



Helios  
Kernel 0.3.5

Helios Developer's Guide

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# 1 Data Structure Index

## 1.1 Data Structures

Here are the data structures with brief descriptions:

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## 2 File Index

### 2.1 File List

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

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## 3 Data Structure Documentation

### 3.1 MemoryRegionStats\_s Struct Reference

Data structure for memory region statistics.

#### 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 by [xMemGetHeapStats\(\)](#) and [xMemGetKernelStats\(\)](#) to obtain statistics about either memory region. The MemoryRegionStats\_t type should be declared as [xMemoryRegionStats](#).

See also

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

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

### 3.1.2 Field Documentation

#### 3.1.2.1 availableSpaceInBytes [Word\\_t](#) MemoryRegionStats\_s::availableSpaceInBytes

The amount of free memory in bytes (i.e., numberOfFreeBlocks \* CONFIG\_MEMORY\_REGION\_BLOCK\_SIZE).

#### 3.1.2.2 largestFreeEntryInBytes [Word\\_t](#) MemoryRegionStats\_s::largestFreeEntryInBytes

The largest free entry in bytes.

#### 3.1.2.3 minimumEverFreeBytesRemaining [Word\\_t](#) MemoryRegionStats\_s::minimumEverFreeBytesRemaining

Lowest water lever since system initialization of free bytes of memory.

#### 3.1.2.4 numberOfFreeBlocks [Word\\_t](#) MemoryRegionStats\_s::numberOfFreeBlocks

The number of free blocks - see CONFIG\_MEMORY\_REGION\_BLOCK\_SIZE for block size in bytes.

#### 3.1.2.5 smallestFreeEntryInBytes [Word\\_t](#) MemoryRegionStats\_s::smallestFreeEntryInBytes

The smallest free entry in bytes.

### 3.1.2.6 **successfulAllocations** [Word\\_t](#) `MemoryRegionStats_s::successfulAllocations`

Number of successful memory allocations.

### 3.1.2.7 **successfulFrees** [Word\\_t](#) `MemoryRegionStats_s::successfulFrees`

Number of successful memory "frees".

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

- [HeliOS.h](#)

## 3.2 **QueueMessage\_s Struct Reference**

Data structure for a queue message.

### Data Fields

- [Base\\_t](#) `messageBytes`
- [Char\\_t](#) `messageValue` [[CONFIG\\_MESSAGE\\_VALUE\\_BYTES](#)]

### 3.2.1 Detailed Description

The `QueueMessage_t` stucture is used to store a queue message and is returned by [xQueueReceive\(\)](#) and [xQueuePeek\(\)](#). The `QueueMessage_t` stucture should be declared as `xQueueMessage`.

### See also

[xQueueMessage](#)  
[xQueueReceive\(\)](#)  
[xQueuePeek\(\)](#)  
[CONFIG\\_MESSAGE\\_VALUE\\_BYTES](#)  
[xMemFree\(\)](#)

### Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

The message value is *NOT* null terminated and thus Standard C Library string functions such as `strcmp()`, `strcpy()` and `strlen()`, which expect a null terminated char array, must not be used to manipulate the message value.

### 3.2.2 Field Documentation

#### 3.2.2.1 messageBytes [Base\\_t](#) QueueMessage\_s::messageBytes

The number of bytes contained in the message value which cannot exceed CONFIG\_MESSAGE\_VALUE\_BYTES.

#### 3.2.2.2 messageValue [Char\\_t](#) QueueMessage\_s::messageValue[CONFIG\_MESSAGE\_VALUE\_BYTES]

The ASCII queue message value - this is *NOT* a null terminated character array.

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

- [HeliOS.h](#)

### 3.3 SystemInfo\_s Struct Reference

Data structure for information about the HeliOS system.

#### Data Fields

- [Char\\_t](#) 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 is used to store information about the HeliOS system and is returned by [xSystemGetSystemInfo\(\)](#). The SystemInfo\_t structure should be declared as xSystemInfo.

#### See also

[xSystemInfo](#)  
[xSystemGetSystemInfo\(\)](#)  
[OS\\_PRODUCT\\_NAME\\_SIZE](#)  
[xMemFree\(\)](#)

#### Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

The product name is *NOT* null terminated and thus Standard C Library string functions such as strcmp(), strcpy() and strlen(), which expect a null terminated char array, must not be used to manipulate the product name.

#### 3.3.2 Field Documentation

### 3.3.2.1 majorVersion `Base_t SystemInfo_s::majorVersion`

The SemVer major version number of HeliOS.

### 3.3.2.2 minorVersion `Base_t SystemInfo_s::minorVersion`

The SemVer minor version number of HeliOS.

### 3.3.2.3 numberOfTasks `Base_t SystemInfo_s::numberOfTasks`

The number of tasks regardless of their state.

### 3.3.2.4 patchVersion `Base_t SystemInfo_s::patchVersion`

The SemVer patch version number of HeliOS.

### 3.3.2.5 productName `Char_t SystemInfo_s::productName[OS_PRODUCT_NAME_SIZE]`

The ASCII product name of the operating system (always "HeliOS").

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\\_t 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 ASCII name and state. The `TaskInfo_t` structure is returned by [xTaskGetTaskInfo\(\)](#) and [xTaskGetAllTaskInfo\(\)](#). If only runtime statistics are needed, then `TaskRuntimeStats_t` should be used because of its smaller memory footprint. The `TaskInfo_t` should be declared as `xTaskInfo`.

See also

[xTaskInfo](#)  
[xTaskGetTaskInfo\(\)](#)  
[xTaskGetAllTaskInfo\(\)](#)  
[CONFIG\\_TASK\\_NAME\\_BYTES](#)  
[xMemFree\(\)](#)

### Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

The task name is *NOT* null terminated and thus Standard C Library string functions such as `strcmp()`, `strcpy()` and `strlen()`, which expect a null terminated char array, must not be used to manipulate the task name.

### 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 duration in ticks of the task's last runtime.

#### 3.4.2.3 name `Char_t` TaskInfo\_s::name[CONFIG\_TASK\_NAME\_BYTES]

The ASCII name of the task which is used by `xTaskGetHandleByName()` to return the task handle - this is *NOT* a null terminated char array.

#### 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 duration in ticks of the task's total runtime.

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

- [HeliOS.h](#)

## 3.5 TaskNotification\_s Struct Reference

Data structure for a direct to task notification.

### Data Fields

- `Base_t` notificationBytes
- `Char_t` notificationValue [CONFIG\_NOTIFICATION\_VALUE\_BYTES]



### 3.5.1 Detailed Description

The `TaskNotification_t` data structure is used by [xTaskNotifyGive\(\)](#) and [xTaskNotifyTake\(\)](#) to send and receive direct to task notifications. Direct to task notifications are part of the event-driven multitasking model. A direct to task notification may be received by event-driven and co-operative tasks alike. However, the benefit of direct to task notifications may only be realized by tasks scheduled as event-driven. In order to wait for a direct to task notification, the task must be in a "waiting" state which is set by [xTaskWait\(\)](#). The `TaskNotification_t` type should be declared as `xTaskNotification`.

See also

[xTaskNotification](#)

#### Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

[xTaskNotifyGive\(\)](#)

[xTaskNotifyTake\(\)](#)

[xTaskWait\(\)](#)

#### Attention

The notification value is *NOT* null terminated and thus Standard C Library string functions such as `strcmp()`, `strcpy()` and `strlen()`, which expect a null terminated char array, must not be used to manipulate the notification value.

### 3.5.2 Field Documentation

#### 3.5.2.1 notificationBytes [Base\\_t](#) `TaskNotification_s::notificationBytes`

The length in bytes of the notification value which cannot exceed `CONFIG_NOTIFICATION_VALUE_BYTES`.

#### 3.5.2.2 notificationValue [Char\\_t](#) `TaskNotification_s::notificationValue[CONFIG_NOTIFICATION_VALUE_BYTES]`

The notification value whose length is specified by the notification bytes member.

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 data structure is used by [xTaskGetTaskRunTimeStats\(\)](#) and [xTaskGetAllRuntimeStats\(\)](#) to obtain runtime statistics about a task. The TaskRunTimeStats\_t type should be declared as xTaskRunTimeStats.

#### See also

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

#### Attention

The memory allocated for the data struture must be freed by calling [xMemFree\(\)](#).

#### See also

[xMemFree\(\)](#)

### 3.6.2 Field Documentation

#### 3.6.2.1 id [Base\\_t](#) TaskRunTimeStats\_s::id

The ID of the task referenced by the task handle.

#### 3.6.2.2 lastRunTime [Ticks\\_t](#) TaskRunTimeStats\_s::lastRunTime

The duration in ticks of the task's last runtime.

#### 3.6.2.3 totalRunTime [Ticks\\_t](#) TaskRunTimeStats\_s::totalRunTime

The duration in ticks of the task's total runtime.

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.*
- `#define CONFIG_STREAM_BUFFER_BYTES 0x20u /* 32 */`  
*Define the length of the stream buffer.*
- `#define CONFIG_TASK_WD_TIMER_ENABLE`  
*Enable task watchdog timers.*
- `#define CONFIG_DEVICE_NAME_BYTES 0x8u /* 8 */`  
*Define the length of a device driver name.*

#### 4.1.1 Detailed Description

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### 4.1.2 Macro Definition Documentation

#### 4.1.2.1 CONFIG\_DEVICE\_NAME\_BYTES `#define CONFIG_DEVICE_NAME_BYTES 0x8u /* 8 */`

Setting CONFIG\_DEVICE\_NAME\_BYTES will define the length of a device driver name. The name of device drivers should be exactly this length. There really isn't a reason to change this and doing so may break existing device drivers. The default length is 8 bytes.

#### 4.1.2.2 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](#)

#### 4.1.2.3 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.

#### 4.1.2.4 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](#)

**4.1.2.5 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](#)

#### 4.1.2.6 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 [xQueuIsQueueFull\(\)](#) 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

[xQueuIsQueueFull\(\)](#)  
[xQueueSend\(\)](#)  
[xQueueCreate\(\)](#)

#### 4.1.2.7 CONFIG\_STREAM\_BUFFER\_BYTES `#define CONFIG_STREAM_BUFFER_BYTES 0x20u /* 32 */`

Setting CONFIG\_STREAM\_BUFFER\_BYTES will define the length of stream buffers created by [xStreamCreate\(\)](#). When the length of the stream buffer reaches this value, it is considered full and can no longer be written to by calling [xStreamSend\(\)](#). The default value is 32. The literal must be appended with "u" to maintain MISRA C:2012 compliance.

#### 4.1.2.8 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](#)

#### 4.1.2.9 CONFIG\_TASK\_WD\_TIMER\_ENABLE `#define CONFIG_TASK_WD_TIMER_ENABLE`

Defining CONFIG\_TASK\_WD\_TIMER\_ENABLE will enable the task watchdog timer feature. The default is enabled.

## 4.2 HeliOS.h File Reference

Header file for end-user application code.

## Data Structures

- struct [TaskNotification\\_s](#)  
*Data structure for a direct to task notification.*
- struct [TaskRunTimeStats\\_s](#)  
*Data structure for task runtime statistics.*
- struct [MemoryRegionStats\\_s](#)  
*Data structure for memory region statistics.*
- struct [TaskInfo\\_s](#)  
*Data structure for information about a task.*
- struct [QueueMessage\\_s](#)  
*Data structure for a queue message.*
- struct [SystemInfo\\_s](#)  
*Data structure for information about the HeliOS system.*

## Typedefs

- typedef [TaskState\\_t](#) xTaskState  
*Enumerated data type for task states.*
- typedef [SchedulerState\\_t](#) xSchedulerState  
*Enumerated data type for the scheduler state.*
- typedef VOID\_TYPE [TaskParm\\_t](#)  
*Data type for the task paramater.*
- typedef [TaskParm\\_t](#) \* xTaskParm  
*Data type for the task paramater.*
- typedef UINT8\_TYPE [Base\\_t](#)  
*Data type for the base type.*
- typedef [Base\\_t](#) xBase  
*Data type for the base type.*
- typedef UINT8\_TYPE [Byte\\_t](#)  
*Data type for an 8-bit wide byte.*
- typedef [Byte\\_t](#) xByte  
*Data type for an 8-bit wide byte.*
- typedef VOID\_TYPE [Addr\\_t](#)  
*Data type for a pointer to an address.*
- typedef [Addr\\_t](#) \* xAddr  
*Data type for a pointer to an address.*
- typedef SIZE\_TYPE [Size\\_t](#)  
*Data type for the storage requirements of an object in memory.*
- typedef [Size\\_t](#) xSize  
*Data type for the storage requirements of an object in memory.*
- typedef UINT16\_TYPE [HalfWord\\_t](#)  
*Data type for a 16-bit half word.*
- typedef [HalfWord\\_t](#) xHalfWord  
*Data type for a 16-bit half word.*
- typedef UINT32\_TYPE [Word\\_t](#)  
*Data type for a 32-bit word.*
- typedef [Word\\_t](#) xWord  
*Data type for a 32-bit word.*
- typedef UINT32\_TYPE [Ticks\\_t](#)

- Data type for system ticks.*

  - typedef [Ticks\\_t](#) xTicks
- Data type for system ticks.*

  - typedef UCHAR\_TYPE [Char\\_t](#)
- Data type for a character.*

  - typedef [Char\\_t](#) xChar
- Data type for a character.*

  - typedef VOID\_TYPE [Device\\_t](#)
- Data type for a device handle.*

  - typedef [Device\\_t](#) \* xDevice
- Data type for a device handle.*

  - typedef VOID\_TYPE [Task\\_t](#)
- Data type for a task handle.*

  - typedef [Task\\_t](#) \* xTask
- Data type for a task handle.*

  - typedef VOID\_TYPE [StreamBuffer\\_t](#)
- Data type for a stream buffer handle.*

  - typedef [StreamBuffer\\_t](#) \* xStreamBuffer
- Data type for a stream buffer handle.*

  - typedef VOID\_TYPE [Queue\\_t](#)
- Data type for a queue handle.*

  - typedef [Queue\\_t](#) \* xQueue
- Data type for a queue handle.*

  - typedef VOID\_TYPE [Timer\\_t](#)
- Data type for a timer handle.*

  - typedef [Timer\\_t](#) \* xTimer
- Data type for a timer handle.*

  - typedef struct [TaskNotification\\_s](#) TaskNotification\_t
- Data structure for a direct to task notification.*

  - typedef [TaskNotification\\_t](#) \* xTaskNotification
- Data structure for a direct to task notification.*

  - typedef struct [TaskRunTimeStats\\_s](#) TaskRunTimeStats\_t
- Data structure for task runtime statistics.*

  - typedef [TaskRunTimeStats\\_t](#) \* xTaskRunTimeStats
- Data structure for task runtime statistics.*

  - typedef struct [MemoryRegionStats\\_s](#) MemoryRegionStats\_t
- Data structure for memory region statistics.*

  - typedef [MemoryRegionStats\\_t](#) \* xMemoryRegionStats
- Data structure for memory region statistics.*

  - typedef struct [TaskInfo\\_s](#) TaskInfo\_t
- Data structure for information about a task.*

  - typedef [TaskInfo\\_t](#) \* xTaskInfo
- Data structure for information about a task.*

  - typedef struct [QueueMessage\\_s](#) QueueMessage\_t
- Data structure for a queue message.*

  - typedef [QueueMessage\\_t](#) \* xQueueMessage
- Data structure for a queue message.*

  - typedef struct [SystemInfo\\_s](#) SystemInfo\_t
- Data structure for information about the HeliOS system.*

  - typedef [SystemInfo\\_t](#) \* xSystemInfo
- Data structure for information about the HeliOS system.*



## Enumerations

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

## Functions

- `xBase xDeviceRegisterDevice` (`xBase(*device_self_register_)( )`)  
*System call to register a device driver.*
- `xBase xDevicesAvailable` (`const xHalfWord uid_`)  
*System call to check if a device is available.*
- `xBase xDeviceSimpleWrite` (`const xHalfWord uid_`, `xWord *data_`)  
*System call to write fixed length data to a device.*
- `xBase xDeviceWrite` (`const xHalfWord uid_`, `xSize *size_`, `xAddr data_`)  
*System call to write variable length data to a device.*
- `xBase xDeviceSimpleRead` (`const xHalfWord uid_`, `xWord *data_`)  
*System call to read fixed length data from a device.*
- `xBase xDeviceRead` (`const xHalfWord uid_`, `xSize *size_`, `xAddr data_`)  
*System call to read variable length data from a device.*
- `xBase xDeviceInitDevice` (`const xHalfWord uid_`)  
*System call to initialize a device driver and its device.*
- `xBase xDeviceConfigDevice` (`const xHalfWord uid_`, `xSize *size_`, `xAddr config_`)  
*System call to configure a device driver and its device.*
- `xAddr xMemAlloc` (`const xSize size_`)  
*System call to allocate memory from the heap.*
- `void xMemFree` (`const volatile 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 volatile 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` (`const xBase limit_`)  
*System call to create a new message queue.*
- `void xQueueDelete` (`xQueue queue_`)  
*System call to delete a message queue.*
- `xBase xQueueGetLength` (`const xQueue queue_`)  
*System call to get the length of the message queue.*
- `xBase xQueueIsQueueEmpty` (`const xQueue queue_`)  
*System call to check if the message queue is empty.*
- `xBase xQueueIsQueueFull` (`const xQueue queue_`)  
*System call to check if the message queue is full.*
- `xBase xQueueMessagesWaiting` (`const xQueue queue_`)  
*System call to check if there are message queue messages waiting.*
- `xBase xQueueSend` (`xQueue queue_`, `const xBase messageBytes_`, `const xChar *messageValue_`)

- System call to send a message using a message queue.*

  - `xQueueMessage xQueuePeek` (const `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.*

  - `xStreamBuffer xStreamCreate` (void)
- The `xStreamCreate()` system call will create a new stream buffer.*

  - void `xStreamDelete` (const `xStreamBuffer` stream\_)
- The `xStreamDelete()` system call will delete a stream buffer.*

  - `xBase xStreamSend` (`xStreamBuffer` stream\_, const `xByte` byte\_)
- The `xStreamSend()` system call will write one byte to the stream buffer.*

  - `xByte * xStreamReceive` (const `xStreamBuffer` stream\_, `xHalfWord *bytes_`)
- The `xStreamReceive()` system call will return the contents of the stream buffer.*

  - `xHalfWord xStreamBytesAvailable` (const `xStreamBuffer` stream\_)
- The `xStreamBytesAvailable()` system call returns the length of the stream buffer.*

  - void `xStreamReset` (const `xStreamBuffer` stream\_)
- The `xStreamReset()` system call will reset a stream buffer.*

  - `xBase xStreamIsEmpty` (const `xStreamBuffer` stream\_)
- The `xStreamIsEmpty()` system call returns true if the stream buffer is empty.*

  - `xBase xStreamIsFull` (const `xStreamBuffer` stream\_)
- The `xStreamIsFull()` system call returns true if the stream buffer is full.*

  - void `xSystemInit` (void)
- System call to initialize the system.*

  - void `xSystemHalt` (void)
- The `xSystemHalt()` system call will halt HeliOS.*

  - `xSystemInfo xSystemGetSystemInfo` (void)
- The `xSystemGetSystemInfo()` system call will return information about the running system.*

  - `xTask xTaskCreate` (const `xChar *name_`, void(\*callback\_)(`xTask` task\_, `xTaskParm` parm\_), `xTaskParm` taskParameter\_)
- System call to create a new task.*

  - void `xTaskDelete` (const `xTask` task\_)
- System call to delete a task.*

  - `xTask xTaskGetHandleByName` (const `xChar *name_`)
- System call to get a task's handle by its ASCII name.*

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

  - `xChar * xTaskGetName (const xTask task_)`
- System call to return the ASCII name of a task.*

  - `xBase xTaskGetId (const 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 (const xTask task_)`
- System call to check if a direct to task notification is waiting.*

  - `xBase xTaskNotifyGive (xTask task_, const xBase notificationBytes_, const xChar *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_, const xTicks timerPeriod_)`
- System call to set the task timer period.*

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

  - `void xTaskResetTimer (xTask task_)`
- System call to reset the task timer.*

  - `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.*

  - `xSchedulerState xTaskGetSchedulerState (void)`
- System call to get the state of the scheduler.*

  - `void xTaskChangeWDPPeriod (xTask task_, const xTicks wdTimerPeriod_)`
- The `xTaskChangeWDPPeriod()` will change the period on the task watchdog timer.*

  - `xTicks xTaskGetWDPPeriod (const xTask task_)`
- The `xTaskGetWDPPeriod()` return the current task watchdog timer.*

  - `xTimer xTimerCreate (const xTicks timerPeriod_)`
- System call to create a new timer.*

  - `void xTimerDelete (const xTimer timer_)`
- System call will delete a timer.*

  - `void xTimerChangePeriod (xTimer timer_, const xTicks timerPeriod_)`
- System call to change the period of a timer.*

  - `xTicks xTimerGetPeriod (const xTimer timer_)`
- System call to get the period of a timer.*

  - `xBase xTimerIsTimerActive (const xTimer timer_)`
- System call to check if a timer is active.*

  - `xBase xTimerHasTimerExpired (const 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\_)  
*System call to stop a timer.*
- void `__SystemAssert__` (const char \*file\_, int line\_)

### 4.2.1 Detailed Description

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### 4.2.2 Typedef Documentation

#### 4.2.2.1 `Addr_t` `typedef VOID_TYPE Addr_t`

The `Addr_t` type is a pointer of type void and is used to pass addresses between the end-user application and system calls. It is not necessary to use the `Addr_t` type within the end-user application as long as the type is not used to interact with the kernel through system calls. `Addr_t` should be declared as `xAddr`.

#### See also

[xAddr](#)

#### 4.2.2.2 **Base\_t** `typedef UINT8_TYPE Base_t`

The `Base_t` type is a simple data type often used as an argument or return type for system calls when the value is known not to exceed its 8-bit width and no data structure requirements exist. There are no guarantees the `Base_t` will always be 8-bits wide. If an 8-bit data type is needed that is guaranteed to remain 8-bits wide, the `Byte_t` data type should be used. `Base_t` should be declared as `xBase`.

See also

[xBase](#)

[Byte\\_t](#)

#### 4.2.2.3 **Byte\_t** `typedef UINT8_TYPE Byte_t`

The `Byte_t` type is an 8-bit wide data type and is guaranteed to always be 8-bits wide. `Byte_t` should be declared as `xByte`.

See also

[xByte](#)

#### 4.2.2.4 **Char\_t** `typedef UCHAR_TYPE Char_t`

The `Char_t` data type is used to store an 8-bit char and is typically used for char arrays for ASCII names (e.g., task name). `Char_t` should be declared as `xChar`.

See also

[xChar](#)

#### 4.2.2.5 **Device\_t** `typedef VOID_TYPE Device_t`

The `Device_t` data type is used as a device handle. The device handle is created when [xDeviceRegisterDevice\(\)](#) is called. For more information about devices and device drivers, see [xDeviceRegisterDevice\(\)](#) for more information. `Device_t` should be declared as `xDevice`.

See also

[xDevice](#)

[xDeviceRegisterDevice\(\)](#)

#### 4.2.2.6 HalfWord\_t `typedef UINT16_TYPE HalfWord_t`

The HalfWord\_t type is a 16-bit wide data type and is guaranteed to always be 16-bits wide. HalfWord\_t should be declared as xHalfWord.

See also

[xHalfWord](#)

#### 4.2.2.7 MemoryRegionStats\_t `typedef struct MemoryRegionStats_s MemoryRegionStats_t`

The MemoryRegionStats\_t data structure is used by [xMemGetHeapStats\(\)](#) and [xMemGetKernelStats\(\)](#) to obtain statistics about either memory region. The MemoryRegionStats\_t type should be declared as xMemoryRegionStats.

See also

[xMemoryRegionStats](#)

[xMemGetHeapStats\(\)](#)

[xMemGetKernelStats\(\)](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

#### 4.2.2.8 Queue\_t `typedef VOID_TYPE Queue_t`

The Queue\_t data type is used as a queue handle. The queue handle is created when [xQueueCreate\(\)](#) is called. For more information about queues, see [xQueueCreate\(\)](#). Queue\_t should be declared as xQueue.

See also

[xQueue](#)

[xQueueCreate\(\)](#)

Attention

The memory referenced by the queue handle must be freed by calling [xQueueDelete\(\)](#).

See also

[xQueueDelete\(\)](#)

#### 4.2.2.9 QueueMessage\_t `typedef struct QueueMessage_s QueueMessage_t`

The QueueMessage\_t stucture is used to store a queue message and is returned by [xQueueReceive\(\)](#) and [xQueuePeek\(\)](#). The QueueMessage\_t stucture should be declared as xQueueMessage.

See also

[xQueueMessage](#)  
[xQueueReceive\(\)](#)  
[xQueuePeek\(\)](#)  
[CONFIG\\_MESSAGE\\_VALUE\\_BYTES](#)  
[xMemFree\(\)](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

The message value is *NOT* null terminated and thus Standard C Library string functions such as `strcmp()`, `strcpy()` and `strlen()`, which expect a null terminated char array, must not be used to manipulate the message value.

#### 4.2.2.10 Size\_t `typedef SIZE_TYPE Size_t`

The Size\_t type is used for the storage requirements of an object in memory and is always represented in bytes. Size\_t should be declared as xSize.

See also

[xSize](#)

#### 4.2.2.11 StreamBuffer\_t `typedef VOID_TYPE StreamBuffer_t`

The StreamBuffer\_t data type is used as a stream buffer handle. The stream buffer handle is created when [xStreamCreate\(\)](#) is called. For more information about stream buffers, see [xStreamCreate\(\)](#). Stream\_t should be declared as xStream.

See also

[xStream](#)  
[xStreamCreate\(\)](#)

Attention

The memory referenced by the stream buffer handle must be freed by calling [xStreamDelete\(\)](#).

See also

[xStreamDelete\(\)](#)

**4.2.2.12 SystemInfo\_t** typedef struct [SystemInfo\\_s](#) [SystemInfo\\_t](#)

The [SystemInfo\\_t](#) data structure is used to store information about the HeliOS system and is returned by [xSystemGetSystemInfo\(\)](#). The [SystemInfo\\_t](#) structure should be declared as [xSystemInfo](#).

See also

[xSystemInfo](#)  
[xSystemGetSystemInfo\(\)](#)  
[OS\\_PRODUCT\\_NAME\\_SIZE](#)  
[xMemFree\(\)](#)

**Attention**

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

The product name is *NOT* null terminated and thus Standard C Library string functions such as [strcmp\(\)](#), [strcpy\(\)](#) and [strlen\(\)](#), which expect a null terminated char array, must not be used to manipulate the product name.

**4.2.2.13 Task\_t** typedef VOID\_TYPE [Task\\_t](#)

The [Task\\_t](#) data type is used as a task handle. The task handle is created when [xTaskCreate\(\)](#) is called. For more information about tasks, see [xTaskCreate\(\)](#). [Task\\_t](#) should be declared as [xTask](#).

See also

[xTask](#)  
[xTaskCreate\(\)](#)

**Attention**

The memory referenced by the task handle must be freed by calling [xTaskDelete\(\)](#).

See also

[xTaskDelete\(\)](#)



#### 4.2.2.14 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 ASCII name and state. The TaskInfo\_t structure is returned by xTaskGetTaskInfo() and xTaskGetAllTaskInfo(). If only runtime statistics are needed, then TaskRuntimeStats\_t should be used because of its smaller memory footprint. The TaskInfo\_t should be declared as xTaskInfo

See also

[xTaskInfo](#)  
[xTaskGetTaskInfo\(\)](#)  
[xTaskGetAllTaskInfo\(\)](#)  
[CONFIG\\_TASK\\_NAME\\_BYTES](#)  
[xMemFree\(\)](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

The task name is *NOT* null terminated and thus Standard C Library string functions such as strcmp(), strcpy() and strlen(), which expect a null terminated char array, must not be used to manipulate the task name.

#### 4.2.2.15 TaskNotification\_t `typedef struct TaskNotification_s TaskNotification_t`

The TaskNotification\_t data structure is used by xTaskNotifyGive() and xTaskNotifyTake() to send and receive direct to task notifications. Direct to task notifications are part of the event-driven multitasking model. A direct to task notification may be received by event-driven and co-operative tasks alike. However, the benefit of direct to task notifications may only be realized by tasks scheduled as event-driven. In order to wait for a direct to task notification, the task must be in a "waiting" state which is set by xTaskWait(). The TaskNotification\_t type should be declared as xTaskNotification.

See also

[xTaskNotification](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)  
[xTaskNotifyGive\(\)](#)  
[xTaskNotifyTake\(\)](#)  
[xTaskWait\(\)](#)

Attention

The notification value is *NOT* null terminated and thus Standard C Library string functions such as strcmp(), strcpy() and strlen(), which expect a null terminated char array, must not be used to manipulate the notification value.

#### 4.2.2.16 TaskParm\_t `typedef VOID_TYPE TaskParm_t`

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

See also

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

#### 4.2.2.17 TaskRunTimeStats\_t `typedef struct TaskRunTimeStats_s TaskRunTimeStats_t`

The TaskRunTimeStats\_t data structure is used by [xTaskGetTaskRunTimeStats\(\)](#) and [xTaskGetAllRuntimeStats\(\)](#) to obtain runtime statistics about a task. The TaskRunTimeStats\_t type should be declared as xTaskRunTimeStats.

See also

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

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

#### 4.2.2.18 Ticks\_t `typedef UINT32_TYPE Ticks_t`

The Ticks\_t type is used to store ticks from the system clock. Ticks is not bound to any one unit of measure for time though most systems are configured for millisecond resolution, milliseconds is not guaranteed and is dependent on the system clock frequency and prescaler. Ticks\_t should be declared as xTicks.

See also

[xTicks](#)

**4.2.2.19 Timer\_t** `typedef VOID_TYPE Timer_t`

The `Timer_t` data type is used as a timer handle. The timer handle is created when `xTimerCreate()` is called. For more information about timers, see `xTimerCreate()`. `Timer_t` should be declared as `xTimer`.

See also

`xTimer`

`xTimerCreate()`

Attention

The memory referenced by the timer handle must be freed by calling `xTimerDelete()`.

See also

`xTimerDelete()`

**4.2.2.20 Word\_t** `typedef UINT32_TYPE Word_t`

The `Word_t` type is a 32-bit wide data type and is guaranteed to always be 32-bits wide. `Word_t` should be declared as `xWord`.

See also

`xWord`

**4.2.2.21 xAddr** `typedef Addr_t* xAddr`

See also

`Addr_t`

**4.2.2.22 xBase** `typedef Base_t xBase`

See also

`Base_t`

**4.2.2.23 xByte** typedef [Byte\\_t](#) xByte

See also

[Byte\\_t](#)

**4.2.2.24 xChar** typedef [Char\\_t](#) xChar

See also

[Data\\_t](#)

**4.2.2.25 xDevice** typedef [Device\\_t\\*](#) xDevice

See also

[Device\\_t](#)

**4.2.2.26 xHalfWord** typedef [HalfWord\\_t](#) xHalfWord

See also

[HalfWord\\_t](#)

**4.2.2.27 xMemoryRegionStats** typedef [MemoryRegionStats\\_t\\*](#) xMemoryRegionStats

See also

[MemoryRegionStats\\_t](#)

Attention

The memory allocated for the data struture must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

**4.2.2.28 xQueue** typedef [Queue\\_t\\*](#) [xQueue](#)

See also

[Queue\\_t](#)

Attention

The memory referenced by the queue handle must be freed by calling [xQueueDelete\(\)](#).

See also

[xQueueDelete\(\)](#)

**4.2.2.29 xQueueMessage** typedef [QueueMessage\\_t\\*](#) [xQueueMessage](#)

See also

[QueueMessage\\_t](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

**4.2.2.30 xSchedulerState** typedef [SchedulerState\\_t](#) [xSchedulerState](#)

See also

[SchedulerState\\_t](#)

**4.2.2.31 xSize** typedef [Size\\_t](#) [xSize](#)

See also

[Size\\_t](#)

**4.2.2.32 xStreamBuffer** `typedef StreamBuffer_t* xStreamBuffer`

See also

[StreamBuffer\\_t](#)

Attention

The memory referenced by the stream buffer handle must be freed by calling [xStreamDelete\(\)](#).

See also

[xStreamDelete\(\)](#)

**4.2.2.33 xSystemInfo** `typedef SystemInfo_t* xSystemInfo`

See also

[SystemInfo\\_t](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

**4.2.2.34 xTask** `typedef Task_t* xTask`

See also

[Task\\_t](#)

Attention

The memory referenced by the task handle must be freed by calling [xTaskDelete\(\)](#).

See also

[xTaskDelete\(\)](#)

**4.2.2.35 xTaskInfo** `typedef TaskInfo_t* xTaskInfo`

See also

[TaskInfo\\_t](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

**4.2.2.36 xTaskNotification** `typedef TaskNotification_t* xTaskNotification`

See also

[TaskNotification\\_t](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

**4.2.2.37 xTaskParm** `typedef TaskParm_t* xTaskParm`

See also

[TaskParm\\_t](#)

**4.2.2.38 xTaskRunTimeStats** `typedef TaskRunTimeStats_t* xTaskRunTimeStats`

See also

[TaskRunTimeStats\\_t](#)

Attention

The memory allocated for the data structure must be freed by calling [xMemFree\(\)](#).

See also

[xMemFree\(\)](#)

**4.2.2.39 xTaskState** typedef [TaskState\\_t](#) xTaskState

See also

[TaskState\\_t](#)

**4.2.2.40 xTicks** typedef [Ticks\\_t](#) xTicks

See also

[Ticks\\_t](#)

**4.2.2.41 xTimer** typedef [Timer\\_t\\*](#) xTimer

See also

[Timer\\_t](#)

Attention

The memory referenced by the timer handle must be freed by calling [xTimerDelete\(\)](#).

See also

[xTimerDelete\(\)](#)

**4.2.2.42 xWord** typedef [Word\\_t](#) xWord

See also

[Word\\_t](#)

## 4.2.3 Enumeration Type Documentation

**4.2.3.1 SchedulerState\_t** enum [SchedulerState\\_t](#)

The scheduler can be in one of three possible states as defined by the [SchedulerState\\_t](#) enumerated data type. The state the scheduler is in is changed by calling [xTaskSuspendAll\(\)](#) and [xTaskResumeAll\(\)](#). The state the scheduler is in can be obtained by calling [xTaskGetSchedulerState\(\)](#). [SchedulerState\\_t](#) should be declared (i.e., used) as [xSchedulerState](#).

See also

[xSchedulerState](#)

[xTaskSuspendAll\(\)](#)

[xTaskResumeAll\(\)](#)

[xTaskGetSchedulerState\(\)](#)

[xTaskStartScheduler\(\)](#)



### Enumerator

SchedulerStateError	Not used - reserved for future use.
SchedulerStateSuspended	State the scheduler is in after calling <a href="#">xTaskSuspendAll()</a> - <a href="#">xTaskStartScheduler()</a> will stop scheduling tasks for execution and relinquish control when <a href="#">xTaskSuspendAll()</a> is called.
SchedulerStateRunning	State the scheduler is in after calling <a href="#">xTaskResumeAll()</a> - <a href="#">xTaskStartScheduler()</a> will continue to schedule tasks for execution until <a href="#">xTaskSuspendAll()</a> is called.

#### 4.2.3.2 TaskState\_t `enum TaskState_t`

A task can be in one of four possible states as defined by the `TaskState_t` enumerated data type. The state a task is in is changed by calling [xTaskResume\(\)](#), [xTaskSuspend\(\)](#) or [xTaskWait\(\)](#). The HeliOS scheduler will only schedule, for execution, tasks in either the `TaskStateRunning` or `TaskStateWaiting` state. `TaskState_t` should be declared (i.e., used) as `xTaskState`.

### See also

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

### Enumerator

TaskStateError	Returned by <a href="#">xTaskGetTaskState()</a> when the task cannot be found.
TaskStateSuspended	State a task is in when it is first created OR after calling <a href="#">xTaskSuspend()</a> - tasks in the <code>TaskStateSuspended</code> state will not be scheduled for execution.
TaskStateRunning	State a task is in after calling <a href="#">xTaskResume()</a> - tasks in the <code>TaskStateRunning</code> state will be scheduled co-operatively.
TaskStateWaiting	State a task is in after calling <a href="#">xTaskWait()</a> - tasks in the <code>TaskStateWaiting</code> state will be scheduled as event driven.

## 4.2.4 Function Documentation

#### 4.2.4.1 [xDeviceConfigDevice\(\)](#) `xBase xDeviceConfigDevice (` `const xHalfWord uid_,` `xSize * size_,` `xAddr config_ )`

The [xDeviceConfigDevice\(\)](#) system call will configure the device driver and its device. Like most aspects of the HeliOS device driver model, the implementation of this feature is dependent on the author of the device driver. Some device drivers may not implement this feature of the device driver model at all. A device driver template and pre-packaged drivers can be found in `/drivers`.

## Parameters

<i>uid_</i>	The unique identifier of the device driver.
<i>size_</i> ↔ —	The number of bytes (i.e., size) of the device configuration data structure.
<i>config_</i> ↔ —	A pointer to the <i>size_</i> bytes of memory occupied by the configuration data structure - the memory <i>MUST</i> be located in the heap memory region.

## Returns

xBase If configuration of the device driver was successful, RETURN\_SUCCESS is returned. Otherwise RETURN\_FAILURE is returned.

#### 4.2.4.2 xDeviceInitDevice() `xBase xDeviceInitDevice ( const xHalfWord uid_ )`

The `xDeviceInitDevice()` system call will initialize the device driver and its device. Like most aspects of the HeliOS device driver model, the implementation of this feature is dependent on the author of the device driver. Some device drivers may not implement this feature of the device driver model at all. A device driver template and pre-packaged drivers can be found in /drivers.

## Parameters

<i>uid_</i> ↔ —	The unique identifier of the device driver.
--------------------	---------------------------------------------

## Returns

xBase If the initialization of the device driver was successful, RETURN\_SUCCESS is returned. Otherwise RETURN\_FAILURE is returned.

#### 4.2.4.3 xDevicesAvailable() `xBase xDeviceIsAvailable ( const xHalfWord uid_ )`

The `xDevicesAvailable()` system call checks to see if a device driver is "available", generally for a read, write or read/write operation. What "available" means is up to the device driver author and may change based on what mode the device driver is in. For example, if the device driver is in read-only mode, then `xDevicesAvailable()` may return "true" if data is ready to be read from the device. A device driver template and pre-packaged device drivers can be found in /drivers.

## Parameters

<i>uid_</i> ↔ —	The unique identifier of the device driver.
--------------------	---------------------------------------------

**Returns**

**xBase** If the device driver is "available", then "true" is returned. Otherwise "false" is returned.

**4.2.4.4 xDeviceRead()** **xBase** xDeviceRead (

```

    const xHalfWord uid_,
    xSize * size_,
    xAddr data_ )

```

The **xDeviceRead()** system call will read variable length data from a device driver. Whether the data is read is dependent on the device driver mode, state and implementation of these features by the device driver author. A device driver template and pre-packaged drivers can be found in /drivers.

**Parameters**

<i>uid</i> ↔ —	The unique identifier of the device driver.
<i>size</i> ↔ —	The number of bytes read from the device.
<i>data</i> ↔ —	A pointer to the data buffer to read the data into from the device - because <b>xDeviceRead()</b> uses variable length data, the pointer must reference <i>size_</i> bytes of memory and the memory <i>MUST</i> be located in the heap memory region.

**Returns**

**xBase** If the read operation was successful, RETURN\_SUCCESS is returned. Otherwise RETURN\_FAILURE is returned.

**4.2.4.5 xDeviceRegisterDevice()** **xBase** xDeviceRegisterDevice (

```

    xBase(*)() device_self_register_ )

```

The **xDeviceRegisterDevice()** system call, as part of the HeliOS device driver model, registers a device driver with the HeliOS kernel. This system call must be made before a device driver can be called by **xDeviceRead()**, **xDeviceWrite()**, etc. If the device driver is successfully registered with the kernel, **xDeviceRegisterDevice()** will return RETURN\_SUCCESS. Once a device is registered it cannot be un-registered - it can only be placed in a suspended state which is done by calling **xDeviceConfigDevice()**. However, as with most aspects of the device driver model in HeliOS, it is important to note that the implementation of the device state and mode is up to the device driver author. A quick word about device driver unique identifiers (uid). A device driver uid *MUST* be a globally unique identifier. No two device drivers in the same application can share the same uid. This is best achieved by ensuring the device driver author selects a uid for his device driver that is not in use by another device driver. A device driver template and pre-packaged device drivers can be found in /drivers.

**Parameters**

<i>device_self_register_</i> ↔	A pointer to the self registration function for the device driver.
--------------------------------	--------------------------------------------------------------------

## Returns

xBase If the device driver is successfully registered with the kernel, [xDeviceRegisterDevice\(\)](#) returns RETURN\_SUCCESS. Otherwise RETURN\_FAILURE is returned..

**4.2.4.6 xDeviceSimpleRead()** [xBase](#) xDeviceSimpleRead (

```
const xHalfWord uid_,
xWord * data_ )
```

The [xDeviceSimpleRead\(\)](#) system call will read fixed length (one word) data from a device driver. Whether the data is read is dependent on the device driver mode, state and implementation of these features by the device driver author. A device driver template and pre-packaged device drivers can be found in /drivers.

## Parameters

<a href="#">uid</a> ↔ —	The unique identifier of the device driver.
<a href="#">data</a> ↔ —	A pointer to the data buffer to read the data into from the device - because <a href="#">xDeviceSimpleRead()</a> uses fixed length data, the pointer must reference a word of memory and the memory <i>MUST</i> be located in the heap memory region.

## Returns

xBase If the read operation was successful, RETURN\_SUCCESS is returned. Otherwise RETURN\_FAILURE is returned.

**4.2.4.7 xDeviceSimpleWrite()** [xBase](#) xDeviceSimpleWrite (

```
const xHalfWord uid_,
xWord * data_ )
```

The [xDeviceSimpleWrite\(\)](#) system call will write fixed length (one word) data to a device driver. Whether the data is written is dependent on the device driver mode, state and implementation of these features by the device driver author. A device driver template and pre-packaged device drives can be found in /drivers.

## Parameters

<a href="#">uid</a> ↔ —	The unique identifier of the device driver
<a href="#">data</a> ↔ —	A pointer to the data to be written to the device - because <a href="#">xDeviceSimpleWrite()</a> uses fixed length data, the pointer must reference a word of memory and the memory <i>MUST</i> be located in the heap memory region.

## Returns

xBase If the write operation was successful, RETURN\_SUCCESS is returned. Otherwise RETURN\_FAILURE is returned.

**4.2.4.8 xDeviceWrite()** `xBase xDeviceWrite (`  
`const xHalfWord uid_,`  
`xSize * size_,`  
`xAddr data_ )`

The `xDeviceWrite()` system call will write variable length data to a device driver. Whether the data is written is dependent on the device driver mode, state and implementation of these features by the device driver author. A device driver template and pre-packaged drivers can be found in /drivers.

#### Parameters

<code>uid↔</code> —	The unique identifier of the device driver.
<code>size↔</code> —	The length (i.e., size) of the data to be written to the device.
<code>data↔</code> —	A pointer to the data to be written to the device - because <code>xDeviceWrite</code> uses variable length data, the pointer must reference <code>size_</code> bytes of memory and the memory <i>MUST</i> be located in the heap memory region.

#### Returns

`xBase` If the write operation was successful, `RETURN_SUCCESS` is returned. Otherwise `RETURN_FAILURE` is returned.

**4.2.4.9 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

<code>size↔</code> —	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.

**4.2.4.10 xMemFree()** `void xMemFree (`  
`const volatile 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 (e.g., `xTaskDelete()`).

**4.2.4.11 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()`.

**4.2.4.12 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()`.

**4.2.4.13 xMemGetSize()** `xSize xMemGetSize ( const volatile 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

`xSize` 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.

**4.2.4.14 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**

`xSize` 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()`).

**4.2.4.15 xQueueCreate()** `xQueue xQueueCreate (`  
     `const 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 <code>xQueueSend()</code> will fail. The minimum limit for queues is dependent on the setting <code>CONFIG_QUEUE_MINIMUM_LIMIT</code> .
—	

**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()`.

**4.2.4.16 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.
---------------------	--------------------------

**4.2.4.17 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.
---------------------	------------------------------------------

**4.2.4.18 xQueueGetLength()** `xBase xQueueGetLength (`  
                                  `const xQueue queue_ )`

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

**Parameters**

<i>queue</i> ↔ —	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.

**4.2.4.19 xQueueIsQueueEmpty()** `xBase xQueueIsQueueEmpty (`  
                                  `const 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**

<i>queue</i> ↔ —	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.

**4.2.4.20 xQueueIsQueueFull()** [xBase](#) xQueueIsQueueFull (   
 const [xQueue](#) queue\_ )

The xQueueIsFull() 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

<i>queue</i> ↔ —	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.

**4.2.4.21 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.
---------------------	--------------------

**4.2.4.22 xQueueMessagesWaiting()** [xBase](#) xQueueMessagesWaiting (   
 const [xQueue](#) queue\_ )

The xQueueMessageWaiting() 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.

**4.2.4.23 xQueuePeek()** [xQueueMessage](#) xQueuePeek (   
const [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\(\)](#).

**4.2.4.24 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**

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

**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()`.

**4.2.4.25 xQueueSend()** `xBase xQueueSend (`  
`xQueue queue_,`  
`const xBase messageBytes_,`  
`const xChar * 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 <code>CONFIG_MESSAGE_VALUE_BYTES</code> .
<i>message↔ Value_</i>	The message value. If the message value is greater than defined in <code>CONFIG_MESSAGE_VALUE_BYTES</code> , only the number of bytes defined in <code>CONFIG_MESSAGE_VALUE_BYTES</code> 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.

**4.2.4.26 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.
—	

**4.2.4.27 xStreamBytesAvailable()** `xHalfWord xStreamBytesAvailable (`  
`const xStreamBuffer stream_ )`

The `xStreamBytesAvailable()` system call will return the length of the stream buffer in bytes (i.e., bytes available to be received by `xStreamReceive()`).

**Parameters**

<i>stream</i> ↔	The stream to operate on.
—	

**Returns**

`xHalfWord` The length of the stream buffer in bytes.

**4.2.4.28 xStreamCreate()** `xStreamBuffer xStreamCreate (`  
`void )`

The `xStreamCreate()` system call will create a new stream buffer. The memory for a stream buffer is allocated from kernel memory and therefor cannot be freed by calling `xMemFree()`.

**Returns**

`xStreamBuffer` The newly created stream buffer.

**Warning**

The stream buffer created by `xStreamCreate()` must be freed by calling `xStreamDelete()`.

**4.2.4.29 xStreamDelete()** `void xStreamDelete (`  
`const xStreamBuffer stream_ )`

The `xStreamDelete()` system call will delete a stream buffer and free its memory. Once a stream buffer is deleted, it can not be written to or read from.

## Parameters

<i>stream</i> ↔	The stream buffer to operate on.
—	

#### 4.2.4.30 xStreamIsEmpty() `xBase xStreamIsEmpty (const xStreamBuffer stream_ )`

The `xStreamIsEmpty()` system call is used to determine if the stream buffer is empty. A stream buffer is considered empty when it's length is equal to zero. If the buffer is greater than zero in length, `xStreamIsEmpty()` will return false.

## Parameters

<i>stream</i> ↔	The stream buffer to operate on.
—	

## Returns

`xBase` Returns true if the stream buffer length is equal to zero in length, otherwise `xStreamIsEmpty()` will return false.

#### 4.2.4.31 xStreamIsFull() `xBase xStreamIsFull (const xStreamBuffer stream_ )`

The `xStreamIsFull()` system call is used to determine if the stream buffer is full. A stream buffer is considered full when it's length is equal to `CONFIG_STREAM_BUFFER_BYTES`. If the buffer is less than `CONFIG_STREAM_↔ BUFFER_BYTES` in length, `xStreamIsFull()` will return false.

## Parameters

<i>stream</i> ↔	The stream buffer to operate on.
—	

## Returns

`xBase` Returns true if the stream buffer is equal to `CONFIG_STREAM_BUFFER_BYTES` in length, otherwise `xStreamIsFull()` will return false.

#### 4.2.4.32 xStreamReceive() `xByte* xStreamReceive (const xStreamBuffer stream_, xHalfWord * bytes_ )`

The `xStreamReceive()` system call will return the contents of the stream buffer. The contents are returned as a byte array whose length is known by the `bytes_` paramater. Because the byte array is stored in the heap, it must be freed by calling `xMemFree()`.

**Parameters**

<i>stream</i> ↔ —	The stream to operate on.
<i>bytes</i> ↔ —	The number of bytes returned (i.e., length of the byte array) by <a href="#">xStreamReceive()</a> .

**Returns**

xByte\* The byte array containing the contents of the stream buffer.

**Warning**

The byte array returned by [xStreamReceive\(\)](#) must be freed by calling [xMemFree\(\)](#).

**4.2.4.33 xStreamReset()** `void xStreamReset (  
    const xStreamBuffer stream_ )`

The [xStreamReset\(\)](#) system call will clear the contents of the stream buffer and reset its length to zero.

**Parameters**

<i>stream</i> ↔ —	The stream buffer to operate on.
----------------------	----------------------------------

**4.2.4.34 xStreamSend()** `xBase xStreamSend (  
    xStreamBuffer stream_,  
    const xByte byte_ )`

The [xStreamSend\(\)](#) system call will write one byte to the stream buffer. If the stream buffer's length is equal to `CONFIG_STREAM_BUFFER_BYTES` (i.e., full) then the byte will not be written to the stream buffer and [xStreamSend\(\)](#) will return `RETURN_FAILURE`.

**Parameters**

<i>stream</i> ↔ —	The stream buffer to operate on.
<i>byte_</i>	The byte to be sent to the stream buffer.

**Returns**

[xBase](#) Returns `RETURN_SUCCESS` if the byte was successfully written to the stream buffer. Otherwise, returns `RETURN_FAILURE`.

**4.2.4.35 xSystemGetSystemInfo()** `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.

#### 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()`.

**4.2.4.36 xSystemHalt()** `void xSystemHalt (`  
`void )`

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

**4.2.4.37 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.

**4.2.4.38 xTaskChangePeriod()** `void xTaskChangePeriod (`  
`xTask task_,`  
`const 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.

**4.2.4.39 xTaskChangeWDPeriod()** `void xTaskChangeWDPeriod (`  
`xTask task_,`  
`const xTicks wdTimerPeriod_ )`

The `xTaskChangeWDPeriod()` system call will change the task watchdog timer period. The period, measured in ticks, must be greater than zero to have any effect. If the tasks last runtime exceeds the task watchdog timer period, the task will automatically be placed in a suspended state.

## See also

`xTaskGetWDPeriod()`

## Parameters

<i>task_</i>	The task to change the task watchdog timer for.
<i>wdTimer↔ Period_</i>	The task watchdog timer period which is measured in ticks. If zero, the task watchdog timer will not have any effect.

**4.2.4.40 xTaskCreate()** `xTask xTaskCreate (`  
`const xChar * name_,`  
`void(*) (xTask task_, xTaskParm parm_) 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 CONFIG_TASK_NAME_BYTES. 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\(\)](#).

**4.2.4.41 xTaskDelete()** `void xTaskDelete (`  
`const 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).

**4.2.4.42 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 <a href="#">xBase</a> 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()`.

**4.2.4.43 `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**

<code>tasks_</code> —	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()`.

**4.2.4.44 `xTaskGetHandleById()`** `xTask` `xTaskGetHandleById` (  
    const `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.

**4.2.4.45 xTaskGetHandleByName()** [xTask](#) xTaskGetHandleByName (   
const [xChar](#) \* *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.

**4.2.4.46 xTaskGetId()** [xBase](#) xTaskGetId (   
const [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).

**4.2.4.47 xTaskGetName()** `xChar* xTaskGetName (`  
`const 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

`xChar*` 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()`.

**4.2.4.48 xTaskGetNumberOfTasks()** `xBase xTaskGetNumberOfTasks (`  
`void )`

The `xTaskGetNumberOfTasks()` system call returns the current number of tasks regardless of their state.

Returns

`xBase` The number of tasks.

**4.2.4.49 xTaskGetPeriod()** `xTicks xTaskGetPeriod (`  
`const 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.

**4.2.4.50 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.

**4.2.4.51 xTaskGetTaskInfo()** [xTaskInfo](#) xTaskGetTaskInfo (   
 const [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\(\)](#).

**4.2.4.52 xTaskGetTaskRunTimeStats()** [xTaskRunTimeStats](#) xTaskGetTaskRunTimeStats (   
const [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\(\)](#).

**4.2.4.53 xTaskGetTaskState()** [xTaskState](#) xTaskGetTaskState (   
const [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.

**4.2.4.54 xTaskGetWDPeriod()** `xTicks xTaskGetWDPeriod (`  
`const xTask task_ )`

The [xTaskGetWDPeriod\(\)](#) will return the current task watchdog timer for the task.

## See also

[xTaskChangeWDPeriod\(\)](#)

## Parameters

<i>task_</i> ↔	The task to get the task watchdog timer period for.
—	

## Returns

xTicks The task watchdog timer period which is measured in ticks.

**4.2.4.55 xTaskNotificationIsWaiting()** `xBase xTaskNotificationIsWaiting (`  
`const 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

<i>task_</i> ↔	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.

**4.2.4.56 xTaskNotifyGive()** `xBase xTaskNotifyGive (`  
`xTask task_,`  
`const xBase notificationBytes_,`  
`const xChar * 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

<i>task_</i>	The task to send the task notification to.
<i>notification↔ Bytes_</i>	The number of bytes contained in the notification value. The number must be between one and the <code>CONFIG_NOTIFICATION_VALUE_BYTES</code> setting.
<i>notification↔ Value_</i>	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.

**4.2.4.57 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.
--------------------	-----------------------------------------

**4.2.4.58 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\(\)](#).

**4.2.4.59 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.
—	

**4.2.4.60 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.
—	

**4.2.4.61 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\(\)](#)

**4.2.4.62 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.

**4.2.4.63 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.
—	

**4.2.4.64 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\(\)](#)

**4.2.4.65 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.
—	

**4.2.4.66 xTimerChangePeriod()** `void xTimerChangePeriod (`  
`xTimer timer_,`  
`const 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.

**4.2.4.67 xTimerCreate()** `xTimer xTimerCreate (`

```
const 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()`.

**4.2.4.68 xTimerDelete()** `void xTimerDelete (`  
`const 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.
---------------------	--------------------------

**4.2.4.69 xTimerGetPeriod()** `xTicks xTimerGetPeriod (`  
`const 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.

**4.2.4.70 xTimerHasTimerExpired()** `xBase xTimerHasTimerExpired ( const 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.

**4.2.4.71 xTimerIsTimerActive()** `xBase xTimerIsTimerActive ( const 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.

**4.2.4.72 xTimerReset()** `void xTimerReset (`  
`xTimer timer_ )`

The `xTimerReset()` system call will reset the start time of the timer to zero.

**Parameters**

<code>timer_↔</code>	The timer to be reset.
<code>—</code>	

**4.2.4.73 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**

<code>timer_↔</code>	The timer to be started.
<code>—</code>	

**4.2.4.74 xTimerStop()** `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()`.

**See also**

`xTimerStart()`  
`xTimerReset()`

## Parameters

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





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