent on whether there is at least one message waiting. The message queue does not have to be full to return true.

Parameters

| | |
|----------------|--|
| <i>queue</i> ↔ | The queue to determine whether one or more messages are waiting. |
| — | |

Returns

`xBase` True if one or more messages are waiting. False if there are no messages waiting of the queue parameter is invalid.

4.2.5.16 xQueuePeek() `xQueueMessage xQueuePeek (`
`xQueue queue_)`

The `xQueuePeek()` system call will return the next message in the specified message queue without dropping the message.

See also

[xQueueMessage](#)
[xMemFree\(\)](#)

Parameters

| | |
|----------------|--|
| <i>queue</i> ↔ | The queue to return the next message from. |
| — | |

Returns

`xQueueMessage` The next message in the queue. If the queue is empty or the queue parameter is invalid, `xQueuePeek()` will return null.

Warning

The memory allocated by `xQueuePeek()` must be freed by `xMemFree()`.

4.2.5.17 xQueueReceive() `xQueueMessage` `xQueueReceive` (
 `xQueue` `queue_`)

The `xQueueReceive()` system call will return the next message in the message queue and drop it from the message queue.

See also

`xQueueMessage`
`xMemFree()`

Parameters

| | |
|----------------------|--|
| <code>queue_↔</code> | The queue to return the next message from. |
| <code>_</code> | |

Returns

`xQueueMessage` The message returned from the queue. If the queue is empty of the queue parameter is invalid, `xQueueReceive()` will return null.

Warning

The memory allocated by `xQueueReceive()` must be freed by `xMemFree()`.

4.2.5.18 xQueueSend() `xBase` `xQueueSend` (
 `xQueue` `queue_`,
 `xBase` `messageBytes_`,
 const char * `messageValue_`)

The `xQueueSend()` system call will send a message using the specified message queue. The size of the message value is passed in the message bytes parameter. The maximum message value size in bytes is dependent on the `CONFIG_MESSAGE_VALUE_BYTES` setting.

See also

`CONFIG_MESSAGE_VALUE_BYTES`
`xQueuePeek()`
`xQueueReceive()`

Parameters

| | |
|----------------------------|---|
| <i>queue_</i> | The queue to send the message to. |
| <i>message↔ Bytes_</i> | The number of bytes contained in the message value. The number of bytes must be greater than zero and less than or equal to the setting CONFIG_MESSAGE_VALUE_BYTES. |
| <i>message↔ Value_</i> | The message value. If the message value is greater than defined in CONFIG_MESSAGE_VALUE_BYTES, only the number of bytes defined in CONFIG_MESSAGE_VALUE_BYTES will be copied into the message value. The message value is NOT a null terminated string. |

Returns

xBase [xQueueSend\(\)](#) returns RETURN_SUCCESS if the message was sent to the queue successfully. Otherwise RETURN_FAILURE if unsuccessful.

4.2.5.19 xQueueUnLockQueue() void xQueueUnLockQueue (
 [xQueue](#) queue_)

The [xQueueUnLockQueue\(\)](#) system call will unlock the message queue. Unlocking a message queue will allow [xQueueSend\(\)](#) to send messages to the queue.

Parameters

| | |
|---------------------|----------------------|
| <i>queue↔ _</i> | The queue to unlock. |
|---------------------|----------------------|

4.2.5.20 xSystemGetSystemInfo() [xSystemInfo](#) xSystemGetSystemInfo (
 void)

Returns

[xSystemInfo](#) The system info is returned if successful, otherwise null is returned if unsuccessful.

See also

[xSystemInfo](#)
[xMemFree\(\)](#)

Warning

The memory allocated by the [xSystemGetSystemInfo\(\)](#) must be freed with [xMemFree\(\)](#)

4.2.5.21 xSystemHalt() `void xSystemHalt (`
`void)`

The `xSystemHalt()` system call will halt HeliOS. Once `xSystemHalt()` is called, the system must be reset.

4.2.5.22 xSystemInit() `void xSystemInit (`
`void)`

The `xSystemInit()` system call initializes the required interrupt handlers and memory and must be called prior to calling any other system call.

4.2.5.23 xTaskChangePeriod() `void xTaskChangePeriod (`
`xTask task_,`
`xTicks timerPeriod_)`

The `xTaskChangePeriod()` system call will change the period (ticks) on the task timer for the specified task. The timer period must be greater than zero. To have any effect, the task must be in the waiting state set by calling `xTaskWait()` on the task. Once the timer period is set and the task is in the waiting state, the task will be executed every `timerPeriod_` ticks. Changing the period to zero will prevent the task from being executed even if it is in the waiting state unless it were to receive a direct to task notification.

See also

`xTaskWait()`
`xTaskGetPeriod()`
`xTaskResetTimer()`

Parameters

| | |
|---------------------------|--|
| <i>task_</i> | The task to change the timer period for. |
| <i>timer↔ Period_</i> | The timer period in ticks. |

4.2.5.24 xTaskCreate() `xTask xTaskCreate (`
`const char * name_,`
`void(*) (xTask, xTaskParm) callback_,`
`xTaskParm taskParameter_)`

The `xTaskCreate()` system call will create a new task. The task will be created with its state set to suspended. The `xTaskCreate()` and `xTaskDelete()` system calls cannot be called within a task. They MUST be called outside of the scope of the HeliOS scheduler.

Parameters

| | |
|-----------------------------|--|
| <i>name_</i> | The ASCII name of the task which can be used by <code>xTaskGetHandleByName()</code> to obtain the task handle. The length of the name is depended on the <code>CONFIG_TASK_NAME_BYTES</code> . The task name is NOT a null terminated char string. |
| <i>callback_</i> | The address of the task main function. This is the function that will be invoked by the scheduler when a task is scheduled for execution. |
| <i>task↔ Parameter_</i> | A pointer to any type or structure that the end-user wants to pass into the task as a parameter. The task parameter is not required and may simply be set to null. |

Returns

xTask A handle to the newly created task.

See also

[xTask](#)
[xTaskParm](#)
[xTaskDelete\(\)](#)
[xTaskState](#)
[CONFIG_TASK_NAME_BYTES](#)

Warning

[xTaskCreate\(\)](#) MUST be called outside the scope of the HeliOS scheduler (i.e., not from a task's main). The task memory can only be freed by [xTaskDelete\(\)](#).

4.2.5.25 xTaskDelete() `void xTaskDelete (`
 [xTask](#) *task_* `)`

The [xTaskDelete\(\)](#) system call will delete a task. The [xTaskCreate\(\)](#) and [xTaskDelete\(\)](#) system calls cannot be called within a task. They MUST be called outside of the scope of the HeliOS scheduler.

Parameters

| | |
|----------------|---------------------------------------|
| <i>task_</i> ↔ | The handle of the task to be deleted. |
| — | |

Warning

[xTaskDelete\(\)](#) MUST be called outside the scope of the HeliOS scheduler (i.e., not from a task's main).

4.2.5.26 xTaskGetAllRunTimeStats() `xTaskRunTimeStats` `xTaskGetAllRunTimeStats (`
 [xBase](#) * *tasks_* `)`

The [xTaskGetAllRunTimeStats\(\)](#) system call will return the runtime statistics for all of the tasks regardless of their state. The [xTaskGetAllRunTimeStats\(\)](#) system call returns the `xTaskRunTimeStats` type. An `xBase` variable must be passed by reference to [xTaskGetAllRunTimeStats\(\)](#) which will be updated by [xTaskGetAllRunTimeStats\(\)](#) to contain the number of tasks so the end-user can iterate through the tasks. The `xTaskRunTimeStats` memory must be freed by [xMemFree\(\)](#) after it is no longer needed.

See also

[xTaskRunTimeStats](#)
[xMemFree\(\)](#)

Parameters

| | |
|---------------------|--|
| <i>tasks</i> ↔ — | A variable of type <code>xBase</code> passed by reference which will contain the number of tasks upon return. If no tasks currently exist, this variable will not be modified. |
|---------------------|--|

Returns

`xTaskRunTimeStats` The runtime stats returned by [xTaskGetAllRunTimeStats\(\)](#). If there are currently no tasks then this will be null. This memory must be freed by [xMemFree\(\)](#).

Warning

The memory allocated by [xTaskGetAllRunTimeStats\(\)](#) must be freed by [xMemFree\(\)](#).

4.2.5.27 xTaskGetAllTaskInfo() `xTaskInfo` `xTaskGetAllTaskInfo` (
 `xBase * tasks_`)

The [xTaskGetAllTaskInfo\(\)](#) system call returns the `xTaskInfo` structure containing the details of ALL tasks including their identifier, name, state and runtime statistics.

See also

[xTaskInfo](#)

Parameters

| | |
|---------------------|--|
| <i>tasks</i> ↔ — | A variable of type <code>xBase</code> passed by reference which will contain the number of tasks upon return. If no tasks currently exist, this variable will not be modified. |
|---------------------|--|

Returns

`xTaskInfo` The `xTaskInfo` structure containing the tasks details. [xTaskGetAllTaskInfo\(\)](#) returns null if there no tasks or if a consistency issue is detected.

Warning

The memory allocated by [xTaskGetAllTaskInfo\(\)](#) must be freed by [xMemFree\(\)](#).

4.2.5.28 xTaskGetHandleById() `xTask` `xTaskGetHandleById` (
 `xBase id_`)

The [xTaskGetHandleById\(\)](#) system call will return the task handle of the task specified by identifier identifier.

See also

[xBase](#)

Parameters

| | |
|-------------------|---|
| <i>id</i> ↔ _↔ | The identifier of the task to return the handle of. |
|-------------------|---|

Returns

xTask The task handle. [xTaskGetHandleById\(\)](#) returns null if the the task identifier cannot be found.

4.2.5.29 xTaskGetHandleByName() [xTask](#) xTaskGetHandleByName (
const char * name_)

The [xTaskGetHandleByName\(\)](#) system call will return the task handle of the task specified by its ASCII name. The length of the task name is dependent on the CONFIG_TASK_NAME_BYTES setting. The name is compared byte-for-byte so the name is case sensitive.

See also

[CONFIG_TASK_NAME_BYTES](#)

Parameters

| | |
|--------------------|--|
| <i>name</i> ↔ _ | The ASCII name of the task to return the handle of. The task name is NOT a null terminated string. |
|--------------------|--|

Returns

xTask The task handle. [xTaskGetHandleByName\(\)](#) returns null if the name cannot be found.

4.2.5.30 xTaskGetId() [xBase](#) xTaskGetId (
[xTask](#) task_)

The [xTaskGetId\(\)](#) system call returns the task identifier for the task.

Parameters

| | |
|--------------------|---------------------------------------|
| <i>task</i> ↔ _ | The task to return the identifier of. |
|--------------------|---------------------------------------|

Returns

xBase The identifier of the task. If the task cannot be found, [xTaskGetId\(\)](#) returns zero (all tasks identifiers are 1 or greater).

4.2.5.31 xTaskGetName() `char* xTaskGetName (`
 `xTask task_)`

The [xTaskGetName\(\)](#) system call returns the ASCII name of the task. The size of the task is dependent on the setting `CONFIG_TASK_NAME_BYTES`. The task name is NOT a null terminated char string. The memory allocated for the char array must be freed by [xMemFree\(\)](#) when no longer needed.

See also

[CONFIG_TASK_NAME_BYTES](#)
[xMemFree\(\)](#)

Parameters

| | |
|---------------------|---------------------------------|
| <code>task_↔</code> | The task to return the name of. |
| <code>_</code> | |

Returns

`char*` A pointer to the char array containing the ASCII name of the task. The task name is NOT a null terminated char string. [xTaskGetName\(\)](#) will return null if the task cannot be found.

Warning

The memory allocated by [xTaskGetName\(\)](#) must be free by [xMemFree\(\)](#).

4.2.5.32 xTaskGetNumberOfTasks() `xBase xTaskGetNumberOfTasks (`
 `void)`

The [xTaskGetNumberOfTasks\(\)](#) system call returns the current number of tasks regardless of their state.

Returns

`xBase` The number of tasks.

4.2.5.33 xTaskGetPeriod() `xTicks xTaskGetPeriod (`
 `xTask task_)`

The [xTaskGetPeriod\(\)](#) will return the period for the timer for the specified task. See [xTaskChangePeriod\(\)](#) for more information on how the task timer works.

See also

[xTaskWait\(\)](#)
[xTaskChangePeriod\(\)](#)
[xTaskResetTimer\(\)](#)

Parameters

| | |
|---------------|--|
| <i>task</i> ↔ | The task to return the timer period for. |
| — | |

Returns

xTicks The timer period in ticks. [xTaskGetPeriod\(\)](#) will return zero if the timer period is zero or if the task could not be found.

4.2.5.34 xTaskGetSchedulerState() [xSchedulerState](#) xTaskGetSchedulerState (
 void)

The [xTaskGetSchedulerState\(\)](#) system call will return the state of the scheduler. The state of the scheduler can only be changed using [xTaskSuspendAll\(\)](#) and [xTaskResumeAll\(\)](#).

See also

[xSchedulerState](#)
[xTaskSuspendAll\(\)](#)
[xTaskResumeAll\(\)](#)

Returns

xSchedulerState The state of the scheduler.

4.2.5.35 xTaskGetTaskInfo() [xTaskInfo](#) xTaskGetTaskInfo (
 [xTask](#) task_)

The [xTaskGetTaskInfo\(\)](#) system call returns the xTaskInfo structure containing the details of the task including its identifier, name, state and runtime statistics.

See also

[xTaskInfo](#)

Parameters

| | |
|---------------|------------------------------------|
| <i>task</i> ↔ | The task to return the details of. |
| — | |

Returns

xTaskInfo The xTaskInfo structure containing the task details. [xTaskGetTaskInfo\(\)](#) returns null if the task cannot be found.

Warning

The memory allocated by [xTaskGetTaskInfo\(\)](#) must be freed by [xMemFree\(\)](#).

4.2.5.36 xTaskGetTaskRunTimeStats() [xTaskRunTimeStats](#) xTaskGetTaskRunTimeStats (
 [xTask](#) task_)

The [xTaskGetTaskRunTimeStats\(\)](#) system call returns the task runtime statistics for one task. The [xTaskGetTaskRunTimeStats\(\)](#) system call returns the [xTaskRunTimeStats](#) type. The memory must be freed by calling [xMemFree\(\)](#) after it is no longer needed.

See also

[xTaskRunTimeStats](#)

[xMemFree\(\)](#)

Parameters

| | |
|---------------|---|
| <i>task</i> ↔ | The task to get the runtime statistics for. |
| — | |

Returns

[xTaskRunTimeStats](#) The runtime stats returned by [xTaskGetTaskRunTimeStats\(\)](#). [xTaskGetTaskRunTimeStats\(\)](#) will return null if the task cannot be found.

Warning

The memory allocated by [xTaskGetTaskRunTimeStats\(\)](#) must be freed by [xMemFree\(\)](#).

4.2.5.37 xTaskGetTaskState() [xTaskState](#) xTaskGetTaskState (
 [xTask](#) task_)

The [xTaskGetTaskState\(\)](#) system call will return the state of the task.

See also

[xTaskState](#)

Parameters

| | |
|---------------|----------------------------------|
| <i>task</i> ↔ | The task to return the state of. |
| — | |

Returns

`xTaskState` The `xTaskState` of the task. If the task cannot be found, `xTaskGetTaskState()` will return null.

4.2.5.38 `xTaskNotificationIsWaiting()` `xBase` `xTaskNotificationIsWaiting` (
`xTask` `task_`)

The `xTaskNotificationIsWaiting()` system call will return true or false depending on whether there is a direct to task notification waiting for the task.

Parameters

| | |
|--------------------------|--|
| <code>task_↔</code> — | The task to check for a waiting task notification. |
|--------------------------|--|

Returns

`xBase` Returns true if there is a task notification. False if there is no notification or if the task could not be found.

4.2.5.39 `xTaskNotifyGive()` `Base_t` `xTaskNotifyGive` (
`xTask` `task_`,
`xBase` `notificationBytes_`,
const char * `notificationValue_`)

The `xTaskNotifyGive()` system call will give a direct to task notification to the specified task. The task notification bytes is the number of bytes contained in the notification value. The number of notification bytes must be between one and the `CONFIG_NOTIFICATION_VALUE_BYTES` setting. The notification value must contain a pointer to a char array containing the notification value. If the task already has a waiting task notification, `xTaskNotifyGive()` will NOT overwrite the waiting task notification. `xTaskNotifyGive()` will return true if the direct to task notification was successfully given.

See also

[CONFIG_NOTIFICATION_VALUE_BYTES](#)
[xTaskNotifyTake\(\)](#)

Parameters

| | |
|--|---|
| <code>task_</code> | The task to send the task notification to. |
| <code>notification_↔</code> <code>Bytes_</code> | The number of bytes contained in the notification value. The number must be between one and the <code>CONFIG_NOTIFICATION_VALUE_BYTES</code> setting. |
| <code>notification_↔</code> <code>Value_</code> | A char array containing the notification value. The notification value is NOT a null terminated string. |

Returns

xBase RETURN_SUCCESS if the direct to task notification was successfully given, RETURN_FAILURE if not.

4.2.5.40 xTaskNotifyStateClear() `void xTaskNotifyStateClear (`
`xTask task_)`

The [xTaskNotifyStateClear\(\)](#) system call will clear a waiting direct to task notification if one exists without returning the notification.

Parameters

| | |
|----------------|---|
| <i>task_</i> ↔ | The task to clear the notification for. |
| — | |

4.2.5.41 xTaskNotifyTake() `xTaskNotification xTaskNotifyTake (`
`xTask task_)`

The [xTaskNotifyTake\(\)](#) system call will return the waiting direct to task notification if there is one. The [xTaskNotifyTake\(\)](#) system call will return an xTaskNotification structure containing the notification bytes and its value. The memory allocated by [xTaskNotifyTake\(\)](#) must be freed by [xMemFree\(\)](#).

See also

[xTaskNotification](#)
[xTaskNotifyGive\(\)](#)
[xMemFree\(\)](#)
[CONFIG_NOTIFICATION_VALUE_BYTES](#)

Parameters

| | |
|----------------|---|
| <i>task_</i> ↔ | The task to return a waiting task notification. |
| — | |

Returns

xTaskNotification The xTaskNotification structure containing the notification bytes and value. [xTaskNotifyTake\(\)](#) will return null if no waiting task notification exists or if the task cannot be found.

Warning

The memory allocated by [xTaskNotifyTake\(\)](#) must be freed by [xMemFree\(\)](#).

4.2.5.42 xTaskResetTimer() `void xTaskResetTimer (`
`xTask task_)`

The [xTaskResetTimer\(\)](#) system call will reset the task timer. [xTaskResetTimer\(\)](#) does not change the timer period or the task state when called. See [xTaskChangePeriod\(\)](#) for more details on task timers.

See also

[xTaskWait\(\)](#)
[xTaskChangePeriod\(\)](#)
[xTaskGetPeriod\(\)](#)

Parameters

| | |
|----------------|---------------------------------------|
| <i>task_</i> ↔ | The task to reset the task timer for. |
| — | |

4.2.5.43 xTaskResume() `void xTaskResume (`
`xTask task_)`

The [xTaskResume\(\)](#) system call will resume a suspended task. Tasks are suspended on creation so either [xTaskResume\(\)](#) or [xTaskWait\(\)](#) must be called to place the task in a state that the scheduler will execute.

See also

[xTaskState](#)
[xTaskSuspend\(\)](#)
[xTaskWait\(\)](#)

Parameters

| | |
|----------------|---------------------------------------|
| <i>task_</i> ↔ | The task to set its state to running. |
| — | |

4.2.5.44 xTaskResumeAll() `void xTaskResumeAll (`
`void)`

The [xTaskResumeAll\(\)](#) system call will set the scheduler state to running so the next call to [xTaskStartScheduler\(\)](#) will resume execute of all tasks. The state of each task is not altered by [xTaskSuspendAll\(\)](#) or [xTaskResumeAll\(\)](#).

See also

[xTaskSuspendAll\(\)](#)

4.2.5.45 xTaskStartScheduler() `void xTaskStartScheduler (`
`void)`

The [xTaskStartScheduler\(\)](#) system call passes control to the HeliOS scheduler. This system call will not return until [xTaskSuspendAll\(\)](#) is called. If [xTaskSuspendAll\(\)](#) is called, [xTaskResumeAll\(\)](#) must be called before [xTaskStartScheduler\(\)](#) can be called again to continue executing tasks.

4.2.5.46 xTaskSuspend() `void xTaskSuspend (`
`xTask task_)`

The [xTaskSuspend\(\)](#) system call will suspend a task. A task that has been suspended will not be executed by the scheduler until [xTaskResume\(\)](#) or [xTaskWait\(\)](#) is called.

See also

[xTaskState](#)
[xTaskResume\(\)](#)
[xTaskWait\(\)](#)

Parameters

| | |
|----------------|----------------------|
| <i>task_</i> ↔ | The task to suspend. |
| — | |

4.2.5.47 xTaskSuspendAll() `void xTaskSuspendAll (`
`void)`

The [xTaskSuspendAll\(\)](#) system call will set the scheduler state to suspended so the scheduler will stop and return. The state of each task is not altered by [xTaskSuspendAll\(\)](#) or [xTaskResumeAll\(\)](#).

See also

[xTaskResumeAll\(\)](#)

4.2.5.48 xTaskWait() `void xTaskWait (`
`xTask task_)`

The [xTaskWait\(\)](#) system call will place a task in the waiting state. A task must be in the waiting state for event driven multitasking with either direct to task notifications OR setting the period on the task timer with [xTaskChangePeriod\(\)](#). A task in the waiting state will not be executed by the scheduler until an event has occurred.

See also

[xTaskState](#)
[xTaskResume\(\)](#)
[xTaskSuspend\(\)](#)

Parameters

| | |
|--------------------|---|
| <i>task</i> ↔ — | The task to place in the waiting state. |
|--------------------|---|

4.2.5.49 xTimerChangePeriod() `void xTimerChangePeriod (`
 `xTimer timer_,`
 `xTicks timerPeriod_)`

The [xTimerChangePeriod\(\)](#) system call will change the period of the specified timer. The timer period is measured in ticks. If the timer period is zero, the [xTimerHasTimerExpired\(\)](#) system call will always return false.

See also

[xTimerHasTimerExpired\(\)](#)

Parameters

| | |
|----------------------------------|---|
| <i>timer_</i> | The timer to change the period for. |
| <i>timer</i> ↔ <i>Period_</i> | The timer period in is ticks. Timer period must be zero or greater. |

4.2.5.50 xTimerCreate() `xTimer xTimerCreate (`
 `xTicks timerPeriod_)`

The [xTimerCreate\(\)](#) system call will create a new timer. Timers differ from task timers in that they do not create events that effect the scheduling of a task. Timers can be used by tasks to initiate various task activities based on a specified time period represented in ticks. The memory allocated by [xTimerCreate\(\)](#) must be freed by [xTimerDelete\(\)](#). Unlike tasks, timers may be created and deleted within tasks.

See also

[xTimer](#)

[xTimerDelete\(\)](#)

Parameters

| | |
|----------------------------------|---|
| <i>timer</i> ↔ <i>Period_</i> | The number of ticks before the timer expires. |
|----------------------------------|---|

Returns

[xTimer](#) The newly created timer. If the timer period parameter is less than zero or [xTimerCreate\(\)](#) was unable to allocate the required memory, [xTimerCreate\(\)](#) will return null.

Warning

The timer memory can only be freed by [xTimerDelete\(\)](#).

4.2.5.51 xTimerDelete() `void xTimerDelete (`
`xTimer timer_)`

The [xTimerDelete\(\)](#) system call will delete a timer. For more information on timers see the [xTaskTimerCreate\(\)](#) system call.

See also

[xTimerCreate\(\)](#)

Parameters

| | |
|---------------------|--------------------------|
| <i>timer</i> ↔ — | The timer to be deleted. |
|---------------------|--------------------------|

4.2.5.52 xTimerGetPeriod() `xTicks xTimerGetPeriod (`
`xTimer timer_)`

The [xTimerGetPeriod\(\)](#) system call will return the current timer period for the specified timer.

Parameters

| | |
|---------------------|--|
| <i>timer</i> ↔ — | The timer to get the timer period for. |
|---------------------|--|

Returns

xTicks The timer period. If the timer cannot be found, [xTimerGetPeriod\(\)](#) will return zero.

4.2.5.53 xTimerHasTimerExpired() `xBase xTimerHasTimerExpired (`
`xTimer timer_)`

The [xTimerHasTimerExpired\(\)](#) system call will return true or false dependent on whether the timer period for the specified timer has elapsed. [xTimerHasTimerExpired\(\)](#) will NOT reset the timer. Timers will not automatically reset. Timers MUST be reset with [xTimerReset\(\)](#).

See also

[xTimerReset\(\)](#)

Parameters

| | |
|----------------|---|
| <i>timer</i> ↔ | The timer to determine if the period has expired. |
| — | |

Returns

xBase True if the timer has expired, false if the timer has not expired or could not be found.

4.2.5.54 xTimerIsTimerActive() `xBase xTimerIsTimerActive (`
`xTimer timer_)`

The [xTimerIsTimerActive\(\)](#) system call will return true if the timer has been started with [xTimerStart\(\)](#).

See also

[xTimerStart\(\)](#)

Parameters

| | |
|----------------|-------------------------------|
| <i>timer</i> ↔ | The timer to check if active. |
| — | |

Returns

xBase True if active, false if not active or if the timer could not be found.

4.2.5.55 xTimerReset() `void xTimerReset (`
`xTimer timer_)`

The [xTimerReset\(\)](#) system call will reset the start time of the timer to zero.

Parameters

| | |
|----------------|------------------------|
| <i>timer</i> ↔ | The timer to be reset. |
| — | |

4.2.5.56 xTimerStart() `void xTimerStart (`
`xTimer timer_)`

The [xTimerStart\(\)](#) system call will place the timer in the running (active) state. Neither [xTimerStart\(\)](#) nor [xTimerStop\(\)](#) will reset the timer. Timers can only be reset with [xTimerReset\(\)](#).

See also

[xTimerStop\(\)](#)
[xTimerReset\(\)](#)

Parameters

| | |
|---------------------|--------------------------|
| <i>timer</i> ↔ — | The timer to be started. |
|---------------------|--------------------------|

4.2.5.57 xTimerStop() `void xTimerStop (`
 `xTimer timer_)`

See also

[xTimerStart\(\)](#)
[xTimerReset\(\)](#)

Parameters

| | |
|---------------------|--------------------------|
| <i>timer</i> ↔ — | The timer to be stopped. |
|---------------------|--------------------------|

Index

[_SystemAssert_](#)
 [HeliOS.h](#), [27](#)

[Addr_t](#)
 [HeliOS.h](#), [17](#)

[Base_t](#)
 [HeliOS.h](#), [17](#)

[config.h](#), [8](#)
 [CONFIG_MEMORY_REGION_BLOCK_SIZE](#), [9](#)
 [CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS](#),
 [10](#)
 [CONFIG_MESSAGE_VALUE_BYTES](#), [10](#)
 [CONFIG_NOTIFICATION_VALUE_BYTES](#), [11](#)
 [CONFIG_QUEUE_MINIMUM_LIMIT](#), [11](#)
 [CONFIG_TASK_NAME_BYTES](#), [11](#)
[CONFIG_MEMORY_REGION_BLOCK_SIZE](#)
 [config.h](#), [9](#)
[CONFIG_MEMORY_REGION_SIZE_IN_BLOCKS](#)
 [config.h](#), [10](#)
[CONFIG_MESSAGE_VALUE_BYTES](#)
 [config.h](#), [10](#)
[CONFIG_NOTIFICATION_VALUE_BYTES](#)
 [config.h](#), [11](#)
[CONFIG_QUEUE_MINIMUM_LIMIT](#)
 [config.h](#), [11](#)
[CONFIG_TASK_NAME_BYTES](#)
 [config.h](#), [11](#)

[DEREF_TASKPARAM](#)
 [HeliOS.h](#), [17](#)

[HeliOS.h](#), [12](#)
 [_SystemAssert_](#), [27](#)
 [Addr_t](#), [17](#)
 [Base_t](#), [17](#)
 [DEREF_TASKPARAM](#), [17](#)
 [MemoryRegionStats_t](#), [17](#)
 [Queue_t](#), [18](#)
 [QueueMessage_t](#), [18](#)
 [SchedulerState_t](#), [26](#)
 [SchedulerStateError](#), [27](#)
 [SchedulerStateRunning](#), [27](#)
 [SchedulerStateSuspended](#), [27](#)
 [Size_t](#), [18](#)
 [SystemInfo_t](#), [19](#)
 [Task_t](#), [19](#)
 [TaskInfo_t](#), [19](#)
 [TaskNotification_t](#), [20](#)
 [TaskParm_t](#), [20](#)
 [TaskRunTimeStats_t](#), [20](#)
 [TaskState_t](#), [27](#)
 [TaskStateError](#), [27](#)
 [TaskStateRunning](#), [27](#)
 [TaskStateSuspended](#), [27](#)
 [TaskStateWaiting](#), [27](#)
 [Ticks_t](#), [21](#)
 [Timer_t](#), [21](#)
 [Word_t](#), [21](#)
 [xAddr](#), [22](#)
 [xBase](#), [22](#)
 [xMemAlloc](#), [28](#)
 [xMemFree](#), [28](#)
 [xMemGetHeapStats](#), [29](#)
 [xMemGetKernelStats](#), [29](#)
 [xMemGetSize](#), [29](#)
 [xMemGetUsed](#), [30](#)
 [xMemoryRegionStats](#), [22](#)
 [xQueue](#), [22](#)
 [xQueueCreate](#), [30](#)
 [xQueueDelete](#), [31](#)
 [xQueueDropMessage](#), [31](#)
 [xQueueGetLength](#), [31](#)
 [xQueuesQueueEmpty](#), [32](#)
 [xQueuesQueueFull](#), [32](#)
 [xQueueLockQueue](#), [32](#)
 [xQueueMessage](#), [22](#)
 [xQueueMessagesWaiting](#), [33](#)
 [xQueuePeek](#), [33](#)
 [xQueueReceive](#), [34](#)
 [xQueueSend](#), [34](#)
 [xQueueUnLockQueue](#), [35](#)
 [xSchedulerState](#), [23](#)
 [xSize](#), [23](#)
 [xSystemGetSystemInfo](#), [35](#)
 [xSystemHalt](#), [35](#)
 [xSystemInfo](#), [23](#)
 [xSystemInit](#), [36](#)
 [xTask](#), [23](#)
 [xTaskChangePeriod](#), [36](#)
 [xTaskCreate](#), [36](#)
 [xTaskDelete](#), [37](#)
 [xTaskGetAllRunTimeStats](#), [37](#)
 [xTaskGetAllTaskInfo](#), [38](#)
 [xTaskGetHandleById](#), [38](#)
 [xTaskGetHandleByName](#), [39](#)
 [xTaskGetId](#), [39](#)
 [xTaskGetName](#), [39](#)
 [xTaskGetNumberOfTasks](#), [40](#)
 [xTaskGetPeriod](#), [40](#)
 [xTaskGetSchedulerState](#), [41](#)
 [xTaskGetTaskInfo](#), [41](#)
 [xTaskGetTaskRunTimeStats](#), [42](#)
 [xTaskGetTaskState](#), [42](#)
 [xTaskInfo](#), [24](#)
 [xTaskNotification](#), [24](#)
 [xTaskNotificationIsWaiting](#), [43](#)
 [xTaskNotifyGive](#), [43](#)
 [xTaskNotifyStateClear](#), [44](#)
 [xTaskNotifyTake](#), [44](#)

- xTaskParm, 24
- xTaskResetTimer, 44
- xTaskResume, 45
- xTaskResumeAll, 45
- xTaskRunTimeStats, 25
- xTaskStartScheduler, 45
- xTaskState, 25
- xTaskSuspend, 46
- xTaskSuspendAll, 46
- xTaskWait, 46
- xTicks, 25
- xTimer, 26
- xTimerChangePeriod, 47
- xTimerCreate, 47
- xTimerDelete, 48
- xTimerGetPeriod, 48
- xTimerHasTimerExpired, 48
- xTimerIsTimerActive, 49
- xTimerReset, 49
- xTimerStart, 49
- xTimerStop, 50
- xWord, 26
- id
 - TaskInfo_s, 6
 - TaskRunTimeStats_s, 8
- lastRunTime
 - TaskInfo_s, 6
 - TaskRunTimeStats_s, 8
- majorVersion
 - SystemInfo_s, 4
- MemoryRegionStats_s, 2
- MemoryRegionStats_t
 - HeliOS.h, 17
- messageBytes
 - QueueMessage_s, 3
- messageValue
 - QueueMessage_s, 4
- minorVersion
 - SystemInfo_s, 4
- name
 - TaskInfo_s, 6
- notificationBytes
 - TaskNotification_s, 7
- notificationValue
 - TaskNotification_s, 7
- numberOfTasks
 - SystemInfo_s, 5
- patchVersion
 - SystemInfo_s, 5
- productName
 - SystemInfo_s, 5
- Queue_t
 - HeliOS.h, 18
- QueueMessage_s, 3
 - messageBytes, 3
 - messageValue, 4
- QueueMessage_t
 - HeliOS.h, 18
- SchedulerState_t
 - HeliOS.h, 26
- SchedulerStateError
 - HeliOS.h, 27
- SchedulerStateRunning
 - HeliOS.h, 27
- SchedulerStateSuspended
 - HeliOS.h, 27
- Size_t
 - HeliOS.h, 18
- state
 - TaskInfo_s, 6
- SystemInfo_s, 4
 - majorVersion, 4
 - minorVersion, 4
 - numberOfTasks, 5
 - patchVersion, 5
 - productName, 5
- SystemInfo_t
 - HeliOS.h, 19
- Task_t
 - HeliOS.h, 19
- TaskInfo_s, 5
 - id, 6
 - lastRunTime, 6
 - name, 6
 - state, 6
 - totalRunTime, 6
- TaskInfo_t
 - HeliOS.h, 19
- TaskNotification_s, 6
 - notificationBytes, 7
 - notificationValue, 7
- TaskNotification_t
 - HeliOS.h, 20
- TaskParm_t
 - HeliOS.h, 20
- TaskRunTimeStats_s, 7
 - id, 8
 - lastRunTime, 8
 - totalRunTime, 8
- TaskRunTimeStats_t
 - HeliOS.h, 20
- TaskState_t
 - HeliOS.h, 27
- TaskStateError
 - HeliOS.h, 27
- TaskStateRunning
 - HeliOS.h, 27
- TaskStateSuspended
 - HeliOS.h, 27
- TaskStateWaiting
 - HeliOS.h, 27

Ticks_t
 HeliOS.h, 21

Timer_t
 HeliOS.h, 21

totalRunTime
 TaskInfo_s, 6
 TaskRunTimeStats_s, 8

Word_t
 HeliOS.h, 21

xAddr
 HeliOS.h, 22

xBase
 HeliOS.h, 22

xMemAlloc
 HeliOS.h, 28

xMemFree
 HeliOS.h, 28

xMemGetHeapStats
 HeliOS.h, 29

xMemGetKernelStats
 HeliOS.h, 29

xMemGetSize
 HeliOS.h, 29

xMemGetUsed
 HeliOS.h, 30

xMemoryRegionStats
 HeliOS.h, 22

xQueue
 HeliOS.h, 22

xQueueCreate
 HeliOS.h, 30

xQueueDelete
 HeliOS.h, 31

xQueueDropMessage
 HeliOS.h, 31

xQueueGetLength
 HeliOS.h, 31

xQueueIsQueueEmpty
 HeliOS.h, 32

xQueueIsQueueFull
 HeliOS.h, 32

xQueueLockQueue
 HeliOS.h, 32

xQueueMessage
 HeliOS.h, 22

xQueueMessagesWaiting
 HeliOS.h, 33

xQueuePeek
 HeliOS.h, 33

xQueueReceive
 HeliOS.h, 34

xQueueSend
 HeliOS.h, 34

xQueueUnLockQueue
 HeliOS.h, 35

xBusyState
 HeliOS.h, 23

xSize
 HeliOS.h, 23

xSystemGetSystemInfo
 HeliOS.h, 35

xSystemHalt
 HeliOS.h, 35

xSystemInfo
 HeliOS.h, 23

xSystemInit
 HeliOS.h, 36

xTask
 HeliOS.h, 23

xTaskChangePeriod
 HeliOS.h, 36

xTaskCreate
 HeliOS.h, 36

xTaskDelete
 HeliOS.h, 37

xTaskGetAllRunTimeStats
 HeliOS.h, 37

xTaskGetAllTaskInfo
 HeliOS.h, 38

xTaskGetHandleById
 HeliOS.h, 38

xTaskGetHandleByName
 HeliOS.h, 39

xTaskGetId
 HeliOS.h, 39

xTaskGetName
 HeliOS.h, 39

xTaskGetNumberOfTasks
 HeliOS.h, 40

xTaskGetPeriod
 HeliOS.h, 40

xTaskGetSchedulerState
 HeliOS.h, 41

xTaskGetTaskInfo
 HeliOS.h, 41

xTaskGetTaskRunTimeStats
 HeliOS.h, 42

xTaskGetTaskState
 HeliOS.h, 42

xTaskInfo
 HeliOS.h, 24

xTaskNotification
 HeliOS.h, 24

xTaskNotificationIsWaiting
 HeliOS.h, 43

xTaskNotifyGive
 HeliOS.h, 43

xTaskNotifyStateClear
 HeliOS.h, 44

xTaskNotifyTake
 HeliOS.h, 44

xTaskParm
 HeliOS.h, 24

xTaskResetTimer
 HeliOS.h, 44

- xTaskResume
 - HeliOS.h, [45](#)
- xTaskResumeAll
 - HeliOS.h, [45](#)
- xTaskRunTimeStats
 - HeliOS.h, [25](#)
- xTaskStartScheduler
 - HeliOS.h, [45](#)
- xTaskState
 - HeliOS.h, [25](#)
- xTaskSuspend
 - HeliOS.h, [46](#)
- xTaskSuspendAll
 - HeliOS.h, [46](#)
- xTaskWait
 - HeliOS.h, [46](#)
- xTicks
 - HeliOS.h, [25](#)
- xTimer
 - HeliOS.h, [26](#)
- xTimerChangePeriod
 - HeliOS.h, [47](#)
- xTimerCreate
 - HeliOS.h, [47](#)
- xTimerDelete
 - HeliOS.h, [48](#)
- xTimerGetPeriod
 - HeliOS.h, [48](#)
- xTimerHasTimerExpired
 - HeliOS.h, [48](#)
- xTimerIsTimerActive
 - HeliOS.h, [49](#)
- xTimerReset
 - HeliOS.h, [49](#)
- xTimerStart
 - HeliOS.h, [49](#)
- xTimerStop
 - HeliOS.h, [50](#)
- xWord
 - HeliOS.h, [26](#)