Connext Cert 2.4.16.1

Integration Manual

Real-Time Innovations, Inc.

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200 Platform Support Library (PSL)

Introduction

This document contains the requirements for the Platform Support Library and describes the Platform Integrator responsibilities to integrate with the RTI Connext Cert (RCC) Platform Independent Library (PIL).

Creating a Data Distribution Service (DDS) application using RCC for a given platform involves three distinct roles:

- DDS Provider
- Platform Integrator
- Application Developer

RTI fulfills the role of the DDS provider by supplying the RCC Platform Independent Library. The RCC PIL contains all of the platform-independent functionality required to support DDS applications. The Application Developer uses the APIs provided by RCC PIL to create applications that utilize DDS. The Platform Integrator uses the interfaces provided by RCC PIL to integrate RCC into their specific target environment.

The Platform Integrator is assumed to have expert-level understanding of the platform where RCC will run. In order to successfully integrate with RCC, the Platform Integrator needs to fully understand the capability of their chosen platform. RCC provides interfaces to integrate with the platform's operating system and selected network stack. Note that the platform chosen by Platform Integrator may not have an operating system as in the case of bare metal systems. Bare metal platforms can be supported by the provided interfaces as long as the Platform Integrator implements the required functionality. This document presents the interface requirements that must be implemented by the Platform Integrator in order to successfully integrate with RCC.

The Application Developer is responsible for creating applications that meet their product requirements. By using the RCC API documentation, the Application Developer can leverage the features of the RCC DDS implementation to create their application.

The figure below shows a layered view of the three aforementioned roles and where each role and element of the system resides in the development of an application.

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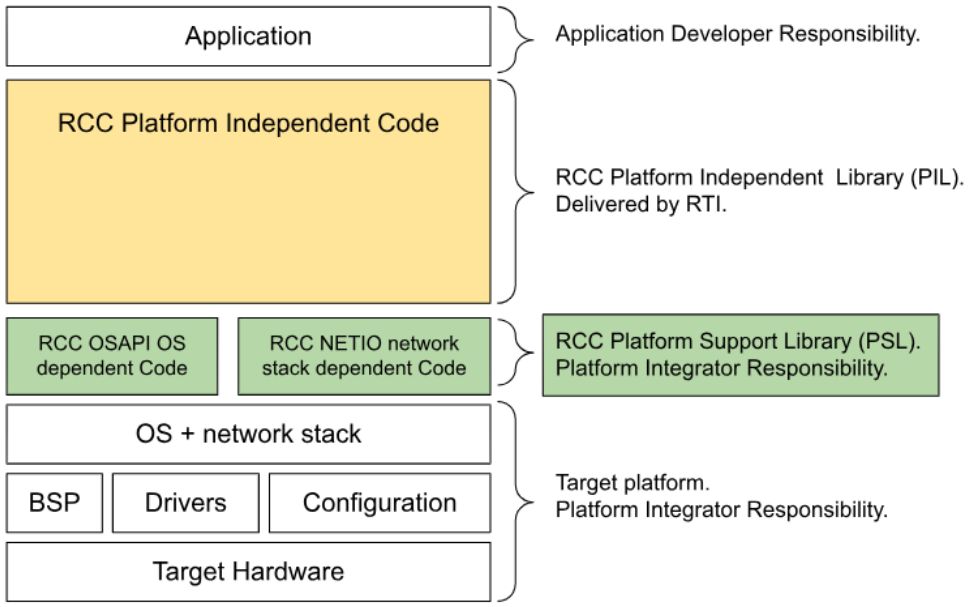
200 Platform Support Library (PSL)



Terminology

Acronyms and Abbreviations

RCC	RTI Connext Cert
OS	Operating System
PSL	Platform Support Library
PIL	Platform Independent Library
QOS	QNX OS for Safety
QTS	Qualification Test Specification *Note: Dependent on PSL requirements*

Definitions

Platform	A system composed of the language, compiler, operating system, processor, network stack, and supporting hardware.
Target Platform	The platform that will run RCC.
Platform Integrator	End user responsible for platform integration with RCC.

Requirements Terminology

All requirement statements shall use the following verbs in the manner defined in this section. Requirements are designed to be contracts between producers and consumers of RTI's software component. The verbs used define the formality of the contract.

Shall	Mandatory and binding. This is the foundation of a requirement's testable assertions.

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Must	Interpreted as “shall”. “Must” can be used to define regulations or legal obligations.
Will	Declaration of some future state. These statements are not binding, and are typically used to define limitations of use.
Should	Strongly recommended, but a failure to implement such statements cannot be used as a basis for rejection of the work product. These are not requirement statements and are non-binding.
May	Suggestions or allowances. Statements with the word “may” are not requirements and are non-binding.

Intended Audience

This document is intended to be used by Platform Integrators.

RCC Integration Responsibilities

RCC provides the platform independent implementation of DDS. To integrate with RCC consists of an integration with an Operating System (OS) and network stack. The code that integrates with RCC is referred to as the Platform Support Library (PSL). The remainder of this document describes the Platform Integrator's responsibility to ensure that RCC is integrated correctly with the target platform.

Global Shared Data Considerations

Special consideration should be given to data that is shared between threads, processes, and processors -- data access protections need to be provided to handle data shared between the entities. This consideration should apply regardless of whether the processors are internal processor cores or external processors.

Concurrency

All PSL APIs have information about concurrency/thread-safety included in the API reference manuals. It is important that an application does not violate that thread-safety/concurrency guidance. The Platform Integrator may create multiple threads as part of the implementation of the PSL, but from an application point of view, there is only a single critical section protecting all DDS resources within a DomainParticipant.

The Platform Integrator is responsible for ensuring that concurrency and re-entrancy requirements for PSL interfaces described in subsequent sections are implemented.

Rationale	

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200.1 PSL OSAPI

OSAPI Integration (OSAPI)

RCC's OSAPI is an abstract API consisting of a set of functions implemented in the PSL.

The OSAPI is implemented using Operating System-dependent APIs, specifically those pertaining to the following areas:

- Primitive data types
- Memory
- Mutex
- Semaphore
- Strings
- System

Rationale	

200.1.1 Heap

Heap Integration

RCC requires memory to create data structures for managing internal resources and states. RCC defines "heap" as a region of memory from where an arbitrary number of bytes can be allocated at will. Memory allocations from the heap need to be thread-safe. The memory allocated by RCC from the heap needs to be readable and writable, but RCC does not require executable memory from the heap. There is no expectation as to where the memory is allocated from. For example, a memory region could be allocated from a statically defined array or by use of the standard C library malloc() function.

All memory resources allocated by a DDS_DomainParticipantFactory and its contained entities need to be managed by a single OS instance. *DomainParticipants* are created by *DomainParticipant* factories. Memory resources that are associated with a *DomainParticipant* have data protection and exclusivity mechanisms that need to be managed by the OS instance that created it.

The Platform Integrator is responsible for implementing the following heap APIs:

- OSAPI_Heap_allocate_buffer()

Data types used by the heap API:

- OSAPI_Alignment_T

OSAPI_Alignment_T is an alias for an RTI_INT32 type. A parameter of type OSAPI_Alignment_T represents the alignment (in bytes) for the platform. An address is considered aligned when it is a positive integer multiple of the *alignment* parameter. The Platform Integrator provides memory aligned to the CPU bus width if the *alignment* is default; otherwise, at least the minimum requested.

Rationale	

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R-521.1
The OSAPI_Heap_allocate_buffer operation **shall** have the following signature:

Operations	Parameters	Type
OSAPI_Heap_allocate_buffer	out: *char* ***buffer in: *RTI_SIZE_T* size in: *OSAPI_Alignment_T* alignment	void

Rationale	

R-521.1.1
The OSAPI_Heap_allocate_buffer operation **shall** allocate contiguous memory that RCC is able to read and write and is aligned to *alignment* of size *size*, set the allocated memory region to 0, and return the address of the allocated memory area through the *buffer* pointer variable.

Rationale	OSAPI_ALIGNMENT_DEFAULT is an RCC-defined constant that indicates that the requested memory should follow the natural alignment of the architecture (sufficiently aligned to store any C type efficiently).

R-521.1.2
The OSAPI_Heap_allocate_buffer operation **shall** set the *buffer* pointer variable to NULL on failure.

Rationale	Execution of the OSAPI_Heap_allocate_buffer operation can fail for reasons that are dependent on the target platform. One potential reason that OSAPI_Heap_allocate_buffer could fail is due to lack of resources to allocate.

200.1.2 Mutex

Mutex Integration

An "execution context" is a sequence of CPU instructions. An execution context is considered to be non-safe when two contexts can access the same shared resources at the same time, either due to multitasking or due to real parallelism.

RCC uses mutexes to protect access to resources and avoid race conditions when resources may be shared between different execution contexts.

RCC expects that a mutex can be in one of the following states:

- unlocked - An unlocked mutex does not have an owner.
- locked - A locked mutex has an owner. Only the owner can unlock a mutex.

The Platform Integrator is responsible for implementing the following mutex APIs:

- OSAPI_Mutex_new()

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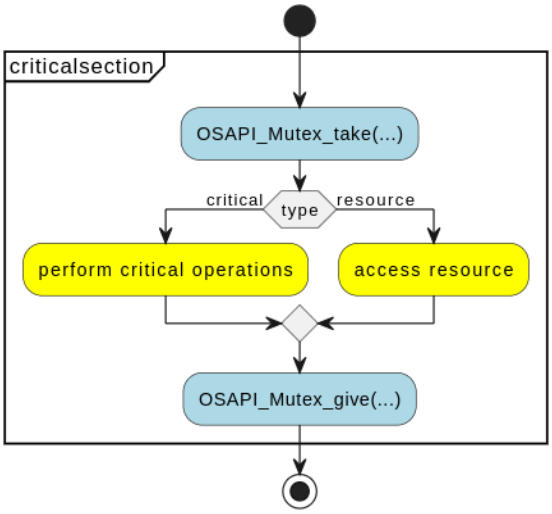
200.1.2 Mutex

- OSAPI_Mutex_take()
- OSAPI_Mutex_give()

RCC relies on the mutex take and give APIs when it needs access to a protected resource or a protected section of code. For protected access, RCC takes the mutex, performs the desired operation, and gives back (releases) the mutex.



Data types used by the mutex API:

- OSAPI_Mutex_T

OSAPI_Mutex_T is an alias for the data structure that contains platform specific information used to manage a mutex. The data structure that is to be implemented is called:

- OSAPI_Mutex

The composition of the OSAPI_Mutex data structure is opaque to RCC. RCC creates the alias OSAPI_Mutex_T from the OSAPI_Mutex data structure. RCC does not access the members of the structure directly. The Platform Integrator is responsible for defining the structure to manage the mutex.

Rationale

R-522.1

The OSAPI_Mutex_new operation **shall** have the following signature:

Operations	Parameters	Type
OSAPI_Mutex_new	in: *void*	OSAPI_Mutex_T*

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R-522.1	
Rationale	

R-522.1.1	
The OSAPI_Mutex_new operation **shall** create an unlocked mutex and return a pointer to it on success.	
Rationale	The returned address points to the OSAPI_Mutex_T object, which has the characteristics of a mutex that guarantees exclusive access when acquired. The mutex is used to protect critical sections of data.

R-522.1.2	
The OSAPI_Mutex_new operation **shall** return **NULL** on failure.	
Rationale	The OSAPI_Mutex_new operation is responsible for creating a mutex on the target platform. The creation could fail for numerous reasons. The OSAPI_Mutex_new operation should account for the failure mechanisms of the platform.

R-522.2	
The OSAPI_Mutex_take operation **shall** have the following signature:	

Operations	Parameters	Type
OSAPI_Mutex_take	in: OSAPI_Mutex_T *mutex	RTI_BOOL

Rationale	

R-522.2.1	
The OSAPI_Mutex_take operation **shall** make the caller of this operation the mutex owner and return *RTI_TRUE* if the mutex was successfully taken **OR** the calling thread is already the owner of the mutex.	
Rationale	To be taken, a mutex needs to be either unlocked or locked by the current execution context. A thread can take a mutex that it already owns.

R-522.2.2	
The OSAPI_Mutex_take operation **shall** return *RTI_FALSE* if the mutex has not been successfully taken.	
Rationale	The OSAPI_Mutex_take operation will return RTI_FALSE when the mutex is invalid or the calling thread cannot be blocked while waiting for the mutex to become unlocked. The OSAPI_Mutex_take operation may need to handle other failure mechanisms.

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R-522.2.4	
The OSAPI_Mutex_take operation **shall** lock the mutex if it was successfully taken and was previously unlocked.	
Rationale	A locked mutex prevents a shared resource from being acessed by other execution contexts.

R-522.3		
The OSAPI_Mutex_give operation **shall** have the following signature:		
Operations	**Parameters**	**Type**
OSAPI_Mutex_give	in: OSAPI_Mutex_T *mutex	RTI_BOOL
Rationale		

R-522.3.1	
The OSAPI_Mutex_give operation **shall** return *RTI_TRUE* if the mutex has been successfully given.	
Rationale	

R-522.3.2	
The OSAPI_Mutex_give operation **shall** return *RTI_FALSE* if the mutex has not been successfully given.	
Rationale	The OSAPI_Mutex_give operation returns RTI_FALSE if the mutex is invalid or the mutex cannot be given by the calling execution context. The OSAPI_Mutex_give operation may need to handle additional failure mechanisms.

R-522.3.3	
The OSAPI_Mutex_give operation **shall** unlock the mutex if it was locked and has been successfully given as many times as it was successfully taken in the same execution context.	
Rationale	RCC may try to take the mutex many times, even if it is already taken, but it will give it the same amount of times, hence this requirement.

200.1.3 Semaphore

Semaphore Integration

RCC uses binary semaphores to block executions contexts until an event occurs. The RCC APIs related to semaphores provide the interface for creating, taking (waiting for signal), and giving (signaling) semaphores.

A binary semaphore is only blocked on by at most one execution context when the semaphore is signaled. An execution context that needs to synchronize with an event will attempt to take a semaphore, which will cause it to wait for the semaphore to be signaled. Multiple events can be accumulated until the semaphore is taken. Once the semaphore is signaled (given) by another

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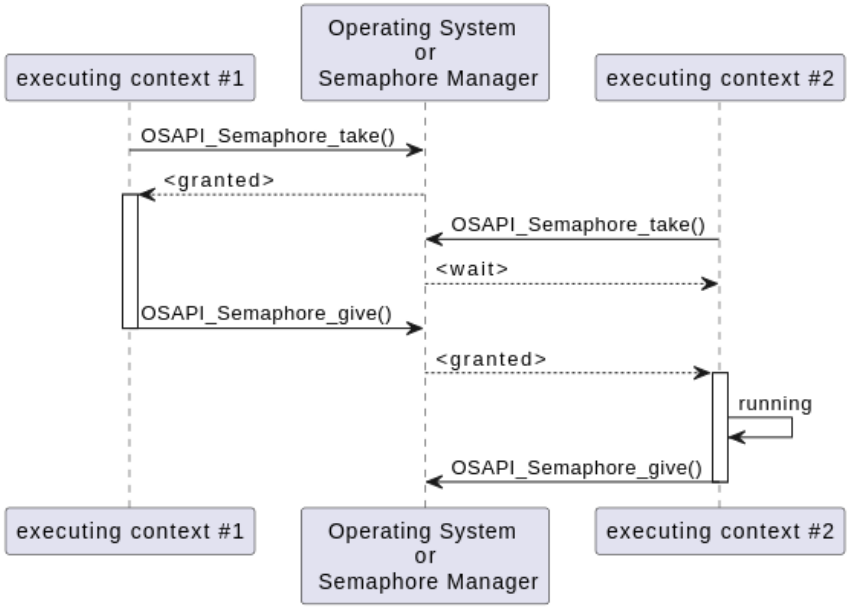
200.1.3 Semaphore

execution context, the execution context that was waiting on the semaphore will be allowed to take the semaphore. When the waiting execution context takes the semaphore, it is allowed to continue.



A binary semaphore can be in one of the following two states:

- signaled: allows a waiting execution context to take the semaphore and continue execution.
- unsignaled: causes an execution context to wait when it attempts to take the semaphore.

The Platform Integrator is responsible for implementing the following semaphore APIs:

- OSAPI_Semaphore_new()
- OSAPI_Semaphore_take()
- OSAPI_Semaphore_give()

Data types used by the semaphore API:

- OSAPI_Semaphore_T

OSAPI_Semaphore_T is an alias for the data structure that contains platform specific information used to manage a semaphore. The data structure that is to be implemented is called:

- OSAPI_Semaphore

The composition of the OSAPI_Semaphore data structure is opaque to RCC. RCC creates the alias OSAPI_Semaphore_T from the OSAPI_Semaphore data structure. RCC does not access the members of the structure directly. The Platform Integrator is responsible for defining the structure to manage the semaphore.

Rationale	

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R-523.1	
The OSAPI_Semaphore_new operation **shall** have the following signature: **Operations** | **Parameters** | **Type** OSAPI_Semaphore_new | in: *void* | OSAPI_Semaphore_T*	
Rationale	

R-523.1.1	
The OSAPI_Semaphore_new operation **shall** create an unsignaled semaphore and return a pointer to it on success.	
Rationale	

R-523.1.2	
The OSAPI_Semaphore_new operation **shall** return **NULL** on failure.	
Rationale	The OSAPI_Semaphore_new operation attempts to create a new semaphore in an unsignaled state. If this operations fails, then the operation will return NULL, indicating that a failure has occurred with the creation of the semaphore. Failure mechanisms are specific to the target platform. Examples of possible reasons for failure include the following: • Lack of permission / privilege to modify or control a resource • Insufficient resources • System is busy Refer to the documentation for the target platform for applicable failures.

R-523.2	
The OSAPI_Semaphore_take operation **shall** have the following signature: **Operations** | **Parameters** | **Type** OSAPI_Semaphore_take | in: *OSAPI_Semaphore_T **self in: *RTI_INT32* timeout out: *RTI_INT32 **fail_reason | RTI_BOOL	
Rationale	*timeout* is in milliseconds. RCC defines the constant OSAPI_SEMAPHORE_TIMEOUT_INFINITE. OSAPI_SEMAPHORE_TIMEOUT_INFINITE is used to indicate that operation does not timeout while waiting to take the semaphore.

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R-523.2.1	
If the semaphore has been successfully taken, the OSAPI_Semaphore_take operation **shall**: 1. return RTI_TRUE; 2. set the *fail_reason* to *OSAPI_SEMAPHORE_RESULT_OK* if the *fail_reason* pointer is not NULL.	
Rationale	*OSAPI_SEMAPHORE_RESULT_OK* is defined by RCC.

R-523.2.2	
If the attempt to take a semaphore times out, the OSAPI_Semaphore_take operation **shall**: 1. return RTI_TRUE; 2. set the *fail_reason* to *OSAPI_SEMAPHORE_RESULT_TIMEOUT* if the *fail_reason* pointer is not NULL.	
Rationale	*OSAPI_SEMAPHORE_RESULT_TIMEOUT* is a constant defined by RCC.

R-523.2.3	
If the semaphore has not been successfully taken due to a failure other than an expired timeout, the OSAPI_Semaphore_take operation **shall**: 1. return RTI_FALSE; 2. set the *fail_reason* to *OSAPI_SEMAPHORE_RESULT_ERROR* if the *fail_reason* pointer is not NULL.	
Rationale	*OSAPI_SEMAPHORE_RESULT_ERROR* is a constant defined by RCC.

R-523.3	
The OSAPI_Semaphore_give operation **shall** have the following signature: **Operations** | **Parameters** | **Type** OSAPI_Semaphore_give | in: *OSAPI_Semaphore_T* *self | RTI_BOOL	
Rationale	

R-523.3.1	
The OSAPI_Semaphore_give operation **shall** return *RTI_TRUE* if the semaphore has been successfully given.	
Rationale	

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R-523.3.2	
The OSAPI_Semaphore_give operation **shall** return *RTI_FALSE* on failure.	
Rationale	The OSAPI_Semaphore_give operation can fail. A common failure mechanism is attempting to give a semaphore that is invalid. Other failure mechanisms are dependent on the target platform and implementation**.**

200.1.4 Process

Process Integration

RCC performs limited introspection on the running process. It uses information about the running process within the DDS implementation.

The Platform Integrator is responsible for implementing following process API:

- OSAPI_Process_getpid()

The OSAPI_Process_getpid operation returns a value of type OSAPI_ProcessId.

Data types used by the process API:

- OSAPI_ProcessId

OSAPI_ProcessId is an alias for an RTI_UINT64 type. The Platform Integrator is responsible for providing the process ID for the application.

Rationale	

R-524	
The OSAPI_Process_getpid operation **shall** have the following signature:	

Operations	Parameters	Type
OSAPI_Process_getpid	in: *void*	OSAPI_ProcessId

Rationale	

R-524.1	
The OSAPI_Process_getpid operation **shall** return the process ID of the caller.	
Rationale	The returned process ID is the ID that identifies the executable environment that holds all the execution contexts, including RCC and the client logic. RCC uses the process ID returned by the OSAPI_Process_getpid operation to create a unique ID. Systems that do not implement the process abstraction may return 0. The operation will always succeed.

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200.1.5 Memory

Memory Integration

RCC declares interfaces for memory manipulation such as comparison, copying, zeroing, searching, and moving data.

The Platform Integrator is responsible for implementing the following memory manipulation APIs:

- OSAPI_Memory_copy()
- OSAPI_Memory_zero()
- OSAPI_Memory_compare()
- OSAPI_Memory_fndchr()
- OSAPI_Memory_move()

Rationale	

R-525.1

The OSAPI_Memory_copy operation **shall** have the following signature:

Operations	**Parameters**	**Type**
OSAPI_Memory_copy	out: *void* *dest in: *const void* *src in: *RTI_SIZE_T* size	void

Rationale	

R-525.1.1

The OSAPI_Memory_copy operation **shall** copy *size* number of bytes from the *src* memory region to the *dest* memory region, where the *src* and *dest* memory regions specified by the caller are valid and do not overlap.

Rationale	It is the caller's responsibility to ensure that the memory regions are valid and do not overlap. The OSAPI_Memory_copy operation does not account for scenarios such where memory regions overlap. The OSAPI_Memory_move operation handles cases where *src* and *dest* overlap.

R-525.2

The OSAPI_Memory_zero operation **shall** have the following signature:

Operations	**Parameters**	**Type**
OSAPI_Memory_zero	out: *void* *mem in: *RTI_SIZE_T* size	void

Rationale	

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R-525.2.1	
The OSAPI_Memory_zero operation **shall** set each byte in the memory region [*mem*,*mem* + *size* - 1] to zero.	
Rationale	

R-525.3	
The OSAPI_Memory_compare operation **shall** have the following signature: **Operations** / **Parameters** / **Type** OSAPI_Memory_compare / in: *const void* *left in: *const void* *right in: *RTI_SIZE_T* size / RTI_INT32	
Rationale	

R-525.3.1	
The OSAPI_Memory_compare operation **shall** perform a lexicographical byte-wise comparison of two memory regions of *size* bytes and return less than 0 if *left* is less than *right,* interpreted as a sequence of unsigned 8-bit values.	
Rationale	*left* memory region: [*left*,*left* + *size* - 1] *right* memory region: [*right*,*right* + *size* - 1]

R-525.3.2	
The OSAPI_Memory_compare operation **shall** perform a lexicographical byte-wise comparison of two memory regions of *size* bytes and return 0 if *left* is equal to *right,* interpreted as a sequence of unsigned 8-bit values.	
Rationale	*left* memory region: [*left*,*left* + *size* - 1] *right* memory region: [*right*,*right* + *size* - 1]

R-525.3.3	
The OSAPI_Memory_compare operation **shall** perform a lexicographical byte-wise comparison of two memory regions of *size* bytes and return greater than 0 if *left* is greater than *right,* interpreted as a sequence of unsigned 8-bit values.	
Rationale	*left* memory region: [*left*,*left* + *size* - 1] *right* memory region: [*right*,*right* + *size* - 1]

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R-525.4	
The OSAPI_Memory_move operation **shall** have the following signature:	

Operations	**Parameters**	**Type**
OSAPI_Memory_move	out: *void* *dest in: *const void* *source in: *RTI_SIZE_T* size	void

Rationale	

R-525.4.1	
The OSAPI_Memory_move operation **shall** copy *size* number of bytes from a valid *source* memory region to a valid *dest* memory region, including *source* and *dest* memory regions that overlap.	
Rationale	*source* memory region: [*source*,*source* + *size* - 1] *dest* memory region: [*dest*,*dest* + *size* - 1] The caller is responsible for ensuring that valid regions are provided for the *source* and *dest* memory regions.

R-525.5	
The OSAPI_Memory_fndchr operation **shall** have the following signature:	

Operations	**Parameters**	**Type**
OSAPI_Memory_fndchr	in: *const void* *s in: *RTI_INT32* c in: *RTI_SIZE_T* size	void *

Rationale	

R-525.5.1	
The OSAPI_Memory_fndchr operation **shall** search for *c,* interpreted as a byte, starting at location *s* for a maximum of RTI_SIZE_T *size* in length, and return a pointer to the first occurrence of *c* if *c* is found.	
Rationale	*s* memory region: [*s*,*s* + *size* - 1]

R-525.5.2	
The OSAPI_Memory_fndchr operation **shall** search for *c* interpreted as a byte starting at location *s* for a maximum of RTI_SIZE_T *size* in length and return NULL if *c* is not found.	
Rationale	

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200.1.6 String

String Integration

RCC declares interfaces for finding the length of strings and making string comparisons. The strings need to be encoded as ASCIIZ (NUL terminated ASCII arrays).

The Platform Integrator is responsible for implementing the following string APIs:

- OSAPI_String_length()
- OSAPI_String_cmp()
- OSAPI_String_ncmp()
- OSAPI_String_nlength()

Rationale	

R-525.6

The OSAPI_String_length operation **shall** have the following signature:

Operations	**Parameters**	**Type**
OSAPI_String_length	in: *const char* *s	RTI_SIZE_T

Rationale	

R-525.6.1

The OSAPI_String_length operation **shall** return the length of an ASCIIZ string, not including the NUL terminator **\0**.

Rationale	

R-525.7

The OSAPI_String_cmp operation **shall** have the following signature:

Operations	**Parameters**	**Type**
OSAPI_String_cmp	in: *const char* *l in: *const char* *r	RTI_INT32

Rationale	

R-525.7.1

The OSAPI_String_cmp operation **shall** lexicographically compare the ASCIIZ strings *l* and *r* and return less than 0 if *l* is lexicographically less than *r* when interpreted as a sequence of unsigned 8-bit values.

Rationale	The comparison ends when a difference is found, or when NUL is reached in any of the input strings, whichever happens first.

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R-525.7.2	
The OSAPI_String_cmp operation **shall** lexicographically compare the ASCIIZ strings *l* and *r* and return 0 if *l* is lexicographically equal to *r* when interpreted as a sequence of unsigned 8-bit values.	
Rationale	The comparison ends when a difference is found, or when NUL is reached in any of the input strings, whichever happens first.

R-525.7.3	
The OSAPI_String_cmp operation **shall** lexicographically compare the ASCIIZ strings *l* and *r* and return greater than 0 if *l* is lexicographically greater than *r* when interpreted as a sequence of unsigned 8-bit values.	
Rationale	The comparison ends when a difference is found, or when NUL is reached in any of the input strings, whichever happens first.

R-525.8	
The OSAPI_String_ncmp operation **shall** have the following signature:	

Operations	**Parameters**	**Type**
OSAPI_String_ncmp	in: *const char* *l in: *const char* *r in: *RTI_SIZE_T* num	RTI_INT32

Rationale	

R-525.8.1	
The OSAPI_String_ncmp operation **shall** lexicographically compare up to a maximum of *num* characters in the ASCIIZ strings *l* and *r*, interpreted as a sequence of unsigned 8-bit values, and return less than 0 if *l* is less than *r*.	
Rationale	The comparison ends when a difference is found, when num characters have been compared, or when NUL is reached in any of the input strings, whichever happens first.

R-525.8.2	
The OSAPI_String_ncmp operation **shall** lexicographically compare up to a maximum of *num* characters in the ASCIIZ strings *l* and *r*, interpreted as a sequence of unsigned 8-bit values, and return zero if *l* is equal to *r*.	
Rationale	The comparison ends when a difference is found, when num characters have been compared, or when NUL is reached in any of the input strings, whichever happens first.

R-525.8.3
The OSAPI_String_ncmp operation **shall** lexicographically compare up to a maximum of *num* characters in the ASCIIZ strings *l* and *r*, interpreted as a sequence of unsigned 8-bit values, and return greater than zero if *l* is greater than *r*.

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R-525.8.3	
Rationale	The comparison ends when a difference is found, when num characters have been compared, or when NUL is reached in any of the input strings, whichever happens first.

R-525.9	
Description: The OSAPI_String_nlength operation **shall** have the following signature: **Operations** / **Parameters** / **Type** OSAPI_String_nlength / in: *const char **s in: *RTI_SIZE_T* max_length / RTI_SIZE_T	
Rationale	

R-525.9.1	
The OSAPI_String_nlength operation **shall** return the length of the ASCIIZ string, if the string length is less than *max_length*, or *max_length* if there is no NUL terminator ('**\0**') within the first *max_length* characters pointed to by *s*.	
Rationale	

R-525.9.2	
The OSAPI_String_nlength operation **shall** return a length of 0 if the string provided by the parameter *s* is NULL.	
Rationale	

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200.1.7 OSAPI_System

System API Integration

The system API consists of functions which are more closely related to the target platform hardware than to the operating system. The system API is implemented as an interface using function pointers, which is different from the rest of the OSAPI. Except for the OSAPI_System portion of the OSAPI, most of the API is implemented by creating concrete functions using the OSAPI function prototypes.

RCC provides a default implementation for OSAPI_System, but the Platform Integrator may create their own implementation. When the default implementation is used, the Platform Integrator uses either the OSAPI_System_clock_tick or OSAPI_System_clock_tick_from_time operations provided by RCC to advance timers. Even though RCC provides a generic implementation that the Platform Integrator may use, the Platform Integrator needs to provide implementations for OSAPI_SystemI.get_time and OSAPI_SystemI.get_timer_resolution operations.

Custom implementations can provide their own means for advancing timers. The default implementation supports up to 8 *DomainParticipants* since a timer is created for each *DomainParticipant*. The maximum number of timers that can be created by the default implementation is 8.

The system interface is defined by the OSAPI_SystemI type. The OSAPI_System_get_native_interface operation needs to be implemented and is a pure function implementation. RCC invokes the OSAPI_System_get_native_interface operation to retrieve the system interface. The Platform Integrator is responsible for setting up the system interface.

If the Platform Integrator opts to implement their own OSAPI_System, they are responsible for implementing each function of the OSAPI_SystemI structure function pointer members and assign the implemented functions to the OSAPI_SystemI appropriately.

This OSAPI_System_get_native_interface operation is expected to return the system interface for the target platform.

Rationale	

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R-526.0

An instance of the OSAPI_SystemI structure **shall** be created and its member attributes assigned function pointers to functions that implement the interfaces described in the table below:

Operation	Parameters	Type
OSAPI_SystemI.get_timer_resolution	in: void	RTI_INT32
OSAPI_SystemI.get_time	in: OSAPI_SystemTime *now	RTI_BOOL
OSAPI_SystemI.start_timer	in: OSAPI_Timer_T self in: OSAPI_TimerTickHandlerFunction tick_handler	RTI_BOOL
OSAPI_SystemI.generate_uuid	out: struct OSAPI_SystemUUID *uuid_out	RTI_BOOL
OSAPI_SystemI.get_hostname	out: char *const hostname	RTI_BOOL
OSAPI_SystemI.initialize	in: void	RTI_BOOL
OSAPI_SystemI.get_ticktime	out: RTI_INT32 *sec out: RTI_UINT32 *nanosec	RTI_BOOL

Rationale

R-526.1

The OSAPI_SystemI.start_timer method **shall** configure the OSAPI_System instance to start invoking the *tick_handler* method parameter on the self OSAPI_Timer_T parameter at the frequency returned by the OSAPI_SystemI.get_timer_resolution operation, and return RTI_TRUE on success.

Rationale

RCC owns and maintains the OSAPI_Timer_T type. The OSAPI_Timer_T type is not public and should be handled as an abstract data type. The OSAPI_TimerTickHandlerFunction prototype and implementation is defined by RCC; this API should handle it as an abstract data type.

RCC will call the *start_timer* method and supply a *tick_handler* function to the *start_timer* method. The Platform Integrator should not call *start_timer* manually nor implement a *tick_handler* function. Instead, the Platform Integrator needs to store OSAPISYSTEM_MAX_TIMERS instances of the *self* and *tick_handler* parameters. The Platform Integrator will use these stored parameters to periodically call the *tick_handler* operation and use the stored *self* instance as the parameter for the tick handler.

RCC provides the OSAPISYSTEM_MAX_TIMERS literal, which is used as a limit to the amount of timers RCC will create and use.

The timer resolution returned by the OSAPI_SystemI.get_timer_resolution operation is in nanoseconds.

R-526.1.1

The OSAPI_SystemI.start_timer operation **shall** not configure the OSAPI_System instance to start invoking the *tick_handler* method and return RTI_FALSE on failure or if the system has not been initialized.

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R-526.1.1	
Rationale	

R-526.1.2	
The Platform Integrator **shall** call the *tick_handler* method for each of the OSAPISYSTEM_MAX_TIMERS instances at least at the timer resolution rate returned by the OSAPI_SystemI.get_timer_resolution operation.	
Rationale	The Platform Integrator needs to periodically call the *tick_handler* method. The *tick_handler* is exposed to the Platform Integrator through the call to the OSAPI_SystemI.start_timer operation. The same tick handler method is used for each of the OSAPISYSTEM_MAX_TIMERS instances. The Platform Integrator needs to iterate through the instances of the timer and call the *tick_handler* method for each instance. RCC places no requirements on how the periodic calling is performed. The only requirement is that the tick handlers are called at the rate of the timer resolution or faster.

R-526.2	
The OSAPI_SystemI.get_timer_resolution operation **shall** return a value greater than 0 (zero) for the resolution of the clock used for the system timer.	
Rationale	The timer resolution is in nanoseconds.

R-526.3	
The OSAPI_SystemI.get_timer_resolution operation **shall** return 0 if the system has not been initialized.	
Rationale	

R-526.4	
The OSAPI_SystemI.get_time operation **shall** return the current system time as OSAPI_SystemTime through the *now* pointer and return RTI_TRUE on success.	
Rationale	The OSAPI_SystemTime type is defined by RCC. RCC relies on a system clock that monotonically increases. It is the caller's responsibility to provide a valid *now* pointer.

R-526.4.1	
The OSAPI_SystemI.get_time operation **shall** provide for the current system time a positive number of seconds and the number of nanoseconds in the range of 0 - 999999999.	
Rationale	

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R-526.4.2	
The OSAPI_SystemI.get_time operation **shall** return RTI_FALSE if the current system time is invalid.	
Rationale	The current system time is invalid if the seconds are negative or if the nanoseconds are outside of the range of 0 - 999999999.

R-526.5	
The OSAPI_SystemI.get_time operation **shall** return RTI_FALSE on failure.	
Rationale	The OSAPI_SystemI.get_time operation attempts to retrieve time from a clock implemented on the target platform. The Platform Integrator is responsible for implementing time keeping. The Platform Integrator is responsible for implementing the possible failure mechanisms for the target platform. Possible failure mechanisms include: • Invalid system time • Non-monotonic time

R-526.6	
The OSAPI_SystemI.initialize operation **shall** initialize the system and return RTI_TRUE on success.	
Rationale	RCC provides an interface that will be called to initialize the system. RCC does not have any requirements on how the system has to be initialized. The Platform Integrator could initialize variables and start periodic processes during initializations.

R-526.7	
The OSAPI_SystemI.initialize operation **shall** return RTI_FALSE on failure.	
Rationale	The OSAPI_SystemI.initialize operation can be used to call initialization sequences specified by the Platform Integrator. The Platform Integrator is responsible for determining whether the initialization was successful. Possible failure mechanisms could include: • Incomplete initialization • Unsuccessful subsystem initialization

R-526.8
The *OSAPI_SystemI.generate_uuid* operation **shall** provide a unique system id through the *uuid_out* pointer and return RTI_TRUE on success.

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R-526.8	
Rationale	The *uuid_out* parameter has the type struct OSAPI_SystemUUID. The struct OSAPI_SystemUUID declares a 128-bit value. RCC overwrites the first 2 bytes and the last 4 bytes of this value. The UUID is treated as an array of 16 octets: MSB: 16| 12| 8| 4| 0| Bytes 14-15 are overwritten with the RTI vendor ID. Bytes 0-3 are overwritten with the DDS Entity ID.

R-526.9	
The OSAPI_SystemI.generate_uuid operation **shall** return RTI_FALSE on failure.	
Rationale	The OSAPI_SystemI.generate_uuid operation will attempt to provide a UUID as implemented by the Platform Integrator. The Platform Integrator is responsible for determining the possible failure mechanisms.

R-526.10	
The OSAPI_SystemI.get_hostname operation **shall** return a hostname through the *hostname* pointer of up to OSAPI_SYSTEM_MAX_HOSTNAME bytes and return RTI_TRUE on success.	
Rationale	RCC does not interpret the hostname; it is only sent as informational knowledge during participant discovery. OSAPI_SYSTEM_MAX_HOSTNAME is defined by RCC.

R-526.11	
The OSAPI_SystemI.get_hostname operation **shall** return RTI_FALSE on failure.	
Rationale	The Platform Integrator is responsible for determining possible failure mechanisms. Failure mechanisms could include: • The *hostname* is NULL • The *hostname* can not be retrieved

R-526.13	
The OSAPI_SystemI.get_ticktime operation **shall** return the number of seconds (*sec*) and nanoseconds (*nanosec)* in increments of the timer resolution since the system started and return RTI_TRUE on success.	
Rationale	

R-526.14
The OSAPI_SystemI.get_ticktime operation **shall** return RTI_FALSE on failure or if the system has not been initialized.

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R-526.14	
Rationale	The OSAPI_SystemI.get_ticktime operation attempts to retrieve the current time in ticks. The Platform Integrator is responsible for determining the possible failure mechanisms. Possible failure mechanism include: • System has not been initialized • NULL pointer for the *sec* parameter • NULL pointer for the *nanosec* parameter

R-526.15	
The OSAPI_System_get_native_interface operation **shall** have the following signature: **Operations** | **Parameters** | **Type** OSAPI_System_get_native_interface | out: OSAPI_SystemI *intf | void	
Rationale	

R-526.15.1	
The OSAPI_System_get_native_interface operation **shall** return a pointer to an OSAPI_SystemI object that implements the OSAPI_SystemI interface through the *intf* parameter.	
Rationale	

R-526.15.2	
The OSAPI_System_get_native_interface operation **shall** return without updating the parameter *intf* if *intf* is 'nil'.	
Rationale	

200.1.7.1 Global Data	
Rationale	

R-526.16
The PSL **shall** initialize the global variable *OSAPI_System_gv_System* to an initialized singleton of type struct OSAPI_System.

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R-526.16	

Rationale	The type OSAPI_System is defined by RCC. It contains state information on the instance of the system. The global pointer variable *OSAPI_System_gv_System* is forward declared by RCC. The Platform Integrator is responsible for initializing the global variable *OSAPI_System_gv_System* to a singleton that inherits from OSAPI_System.
	
	The *OSAPI_System_gv_System* variable is the mechanism RCC uses to get access to the user defined OSAPI_System instance. As C doesn't support object orientation, this mechanism is supported by the implementation of an inheritance method that uses the inherited type as the first member of the derived type. This way, the Platform Integrator will be able to share information with RCC by using the same instance of the subclass of an OSAPI_System, with the extended attributes in the case of the derived type.
	
	An example of the system state structure is as follows:
	
	`struct OSAPI_SystemPosix`
	`{`
	`/* base-class */`
	`struct OSAPI_System _parent;`
	`struct OSAPI_SystemTimerHandler`
	`timer_handler[OSAPISYSTEM_MAX_TIMERS];`
	`OSAPI_Semaphore_T timed_sem_head;`
	`OSAPI_Semaphore_T *timer_sem;`
	`struct OSAPI_Thread *timer_thread;`
	`clockid_t rt_clock;`
	`struct OSPSL_SystemProperty psl_property;`
	`/*... */`
	`};`
	
	An example of the user defined structure is:
	
	`RTI_PRIVATE struct OSAPI_SystemPosix OSAPI_System_g =`
	`{`
	`._parent = OSAPI_System_INITIALIZER,`
	`.psl_property = OSPSL_SystemProperty_INITIALIZER`
	`/*... */`
	`};`
	
	An example of the assignment to the *OSAPI_System_gv_System* is shown below:
	
	`struct OSAPI_System *OSAPI_System_gv_System =`
	`&OSAPI_System_g._parent;`
	
	The Platform Integrator is responsible for not accessing the derived singleton using the global variable *OSAPI_System_gv_System* because RCC might update the variable *OSAPI_System_gv_System* to point to an internal singleton defined by RCC.
	
	The Platform Integrator is responsible for not accessing the private base class attributes.

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R-526.17	
The PSL **shall** have an instance of an OSAPI_System object.	
Rationale	An OSAPI_System object is used to initialize the global pointer variable *OSAPI_System_gv_System* and should endure for the lifetime of the application.

R-526.18	
The PSL **shall** initialize its instance of the OSAPI_System object with OSAPI_System_INITIALIZER.	
Rationale	OSAPI_System_INITIALIZER is defined by RCC.

200.1.8 Concurrency	
Rationale	

R-527.1
The following PSL operations **shall** be reentrant and thread-safe: • OSAPI_Heap_allocate_buffer • OSAPI_Mutex_new • OSAPI_Mutex_take • OSAPI_Mutex_give • OSAPI_Semaphore_new • OSAPI_Semaphore_take • OSAPI_Semaphore_give • OSAPI_Process_getpid • OSAPI_Memory_copy • OSAPI_Memory_zero • OSAPI_Memory_compare • OSAPI_Memory_fndchr • OSAPI_Memory_move • OSAPI_String_length • OSAPI_String_cmp • OSAPI_String_ncmp • OSAPI_SystemI.get_timer_resolution • OSAPI_SystemI.get_time • OSAPI_SystemI.start_timer • OSAPI_SystemI.generate_uuid • OSAPI_SystemI.get_hostname • OSAPI_SystemI.initialize • OSAPI_SystemI.get_ticktime

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R-527.1	
Rationale	An operation is thread-safe if it guarantees safe execution by multiple threads at the same time, either by multitasking or real parallelism. A function is reentrant if it can be interrupted at any point during its execution and then safely called again before its previous invocations complete execution, such as a recursive function.

200.1.9 Debug support

Debug Support Integration

The Platform Integrator is responsible for implementing the following Debug support APIs.

- OSAPI_Log_get_last_error_code()
- OSAPI_Log_set_last_error_code()

Rationale	

R-528.1

The OSAPI_Log_get_last_error_code operation **shall** have the following signature when debugging is enabled:

Operations	Parameters	Type
OSAPI_Log_get_last_error_code	in: *void*	RTI_INT32

Rationale	This function is only defined when debugging is enabled for the build. If debugging is disabled, it should not be defined.

R-528.1.1

The OSAPI_Log_get_last_error_code operation **shall** return the last error code tracked by the platform.

Rationale	

R-528.1.2

The OSAPI_Log_get_last_error_code operation **shall** only be defined when debugging is enabled.

Rationale	

R-528.10

The OSAPI_Log_set_last_error_code operation **shall** have the following signature when debugging is enabled:

Operations	Parameters	Type
OSAPI_Log_set_last_error_code	in: *RTI_INT32* err	void

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R-528.10	
Rationale	This function is only defined when debugging is enabled for the build. If debugging is disabled, it should not be defined.

R-528.10.1
The OSAPI_Log_set_last_error_code operation **shall** set the last error code tracked by the platform to the value of the parameter *err*.
Rationale

R-528.10.2
The OSAPI_Log_set_last_error_code operation **shall** only be defined when debugging is enabled.
Rationale

200.2 PSL NETIO_DGRAM

NETIO Datagram (DGRAM) Transport plugin

RCC provides a generic transport plugin service called the NETIO Datagram (DGRAM) Transport plugin. The DGRAM Transport plugin supports transmission and reception of RTPS messages over a connectionless network link.

It is not required to integrate with NETIO_DGRAM. However, without an integration with NETIO_DGRAM, it is only possible to communicate within the same *DomainParticipant*. The NETIO_DGRAM transport plugin provides an interface used to enable support for a network stack. The DGRAM Transport plugin API only provides functionality related to connectionless network links. Functionality related to establishing connections, such as TCP, is not provided.

The interface provided by the DGRAM Transport plugin is defined in the NETIO_DGRAM_InterfaceI data structure. An implementation for each of the interfaces defined in the NETIO_DGRAM_InterfaceI data structure is provided by the Platform Integrator. The Platform Integrator uses the interface to incorporate the network stack of their choosing.

The NETIO_DGRAM consists of an upstream and downstream layer:

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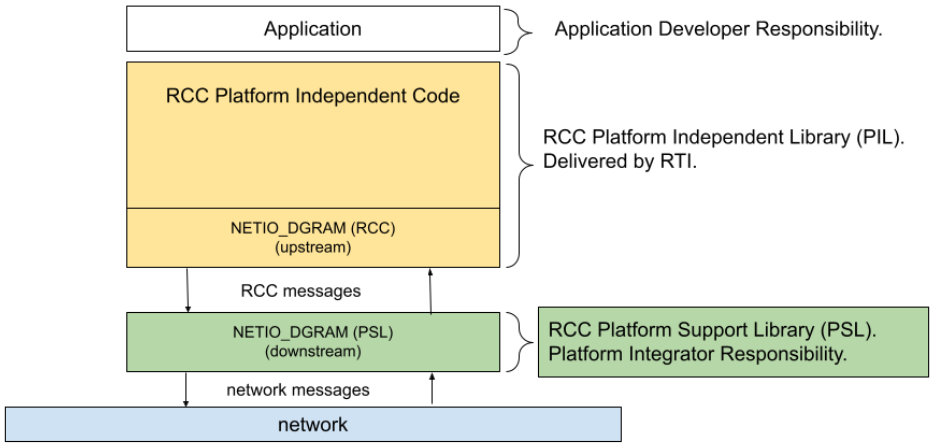
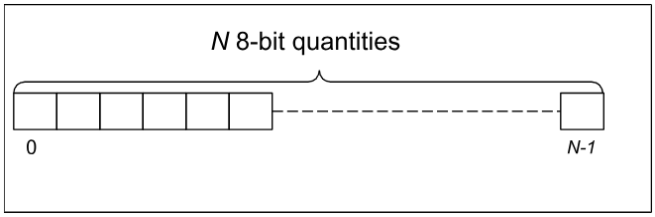
200.2 PSL NETIO_DGRAM



An RCC message is an opaque sequence of N 8-bit quantities:



The structure of the network message is defined by the PSL. Note that N is allowed, but not required to be, a multiple of 2. Any requirements to message length and alignment by the PSL shall be implemented by the PSL.

The upstream layer integrates with RCC and provides management functionality. This layer is provided by RTI as part of the RCC library.

The downstream layer integrates with NETIO_DGRAM and is responsible for sending messages from the upstream layer to the network and receiving messages from the network and forwarding them to the upstream layer.

NOTE: The current architecture of the RCC NETIO DGRAM does not support reliability when transmitting and receiving network data within the same execution context. The Platform Integrator should avoid utilizing reliability Quality of Service configurations when testing using a loopback that has calls to transmit and receive operations within the same execution context. A Best Effort Quality of Service may be appropriate.

NETIO_DGRAM Life-Cycle

The figure below shows how the NETIO_DGRAM transport is created and initialized by a *DomainParticipant:*

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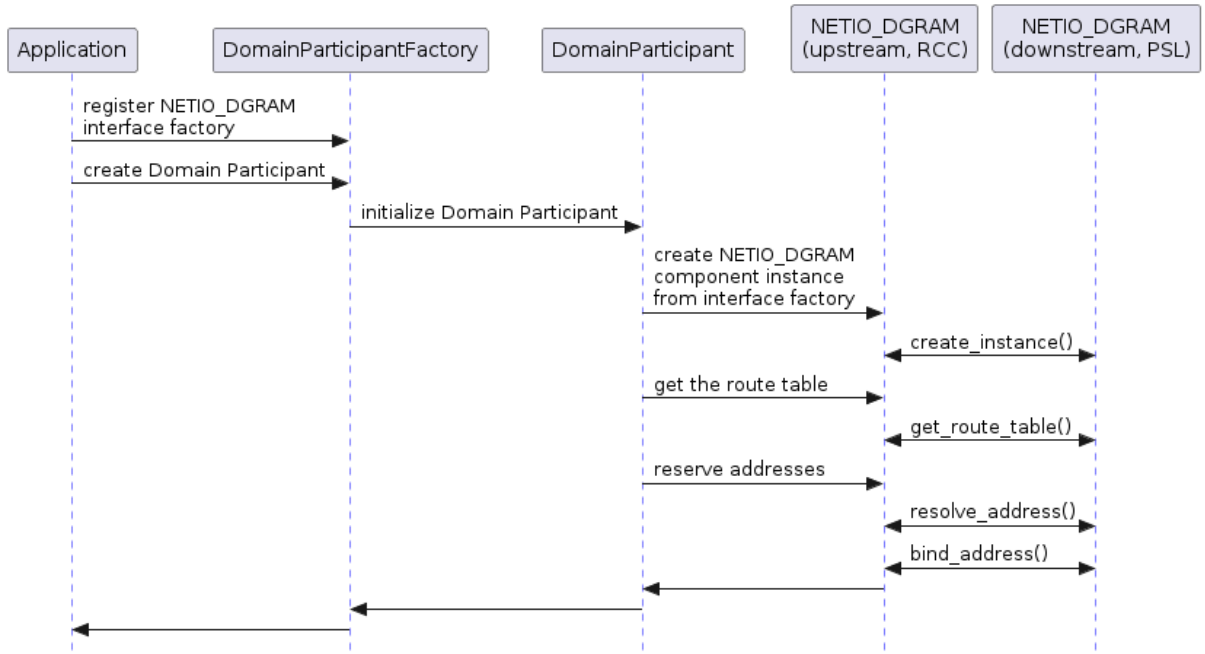
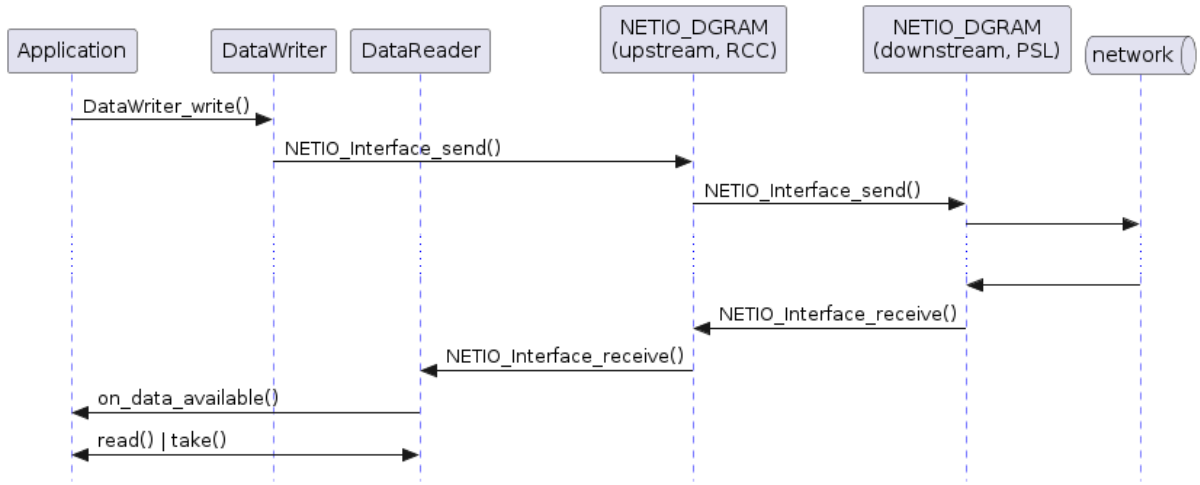
200.2 PSL NETIO_DGRAM



All messages in the sequence from the "Application" through "NETIO_DGRAM (upstream, RCC)" use only descriptions of the calls that are used. The messages between "NETIO_DGRAM (upstream, RCC)" and "NETIO_DGRAM (upstream, PSL)" use the actual attribute names of the NETIO DGRAM Interface.

A *DomainParticipant* creates one instance of each transport that has been enabled in the DDS_DomainParticipantQos.transports.enabled_transports.

The figure below shows how RCC messages are sent and received:



The sequence diagram above shows the actual names of the operations used during the sending and reception of data.

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200.2 PSL NETIO_DGRAM	
Rationale	

200.2.1 DGRAM Transport plugin API
The NETIO DGRAM Transport plugin is defined by the members of the NETIO_DGRAM_InterfaceI structure. The NETIO DGRAM Transport API consists of functions which are used to implement a user specified datagram transport. The NETIO DGRAM Transport API is implemented as an interface using function pointers instead of an implementation using function prototypes. The NETIO_DGRAM transport interface is defined by the NETIO_DGRAM_InterfaceI type. The user's datagram transport will be registered in the application by a call to the NETIO_DGRAM_InterfaceFactory_register function which is provided by RCC. The Platform Integrator creates functions to implement each of the function pointer structure members in the NETIO_DGRAM_InterfaceI structure. The Platform Integrator assigns each of the created functions to the appropriate member of the NETIO_DGRAM_InterfaceI structure.
Rationale

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R-550.1

To create a NETIO_DGRAM transport plugin implementation, an instance of the NETIO_DGRAM_InterfaceI structure **shall** be created and its member attributes assigned function pointers to functions that implement the interfaces described in the table below:

NETIO_DGRAM_InterfaceI Attribute	**Parameters**	**Type**
create_instance	in: *NETIO_Interface_T* *upstream in: *void* *property	NETIO_Interface_T*
get_interface_list	in: *NETIO_Interface_T* *user_intf inout: *struct NETIO_DGRAM_InterfaceTableEntrySeq* *if_table	RTI_BOOL
release_address	in: *NETIO_Interface_T* *self in: *struct NETIO_Address* *src_addr	RTI_BOOL
resolve_address	in: *NETIO_Interface_T* *netio_intf in: *const struct NETIO_DGRAM_InterfaceTableEntry* *if_entry in: *const char* *address_string out: *struct NETIO_Address* *address_value out: *RTI_BOOL* *invalid	RTI_BOOL
send	in: *NETIO_Interface_T* *self in: *struct NETIO_Interface* *source in: *struct NETIO_Address* *destination in: *NETIO_Packet_T* *packet	RTI_BOOL
get_route_table	in: *NETIO_Interface_T* *netio_intf inout: *struct NETIO_AddressSeq* *address inout: *struct NETIO_NetmaskSeq* *netmask	RTI_BOOL
bind_address	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *source	RTI_BOOL

Rationale

RCC provides the definition of the NETIO_DGRAM_InterfaceI structure. To implement the interface, functions need to be created that can be assigned to the attributes of the structure. The names of the functions created to implement the interface are arbitrary and are at the discretion of the implementer since function pointers are used to assign those functions to the member attributes.

The Platform Integrator is allowed to assign the resolve_address attribute to NULL if desired. If the resolve_address attribute is NULL, then the RCC provided implementation for the resolve_address operation will be used. If resolve_address is NULL then the RCC will resolve addresses in the dotted IPv4 notation. When the RCC provided implementation is used, then the resolve_address operation will not convert the IPv4 address_string if the *if_entry.locator_kind* is different from NETIO_ADDRESS_KIND_UDPv4.

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R-550.1.1	
The NETIO_DGRAM_InterfaceI.create_instance operation **shall** return a non-NULL pointer to an instance of an interface of type NETIO_Interface_T on success.	
Rationale	The structure member NETIO_DGRAM_InterfaceI.create_instance is used to allocate and instantiate any resources needed for the user's desired transport. The created NETIO_Interface_T instance will later be used to send packets of type NETIO_Packet_T. RCC will try to send packets using the NETIO_DGRAM_InterfaceI.send operation. RCC will receive packets when this implementation calls the NETIO_DGRAM_Interface_upstream_receive operation with upstream as the *netio_intf* parameter, meaning that upstream has to be saved. The property parameter carries the information passed to the NETIO_DGRAM_InterfaceFactory_register operation as the user properties. The property parameter can be used to provide properties needed by the NETIO_DGRAM_InterfaceI.create_instance. The use of the property parameter is at the discretion of the implementer. A pointer to the property structure could have a NULL value. The user can leverage a derived type from the base type NETIO_Interface_T in order to save all the needed resources for the internal operation of the interface (such as the upstream parameter), but will have to return a pointer to a downcast version of it.

R-550.1.1.1	
The PSL **shall** not use the *upstream* NETIO_Interface_T parameter to call RCC APIs in the implementation of NETIO_DGRAM_InterfaceI.create_instance.	
Rationale	The instance of an interface of type NETIO_Interface_T is not fully initialized by the time the NETIO_DGRAM_InterfaceI.create_instance is called by RCC.

R-550.1.2	
The NETIO_DGRAM_InterfaceI.create_instance operation **shall** return NULL on failure.	
Rationale	The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • Insufficient memory for allocations • Resources are not available • Insufficient access permissions • Improper values for parameters

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R-550.1.3	

The NETIO_DGRAM_InterfaceI.get_interface_list operation **shall** return the available network interfaces to the *if_table* parameter for the NETIO_DGRAM interface passed in *user_intf*, where for each element of the *if_table* <*entry*> the following criteria are met:
 	
• <*entry.address*> is not within <*entry.multicast_group*> **AND**
• <*entry.multicast_group.netmask.bits*> is not less than 0 and not greater than 128 **AND**
• <*entry.multicast_group.netmask.mask*> all array elements are zeroes **AND**
• <*entry.locator_kind*>
  ○ is greater than 0 and less than NETIO_ADDRESS_RTPS_RESERVED_LOW **OR**
  ○ is greater than NETIO_ADDRESS_RTPS_RESERVED_HIGH
 	
and return RTI_TRUE on success.	

Rationale	The NETIO_DGRAM_InterfaceI.get_interface_list operation will retrieve only available interfaces that meet the criteria and append them to the *if_table* sequence. RCC provides the definition of NETIO_ADDRESS_RTPS_RESERVED_LOW and NETIO_ADDRESS_RTPS_RESERVED_HIGH. The <e*ntry.multicast_group.netmask.bits*> field is of type RTI_UINT32.

R-550.1.3.1	
The NETIO_DGRAM_InterfaceI.get_interface_list operation **shall** return RTI_TRUE without updating the *if_table* sequence if there are no available interfaces.	
Rationale	

R-550.1.4	
The NETIO_DGRAM_InterfaceI.get_interface_list operation **shall** return RTI_FALSE on failure.	
Rationale	The possible sources of failure for this method are at the discretion of the Platform Integrator. One possible failure could be insufficient space in the *if_table* to append additional interfaces.On a failure, the Platform Integrator may elect to update the *if_table* sequence. A failure of the NETIO_DGRAM_InterfaceI.get_interface_list operation will result in a failure during initialization.

R-550.1.5	
The NETIO_DGRAM_InterfaceI.release_address operation **shall** cause the NETIO_DGRAM interface specified by *self* to stop listening to messages from the address *src_addr* and return RTI_TRUE on success.	
Rationale	When the resources associated with the *src_addr* are no longer needed by the NETIO_DGRAM transport, this function is called by the upstream interface so the resources can be released. When an address is released, no more messages are expected from this address. The resources associated with the *src_addr* were previously created by a successful call to the NETIO_DGRAM_InterfaceI.bind_address operation.

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R-550.1.6	
The NETIO_DGRAM_InterfaceI.release_address operation **shall** return RTI_FALSE on failure.	
Rationale	

R-550.1.7	
The NETIO_DGRAM_InterfaceI.resolve_address operation **shall** convert an *address_string* that is a valid address for the NETIO_DGRAM interface specified by *netio_intf* to an *address_value* using the locator kind information stored in the interface table *if_entry*, set the value pointed to by *invalid* to RTI_FALSE, **AND** return RTI_TRUE on successful conversion.	
Rationale	An address is valid when it meets the requirements of the user's desired transport. The NETIO_DGRAM_InterfaceI.resolve_address operation is successful only when *address_string* is valid. Note that RCC ignores the values returned by PSL in the *address_value.port* and *address_value.kind* attributes. RCC overwrites the values assigned to the *address_value.port* and *address_value.kind* attributes during the execution of the NETIO_DGRAM_InterfaceI.*resolve_address* operation.

R-550.1.7.1	
If the locator_kind of the interface entry *if_entry* is NETIO_ADDRESS_KIND_UDPv4 and the address_string is an IPv4 address, then the NETIO_DGRAM_InterfaceI.resolve_address operation **shall** convert the *address_string* in dotted notation "a.b.c.d" to *address_value.value.address.octet* in the following form in network order: Byte 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Value a b c d 0 0 0 0 0 0 0 0 0 0 0 0 0	
Rationale	IPv4 address means, it is specified in dotted notation "a.b.c.d", where a, b, c, d are numbers not greater than 255. The locator_kind information is stored in the interface table *if_entry.* When the locator_kind is NETIO_ADDRESS_KIND_UDPv6, then the format is specified in the RTPS specification.

R-550.1.8	
The NETIO_DGRAM_InterfaceI.resolve_address operation **shall** return RTI_FALSE on failure.	
Rationale	Failure modes are determined by the implementer of this method. Examples of failures can include: • Invalid address in the *address_string* • Conversion failure of a valid address string

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R-550.1.8.1	
If the *address_string* provided to the NETIO_DGRAM_InterfaceI.resolve_address operation is an invalid address for the NETIO_DGRAM interface specified by *netio_intf*, the NETIO_DGRAM_InterfaceI.resolve_address operation **shall** set the value pointed to by *invalid* to RTI_TRUE, otherwise set it to RTI_FALSE.	
Rationale	This requirements describes how the *invalid* parameter is set depending on the failure that occur. This failure situation will return RTI_FALSE.

R-550.1.9	
The NETIO_DGRAM_InterfaceI.send operation **shall** send the *packet* from *source* to the *destination* using the NETIO_Interface_T object *self* and return RTI_TRUE on success.	
Rationale	Sending data from RCC to the DDS databus is accomplished when RCC calls the NETIO_DGRAM_InterfaceI.send operation. The *self* parameter is a pointer to a NETIO_Interface_T which was previously created during the call to the NETIO_DGRAM_InterfaceI.create_instance operation. The operation should not modify the contents of the NETIO_Packet_T packet.

R-550.1.10	
The NETIO_DGRAM_InterfaceI.send operation **shall** return RTI_FALSE on failure.	
Rationale	The implementation of the NETIO_DGRAM_InterfaceI.send operation is at the discretion of the Platform Integrator. RCC uses the return code provided by the operation to handle success or failure. The Platform Integrator determines when and how the NETIO_DGRAM_InterfaceI.send operation fails.

R-550.1.11	
The NETIO_DGRAM_InterfaceI.get_route_table operation **shall** retrieve a sequence of all addresses as *address* and a sequence of all netmasks as *netmask* from the routing table that the NETIO_DGRAM interface can send to and return RTI_TRUE on success.	
Rationale	The NETIO_DGRAM_InterfaceI.get_route_table operation is used to retrieve the current route table associated with the interface *netio_intf* and this information will be used by RCC to determine if the interface is able to send packets to a specific NETIO_Address destination. The implementor is responsible for determining and storing the routes applicable for the desired transport. Some platforms may have fixed routes while others may be determined dynamically. The route table could be stored separately from the *netio_intf* or in conjunction with it - as a part of the property *user_property* (optionally provided during the registration of the DGRAM transport; i.e., a NETIO_DGRAM_InterfaceFactory_register function call) which automatically associates property data with the registered DGRAM transport.

R-550.1.12	
The NETIO_DGRAM_InterfaceI.get_route_table operation **shall** return RTI_FALSE on failure.	
Rationale	

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R-550.1.13	
The NETIO_DGRAM_InterfaceI.bind_address operation **shall** cause the interface specified by *user_intf* to listen for messages from the address specified by *source* and return RTI_TRUE on success.	
Rationale	When an address is bound to an interface, the interface will listen for messages sent from the address indicated from *source.* Before attempting to bind to the *source* address, the Platform Integrator should check that the *source* address is not already bound on the interface provided in *user_intf* according to the requirements of the desired transport.

R-550.1.14	
The NETIO_DGRAM_InterfaceI.bind_address operation **shall** return RTI_FALSE on failure.	
Rationale	

R-550.1.15	
The Platform Integrator **shall** use the NETIO_DGRAM_Interface_upstream_receive operation to forward a NETIO_Packet_T *packet* that contains payload data received from the network and a NETIO_Address *source* to the upstream interface specified by the *netio_intf* parameter upon reception of data from the platform's network stack.	
Rationale	The NETIO_DGRAM_Interface_upstream_receive operation is provided by RCC. RCC does not place any requirements on how data is received from the network. The Platform Integrator has complete authority on how it is collected from the network. The Platform Integrator can use the NETIO_Packet_set_payload operation provided by RCC to set the payload in the NETIO_Packet_T *packet*.

200.2.2 DGRAM Component Registration

DGRAM Component Registration

Once the Platform Integrator implements the API defined in the NETIO_DGRAM_InterfaceI struct, the DGRAM transport plugin is to be registered.

A RCC component called DGRAM is created when the DGRAM transport plugin is registered. To create the DGRAM component, a call to the NETIO_DGRAM_InterfaceFactory_register function is made by the application developer. The NETIO_DGRAM_InterfaceFactory_register function registers the DGRAM Transport Plugin and links the NETIO_DGRAM_InterfaceI implementation.

Rationale	

200.2.3 Concurrency	
Rationale	

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R-551.1	
The following NETIO_DGRAM_InterfaceI operations shall be reentrant and thread-safe: • NETIO_DGRAM_InterfaceI.create_instance • NETIO_DGRAM_InterfaceI.get_interface_list • NETIO_DGRAM_InterfaceI.release_address • NETIO_DGRAM_InterfaceI.resolve_address • NETIO_DGRAM_InterfaceI.send • NETIO_DGRAM_InterfaceI.get_route_table • NETIO_DGRAM_InterfaceI.bind_address	
Rationale	An operation is thread-safe if it guarantees safe execution by multiple threads at the same time, either by multitasking or real parallelism. A function is reentrant if it can be interrupted at any point during its execution and then safely called again before its previous invocations complete execution, such as a recursive function.

200.3 PSL Data Types	
Rationale	

R-560.1
The PSL **shall** access the following RCC-defined data types (atomically where noted) and ensure that the minimum required alignment is met:

Type	Size (bit)	Minimum Required Alignment (in bits)	Atomic access
RTI_INT8	8	8	Yes
RTI_UINT8	8	8	Yes
RTI_INT16	16	16	Yes
RTI_UINT16	16	16	Yes
RTI_INT32	32	32	Yes
RTI_UINT32	32	32	Yes
RTI_INT64	64	32	No
RTI_UINT64	64	32	No
RTI_FLOAT32	32	32	No
RTI_DOUBLE64	64	32	No
RTI_DOUBLE128	128	8	No
RTI_BOOL	32	32	Yes
RTI_SIZE_T	32	32	Yes
OSAPI_Alignment_T	32	32	Yes

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R-560.1	
Rationale	Atomic access means that access to a variable of a given type is guaranteed to be atomic. This typically means single cycle bus access or a bus arbiter that ensures that updating a primitive type is an atomic bus transaction. RCC does not make any assumptions on the binary format of the RTI_DOUBLE128 type and treats it as an opaque array of 16 octets.

200.4 PSL Type Plugin

RCC provides a generic Type service called the Type plugin. The Type plugin support includes the following operations for data types: serialization, deserialization, sample creation, and sample deletion.

For RCC to publish and subscribe to topics of user-defined types, the types need to be defined and programmatically registered with RCC. A registered type is then serialized and deserialized by RCC through a pluggable Type interface that the Platform Integrator must implement for each type.

The interface provided by the Type plugin is defined in the NDDS_Type_Plugin data structure. An implementation for each of the interfaces defined in the NDDS_Type_Plugin data structure is provided by the Platform Integrator.

The Platform Integrator may manually implement each new type, but there is a strong suggestion to use the *rtiddsgen* utility provided by RCC for automatically generating type support code.

The Type Plugin requirements are not obligatory to be implemented as *rtiddsgen* should preferably be used. They are provided in the Integration Manual for completeness, in case the user or integrator chooses to implement the plugins without the assistance of *rtiddsgen*. They are also used to verify type support code on the target platform.

Rationale	

R-700.0

To create a Type plugin implementation, an instance of the NDDS_Type_Plugin structure **shall** be created with the following member attributes assigned function pointers to functions that implement the interfaces described in the table below:

NDDS_Type_Plugin Attribute	Parameters	Type
serialize_data	in: *struct CDR_Stream_t* *stream in: *const void* *sample in: *void* *param	RTI_BOOL
deserialize_data	in: *struct CDR_Stream_t* *stream out: *void* *sample in: *void* *param	RTI_BOOL
serialize_key	in: *struct CDR_Stream_t* *stream in: *const void* *sample in: *void* *param	RTI_BOOL

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R-700.0

deserialize_key	in: *struct CDR_Stream_t* *stream out: *void* *sample in: *void* *param	RTI_BOOL
get_serialized_sample_max_size	in: *struct NDDS_Type_Plugin* *plugin in: *RTI_UINT32* current_alignment in: *void* *param	RTI_UINT32
get_serialized_key_max_size	in: *struct NDDS_Type_Plugin* *plugin in: *RTI_UINT32* current_alignment in: *void* *param	RTI_UINT32
create_sample	in: *struct NDDS_Type_Plugin* *plugin out: *void* **sample in: *void* *param	RTI_BOOL
delete_sample	in: *struct NDDS_Type_Plugin* *plugin in: *void* *sample in: *void* *param	RTI_BOOL
copy_sample	in: *struct NDDS_Type_Plugin* *plugin out: *void* *dst in: *void* *src in: *void* *param	RTI_BOOL
get_key_kind	in: *struct NDDS_Type_Plugin* *plugin in: *void* *param	NDDS_TypePluginKeyKind
instance_to_keyhash	in: *struct NDDS_Type_Plugin* *plugin in: *struct CDR_Stream_t* *stream out: *DDS_KeyHash_t* *key_hash in: *const void* *instance in: *void* *param	RTI_BOOL
create_typed_datareader	in: *void* *reader	void*
create_typed_datawriter	in: *void* *writer	void*
delete_typed_datareader	in: *void* *wrapper	void
delete_typed_datawriter	in: *void* *wrapper	void

Rationale

RCC provides the definition of the NDDS_Type_Plugin structure. To implement the interface, functions need to be created that can be assigned to the attributes of the structure. The names of the functions created to implement the interface are arbitrary and are at the discretion of the implementer since function pointers are used to assign those functions to the member attributes.

The *rtiddsgen* utility is provided by RCC for automatically generating type support code rather than manually implementing each new type by the Platform Integrator.

200.4.1 TypePlugin serialize_data

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200.4.1 TypePlugin serialize_data	
Rationale	

R-700.1
The serialize_data operation **shall** serialize a sample into a *Stream_t* instance, performing a transformation from its in-memory representation to the equivalent network representation obtained by using serialization rules defined by the CDR specification.
Rationale

200.4.2 TypePlugin deserialize_data	
Rationale	

R-700.2
The deserialize_data operation **shall** deserialize a sample from a *Stream_t* instance, performing a transformation from its network representation obtained by using serialization rules defined by the CDR specification to its equivalent in-memory representation.
Rationale

200.4.3 TypePlugin get_serialized_sample_max_size	
Rationale	

R-700.3
The get_serialized_sample_max_size operation **shall** retrieve the maximum size (in bytes) of a sample when serialized into network representation, using serialization rules defined by the CDR specification.
Rationale

200.4.4 TypePlugin create_sample	
Rationale	

R-700.4
The create_sample operation **shall** retrieve a sample, possibly allocating and initializing the memory required to store it.
Rationale

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200.4.5 TypePlugin copy_sample	
Rationale	

R-700.5	
The copy_sample operation **shall** perform a deep copy of all attributes from one sample to another.	
Rationale	

200.4.6 TypePlugin serialize_key	
Rationale	

R-700.6	
The serialize_key operation **shall** serialize a key provided as *sample* into a *Stream_t* instance, performing a transformation from its in-memory representation to the equivalent network representation obtained by using serialization rules defined by the CDR specification.	
Rationale	

200.4.7 TypePlugin deserialize_key	
Rationale	

R-700.7	
The deserialize_key operation **shall** deserialize a key from a *Stream_t* instance to *sample*, performing a transformation from its network representation obtained by using serialization rules defined by the CDR specification to its equivalent in-memory representation.	
Rationale	

200.4.8 TypePlugin get_serialized_key_max_size	
Rationale	

R-700.8	
The get_serialized_key_max_size operation **shall** retrieve the maximum size (in bytes) of a key when serialized into network representation, using serialization rules defined by the CDR specification.	
Rationale	

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200.4.9 TypePlugin get_key_kind	
The get_key_kind operation is implemented by the **PluginHelper_get_key_kind** function.	
Rationale	

R-700.9	
The **PluginHelper_get_key_kind** function defined in RCC **shall** be used as the implementation of the get_key_kind operation.	
Rationale	

200.4.10 TypePlugin instance_to_keyhash	
The instance_to_keyhash operation is implemented by the **PluginHelper_instance_to_keyhash** function.	
Rationale	

R-700.10	
The **PluginHelper_instance_to_keyhash** function defined in RCC **shall** be used as the implementation of the instance_to_keyhash operation.	
Rationale	

200.5 Zero Copy Transfer

This section describes the Platform Integrator's responsibilities to integrate the Zero Copy transfer implementation with the RCC PIL.The following sections contain information about Zero Copy transfer and the requirements for supporting the Zero Copy v2 transport within the PSL.

In the context of RCC, “Zero Copy v2” refers to a data transport that can effectively present data, written by some DDS *DataWriter*, to a DDS *DataReader*, with very low latency compared to traditional UDP-based transports.

The Zero Copy v2 transport gets its name from the fact that no user data is actually “moved” over a network, which would involve multiple copies of that data at various stages (i.e., between the user application and the middleware, and between the middleware and the operating system). Instead, when using the Zero Copy v2 transport, the producer of the data (a DDS *DataWriter*) writes the instance of that data to some location in memory that is also accessible to the data consumer (one or more DDS *DataReaders*.) With this configuration, all consumers observe the actual memory being modified by the producer. A signaling mechanism referred to as SHMEM Notification Mechanism (Notif) alerts consumers that new data is available. This mechanism is very lightweight and utilizes shared memory, similar to the user data itself. In the Zero Copy v2 transport, Notif refers to the shared memory mechanism that allows signaling and synchronization between matched *DataWriters* and *DataReaders*.

The reduced latency resulting from fewer copies benefits a broad range of applications.

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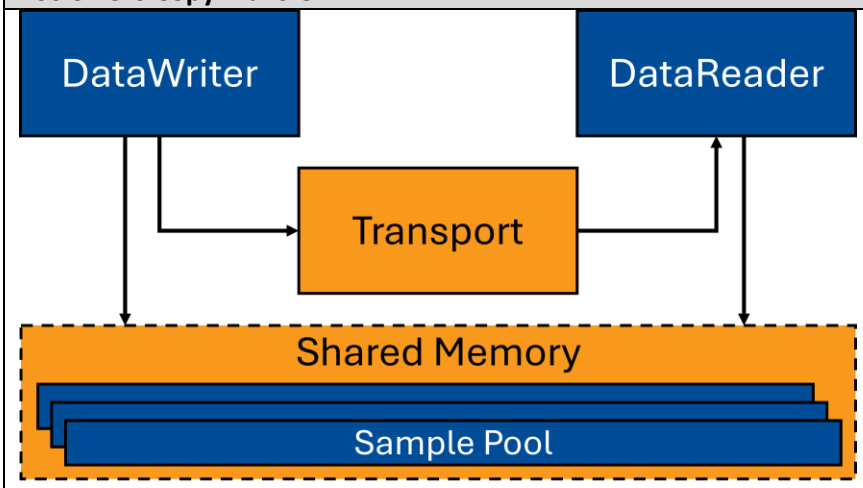
200.5 Zero Copy Transfer



Terminology

Acronyms and Abbreviations	
ZCv2	Zero Copy v2
SHMEM	Shared Memory
Notif	Notification Mechanism

Concurrency

All PSL APIs have information about concurrency and thread-safety included in the API reference manuals. It is important that an application does not violate thread-safety and concurrency guidance. The Platform Integrator may create multiple threads as part of the implementation of the PSL, but from an application point of view, there is only a single critical section protecting all DDS resources within a *DomainParticipant*.

The Platform Integrator is responsible for implementing the concurrency and reentrancy requirements for PSL interfaces described in subsequent sections.

Rationale	

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200.5.1 Zero Copy v2 PSL OSAPI	
Zero Copy v2 PSL OSAPI Integration (ZCv2 OSAPI) RCC's ZCv2 OSAPI is an abstract API consisting of a set of functions implemented in the PSL to satisfy the interface requirements of the PIL for the Zero Copy transfer feature. The ZCv2 OSAPI is implemented using Operating System-dependent APIs, specifically those pertaining to the following areas: • Shared memory segment • ZCv2 OSAPI Type Plugin	
Rationale	

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200.5.1.1 SHMEM Segment

SHMEM Segment Integration

RCC provides API for creating, managing, and interrogating segments of shared memory. Shared memory segments allow data access between processes that share memory.
RCC creates shared memory segments to facilitate data exchange without the need to copy data.

The Platform Integrator is responsible for implementing the following SHMEM Segment APIs:

- OSAPI_SharedMemorySegment_exists()
- OSAPI_SharedMemorySegment_get_max_size()
- OSAPI_SharedMemorySegment_is_owner_alive()
- OSAPI_SharedMemorySegmentHandle_get_size()
- OSAPI_SharedMemorySegmentHeader_get_size()
- OSAPI_SharedMemorySegment_create_impl()
- OSAPI_SharedMemorySegment_delete_impl()
- OSAPI_SharedMemorySegment_attach_impl()
- OSAPI_SharedMemorySegment_detach_impl()
- OSAPI_SharedMemorySegment_lock_impl()
- OSAPI_SharedMemorySegment_unlock_impl()
- OSAPI_SharedMemorySegment_mark_consistent_impl()

Data types used by the SHMEM Segment API:

- struct OSAPI_SharedMemorySegmentHandle
- OSAPI_SHMEM_MODE
- OSAPI_SHMEM_STATUS

The OSAPI_SharedMemorySegmentHandle data structure is used to interact with a shared memory segment. It is initialized by the OSAPI_SharedMemorySegment_create_impl and OSAPI_SharedMemorySegment_attach_impl operations. The composition of the OSAPI_SharedMemorySegmentHandle data structure is defined by RCC. It contains information necessary to interact with a specific shared memory segment.

OSAPI_SHMEM_MODE is an enumerated type that defines specific capabilities of a shared memory segment.

OSAPI_SHMEM_STATUS is an enumerated type that defines the possible states of a shared memory segment.

Rationale	

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R-601.1	
The OSAPI_SharedMemorySegment_exists operation **shall** have the following signature:	

Operations	Parameters	Type
OSAPI_SharedMemorySegment_exists	in: *const char* *name	RTI_BOOL

Rationale	*name* is the OSAPI_SharedMemorySegment name to lookup in the system.

R-601.1.1
The OSAPI_SharedMemorySegment_exists operation **shall** return RTI_TRUE if the OSAPI_SharedMemorySegment referenced by the name parameter exists.
Rationale

R-601.1.2
The OSAPI_SharedMemorySegment_exists operation **shall** return RTI_FALSE if the OSAPI_SharedMemorySegment referenced by the *name* parameter does not exist or if it cannot be determined.
Rationale

R-601.2
The OSAPI_SharedMemorySegment_get_max_size operation **shall** have the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_get_max_size	in: *void*	RTI_UINT64

Rationale

R-601.2.1
The OSAPI_SharedMemorySegment_get_max_size operation **shall** return the maximum number of bytes an OSAPI_SharedMemorySegment can hold.
Rationale This operation is infallible.

R-601.3
The OSAPI_SharedMemorySegment_is_owner_alive operation **shall** have the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_is_owner_alive	in: *struct OSAPI_SharedMemorySegmentHandle* *handle out: *RTI_BOOL* *alive	RTI_BOOL

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R-601.3	
Rationale	*handle* is the handle to the OSAPI_SharedMemorySegment. *alive* carries out information about the liveliness of the OSAPI_SharedMemorySegment owner.

R-601.3.1	
The OSAPI_SharedMemorySegment_is_owner_alive operation, upon success, **shall** set alive to RTI_TRUE if the owner of the OSAPI_SharedMemorySegment referenced by its *handle* parameter is alive or to RTI_FALSE otherwise, and return RTI_TRUE.	
Rationale	The owner is the execution context that creates the shared OSAPI_SharedMemorySegment.

R-601.3.2	
The OSAPI_SharedMemorySegment_is_owner_alive operation **shall** return RTI_FALSE if the liveliness of the OSAPI_SharedMemorySegment owner referenced by the *handle* parameter cannot be determined.	
Rationale	

R-601.4		
The OSAPI_SharedMemorySegmentHandle_get_size operation **shall** have the following signature:		
Operations	**Parameters**	**Type**
OSAPI_SharedMemorySegmentHandle_get_size	in: *OSAPI_SHMEM_MODE* mode	RTI_SIZE_T
Rationale	*mode* is the requested OSAPI_SharedMemorySegmentHandle mode for the query. The *OSAPI_SHMEM_MODE* enum is declared by the PIL.	

R-601.4.1	
The OSAPI_SharedMemorySegmentHandle_get_size operation **shall** return the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT that is higher than or equal to the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter.	
Rationale	This operation is infallible. The OSAPI_SHARED_MEMORY_ALIGNMENT value is declared by the PIL.

R-601.5		
The OSAPI_SharedMemorySegmentHeader_get_size operation **shall** have the following signature:		
Operations	**Parameters**	**Type**
OSAPI_SharedMemorySegmentHeader_get_size	in: *OSAPI_SHMEM_MODE* mode	RTI_SIZE_T
Rationale	*mode* is the requested OSAPI_SharedMemorySegmentHeader mode for the query. The *OSAPI_SHMEM_MODE* enum is declared by the PIL.	

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R-601.5.1	
The OSAPI_SharedMemorySegmentHeader_get_size operation **shall** return the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT that is higher than or equal to the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the mode parameter.	
Rationale	This operation is infallible. The OSAPI_SHARED_MEMORY_ALIGNMENT value is declared by the PIL.

R-601.6

The OSAPI_SharedMemorySegment_create_impl operation **shall** have the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_create_impl	inout: *struct OSAPI_SharedMemorySegmentHandle* *handle in: *const char* *name in: *RTI_UINT64* size in: *OSAPI_SHMEM_MODE* mode out: *RTI_BOOL* *exists	RTI_BOOL

Rationale	
	handle is the handle to the OSAPI_SharedMemorySegment. *name* is the name to create the OSAPI_SharedMemorySegment with. *size* is the minimum size to create the OSAPI_SharedMemorySegment with. *mode* is the mode to create the OSAPI_SharedMemorySegment with. *exists* carries out information about the current existence of another OSAPI_SharedMemorySegment with the same name.

R-601.6.1

The OSAPI_SharedMemorySegment_create_impl operation **shall**:

- attempt to create a new initialized OSAPI_SharedMemorySegment:
  - accessible to other processes;
  - named according to the name specified by the *name* parameter;
  - of a size that is equal to or greater than the size specified by the *size* parameter;
  - with a mode specified by the *mode* parameter;
- and upon success:
  - acquire a lock to the created share memory segment, if *mode* was lockable;
  - populate the handle with the OSAPI_SharedMemorySegment information;
  - set the *exists* parameter to RTI_FALSE; and
  - return RTI_TRUE.

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R-601.6.1	
Rationale	To allow the user of a newly created segment to complete any additional user-level initialization that may need to take place before any other application can attach to the segment, the function OSAPI_SharedMemorySegment_create_impl() should be implemented as returning to the caller with the lock of the shared memory acquired, if its handle was created with a lockable mode. With this mechanism in place, it becomes the responsibility of the user of this API to release the lock when the user-level initialization is completed by calling the OSAPI_SharedMemorySegment_unlock_impl API function.

R-601.6.2
If there is already an OSAPI_SharedMemorySegment in the system identified by the name specified by the *name* parameter, the OSAPI_SharedMemorySegment_create_impl operation **shall** set the *exists* parameter to RTI_TRUE and return RTI_FALSE.
Rationale Solved

R-601.6.3
If the OSAPI_SharedMemorySegment_create_impl operation cannot create the new OSAPI_SharedMemorySegment it **shall** return RTI_FALSE.
Rationale

R-601.7		
The OSAPI_SharedMemorySegment_delete_impl operation **shall** have the following signature:		
Operations	**Parameters**	**Type**
OSAPI_SharedMemorySegment_delete_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL
Rationale	*handle* is the handle to the OSAPI_SharedMemorySegment.	

R-601.7.1
The OSAPI_SharedMemorySegment_delete_impl operation, upon success, **shall** delete the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter and return RTI_TRUE
Rationale An OSAPI_SharedMemorySegment can no longer be used after returning from a successful call to OSAPI_SharedMemorySegment_delete_impl. The caller of OSAPI_SharedMemorySegment_delete_impl cannot expect to retrieve the information held by the deleted OSAPI_SharedMemorySegment even if the OSAPI_SharedMemorySegment is re-created with the same arguments.

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R-601.7.2	
If the OSAPI_SharedMemorySegment_delete_impl operation cannot delete the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter, it **shall** return RTI_FALSE.	
Rationale	

R-601.8	
The OSAPI_SharedMemorySegment_attach_impl operation **shall** have the following signature:	

Operations	Parameters	Type
OSAPI_SharedMemorySegment_attach_impl	inout: *struct OSAPI_SharedMemorySegmentHandle* *handle in: *const char* *name, in: *OSAPI_SHMEM_MODE* mode out: *OSAPI_SHMEM_ATTACH_STATUS* status_out	RTI_BOOL

Rationale	*handle* is the handle to the OSAPI_SharedMemorySegment. *name* is the name of the OSAPI_SharedMemorySegment to attach to. *mode* is the mode in which the OSAPI_SharedMemorySegment will be attached to. *status_out* is the resulting status of the OSAPI_SharedMemorySegment attachment attempt.

R-601.8.1	
The OSAPI_SharedMemorySegment_attach_impl operation **shall** attempt to attach the OSAPI_SharedMemorySegmentHandle specified by the handle parameter, in the mode specified by the mode parameter, to an existing OSAPI_SharedMemorySegment with a name equal to the name parameter and upon success: • set the status_out to OSAPI_SHMEM_ATTACH_STATUS_OK if the status_out pointer is not NULL AND, • return RTI_TRUE.	
Rationale	The caller of this operation should be capable of attaching the OSAPI_SharedMemorySegment more than once.

R-601.8.2	
If the OSAPI_SharedMemorySegment_attach_impl operation cannot attach to an existing OSAPI_SharedMemorySegment it **shall** return RTI_FALSE.	
Rationale	The *status_out* is not guaranteed to have any relevant meaning when the OSAPI_SharedMemorySegment_attach_impl operation returns RTI_FALSE.

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R-601.8.3	
If the OSAPI_SharedMemorySegment with a name equal to the *name* parameter does not exist, the OSAPI_SharedMemorySegment_attach_impl operation **shall**, • set the status_out to OSAPI_SHMEM_ATTACH_STATUS_SEGMENT_NOT_FOUND if the status_out pointer is not NULL • return RTI_TRUE.	
Rationale	The developer should provide the *status_out* pointer and check its value after the call to determine whether or not the attachment attempt was successful.

R-601.9	
The OSAPI_SharedMemorySegment_detach_impl operation **shall** have the following signature:	

Operations	Parameters	Type
OSAPI_SharedMemorySegment_detach_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL

Rationale	*handle* is the handle to the OSAPI_SharedMemorySegment.

R-601.9.1	
The OSAPI_SharedMemorySegment_detach_impl operation, upon success, **shall** detach the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter and return RTI_TRUE	
Rationale	An OSAPI_SharedMemorySegment can no longer be used by an endpoint after returning from a successful call to the OSAPI_SharedMemorySegment_detach_impl operation. The OSAPI_SharedMemorySegment_detach_impl operation causes the resource to be "disconnected" from an endpoint without being deleted. An endpoint can not use a detached shared memory segment to communicate. It may be possible for an endpoint to re-attach to a detached shared memory segment. An OSAPI_SharedMemorySegment can be reused (i.e. the information is persisted) if it hasn't been deleted by calling the OSAPI_SharedMemorySegment_delete_impl operation.

R-601.9.2	
If the OSAPI_SharedMemorySegment_detach_impl operation cannot detach the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter, it **shall** return RTI_FALSE.	
Rationale	

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R-601.10

The OSAPI_SharedMemorySegment_lock_impl operation **shall** have the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_lock_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle out: *OSAPI_SHMEM_STATUS* *status_out	RTI_BOOL

Rationale	*handle* is the handle to the OSAPI_SharedMemorySegment. *status_out* carries out information about the OSAPI_SharedMemorySegment status.

R-601.10.1

The OSAPI_SharedMemorySegment_lock_impl operation **shall** lock the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter if the OSAPI_SharedMemorySegment is not locked yet.

Rationale	This operation will only be called if the OSAPI_SharedMemorySegment was created with a mode as strict or stricter than OSAPI_SHMEM_MODE_LOCKABLE.

R-601.10.2

If the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter is already locked, then the OSAPI_SharedMemorySegment_lock_impl operation **shall** block the calling execution context until the lock is released and then lock the OSAPI_SharedMemorySegment.

Rationale	

R-601.10.3

The OSAPI_SharedMemorySegment_lock_impl operation, upon success, **shall**:

1. return RTI_TRUE.
2. return OSAPI_SHMEM_STATUS_OK through the *status_out* parameter.

Rationale	

R-601.10.4

The OSAPI_SharedMemorySegment_lock_impl operation **shall** return OSAPI_SHMEM_STATUS_OWNER_DEAD through the *status_out* parameter if the previous owner of the OSAPI_SharedMemorySegment terminated while holding a lock on the OSAPI_SharedMemorySegment.

Rationale	The owner is the execution context that locked the shared OSAPI_SharedMemorySegment.

R-601.10.5

If the OSAPI_SharedMemorySegment cannot be locked, the OSAPI_SharedMemorySegment_lock_impl operation **shall** return RTI_FALSE.

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R-601.10.5	
Rationale	

R-601.11	
The OSAPI_SharedMemorySegment_unlock_impl operation **shall** have the following signature:	

Operations	Parameters	Type
OSAPI_SharedMemorySegment_unlock_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL

Rationale	*handle* is the handle to the OSAPI_SharedMemorySegment.

R-601.11.1	
The OSAPI_SharedMemorySegment_unlock_impl operation, upon success, **shall** unlock the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter and return RTI_TRUE.	
Rationale	This operation will only be called if the OSAPI_SharedMemorySegment was created with a mode as strict or stricter than OSAPI_SHMEM_MODE_LOCKABLE.

R-601.11.2	
If the OSAPI_SharedMemorySegment cannot be unlocked, the OSAPI_SharedMemorySegment_unlock_impl operation **shall** return RTI_FALSE.	
Rationale	

R-601.12	
The OSAPI_SharedMemorySegment_mark_consistent_impl operation **shall** have the following signature:	

Operations	Parameters	Type
OSAPI_SharedMemorySegment_mark_consistent_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL

Rationale	*handle* is the handle to the OSAPI_SharedMemorySegment.

R-601.12.1
The OSAPI_SharedMemorySegment_mark_consistent_impl operation, upon success, **shall** mark the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter as consistent and return RTI_TRUE.

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R-601.12.1	
Rationale	This operation will only be called if the OSAPI_SharedMemorySegment was created with a mode as strict or stricter than OSAPI_SHMEM_MODE_LOCKABLE and if OSAPI_ROBUST_LOCKING_ENABLED is ON.

R-601.12.2
If the OSAPI_SharedMemorySegment cannot be marked as consistent, or the support for robust locking is not enabled, the OSAPI_SharedMemorySegment_mark_consistent_impl operation **shall** return RTI_FALSE.
Rationale

200.5.1.3 Type Plugin
RCC provides a generic Type service called the Type plugin. The Type plugin support includes the following operations for data types used when the Zero Copy feature is enabled: get and discard loan, create managed pool, and get sample ID. The Platform Integrator may manually implement each new type, but there is a strong suggestion to use the *rtiddsgen* utility provided by RCC for automatically generating type support code. The Type Plugin requirements are not obligatory to be implemented as *rtiddsgen* should preferably be used. They are provided in the Integration Manual for completeness, in case the user or integrator chooses to implement the plugins without the assistance of *rtiddsgen*. They are also used to verify type support code on the target platform. For any further details regarding the Type plugin, please refer to **200.4 PSL Type Plugin**.
Rationale

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R-604.0

To create a Type plugin implementation for Zero Copy transport, the following additional member attributes assigned function pointers to functions that implement the interfaces **shall** be set while creating an instance of the NDDS_Type_Plugin structure:

NDDS_Type_Plugin Attribute	Parameters	Type
get_loan	in: *void* *managed_pool out: *void*** sample_out	*ReturnCode_t*
discard_loan	in: *void* *managed_pool in: *RTI_UINT32* sample_id	*RTI_BOOL*
create_managed_pool	in: *struct NDDS_Type_Plugin* *plugin in: *void* *datawriter in: *void* *param out: *void* **managed_pool_out	*RTI_BOOL*
delete_managed_pool	in: *void* *managed_pool	*void*
get_sample_id	in: *void* *managed_pool in: *const void* *user_data out: *RTI_UINT32* *sample_id_out	*RTI_BOOL*
needs_opaque_samples	in: *void* *reader in: *void* *param	*RTI_BOOL*

Rationale

This subset of attributes is only for Zero Copy transport. The remaining attributes are described in **R-700.0**.

To implement the interface, functions need to be created that can be assigned to the attributes of the structure. The names of the functions created to implement the interface are arbitrary and are at the discretion of the implementer since function pointers are used to assign those functions to the member attributes.

The *rtiddsgen* utility is provided by RCC for automatically generating type support code rather than manually implementing each new type by the Platform Integrator.

200.5.1.3.1 TypePlugin get_loan

Rationale

R-604.1

The get_loan operation **shall** request a loan of a sample from a managed pool of samples.

Rationale This operation is only needed if the Zero Copy component is present.

200.5.1.3.2 TypePlugin discard_loan

Rationale

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R-604.2	
The discard_loan operation **shall** return a loaned sample previously retrieved by a get_loan operation to a managed pool of samples.	
Rationale	This operation is only needed if the Zero Copy component is present.

200.5.1.3.3 TypePlugin create_managed_pool	
Rationale	

R-604.3	
The create_managed_pool operation **shall** create a managed pool of samples if it is needed.	
Rationale	The criterion for the need of a managed pool to be created is the implementation detail. This function can successfully exit without creating a managed pool. This operation is only needed if the Zero Copy component is present.

200.5.1.3.4 TypePlugin get_sample_id	
Rationale	

R-604.4	
The get_sample_id operation **shall** lookup the unique ID of a loaned sample given its user data memory region.	
Rationale	This operation is only needed if the Zero Copy component is present.

200.5.1.3.5 TypePlugin needs_opaque_samples	
Rationale	

R-604.5	
The needs_opaque_samples operation **shall** check whether the additional opaque samples are needed.	
Rationale	This operation is only needed if the Zero Copy component is present.

200.5.1.4 Concurrency	
Rationale	

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R-605.1	
The following PSL operations **shall** be reentrant and thread-safe: • OSAPI_SharedMemorySegment_exists • OSAPI_SharedMemorySegment_get_max_size • OSAPI_SharedMemorySegment_is_owner_alive • OSAPI_SharedMemorySegmentHandle_get_size • OSAPI_SharedMemorySegmentHeader_get_size • OSAPI_SharedMemorySegment_create_impl • OSAPI_SharedMemorySegment_delete_impl • OSAPI_SharedMemorySegment_attach_impl • OSAPI_SharedMemorySegment_detach_impl • OSAPI_SharedMemorySegment_lock_impl • OSAPI_SharedMemorySegment_unlock_impl • OSAPI_SharedMemorySegment_mark_consistent_impl	
Rationale	An operation is thread-safe if it guarantees safe execution by multiple threads at the same time, either multitasking or real parallelism. A function is reentrant if it can be interrupted at any point during its execution and then safely called again before its previous invocations complete execution, such as a recursive function.

200.5.2 Zero Copy v2 Notification Transport	
# Zero Copy v2 Notification Transport Integration The Zero Copy v2 Notification Transport is used to notify processes that shared memory associated events have occurred.	
Rationale	

200.5.2.1 Notification Transport plugin API	
The ZCv2 Notification Transport API consists of functions which are used to implement a user specified Notification transport. The ZCv2 Notification Transport API is implemented as an interface using function pointers instead of an implementation using function prototypes. The ZCv2 Notification Transport interface is defined by the ZCOPY_NotifUserInterfaceI type. The user's notification transport will be registered in the application by a call to the ZCOPY_NotifInterfaceFactory_register function which is provided by RCC. The Platform Integrator creates functions to implement each of the function pointer structure members in the ZCOPY_NotifUserInterfaceI structure. The Platform Integrator assigns each of the created functions to the appropriate member of the ZCOPY_NotifUserInterfaceI structure.	
Rationale	

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R-602.1

To create a Notification Transport plugin implementation, an instance of the ZCOPY_NotifUserInterfaceI structure **shall** be created and its member attributes assigned function pointers to functions that implement the interfaces described in the table below:

ZCOPY_NotifUserInterfaceI Attribute	**Parameters**	**Type**	**Description (non-normative)**
create_instance	in: *NETIO_Interface_T* *upstream in: *void* *property	NETIO_Interface_T*	Create an instance of the Notification Mechanism interface with *upstream* as the owner.
reserve_address	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *src_addr out: *void* **port_entry_out	RTI_BOOL	Instruct the Notification Mechanism interface specified by *user_intf* to setup resources for listening to messages on the address *src_addr* and return a *port_entry_out.* The *port_entry_out* will be provided to a *bind* call.
release_address	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *src_addr in: *void* *port_entry	RTI_BOOL	Instruct the Notification Mechanism interface specified by *user_intf* to release resources for listening to messages on the address *src_addr.*
resolve_address	in: *NETIO_Interface_T* *user_intf in: *const char* *address_string out: *struct NETIO_Address* *address_value out: *RTI_BOOL* *invalid	RTI_BOOL	Instruct the Notification Mechanism interface specified by user_*intf* to determine if the address string *address_string* is a valid address and return the result in *address_value*.
send	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *source in: *struct NETIO_Address* *destination in: *void* *route_entry	RTI_BOOL	Instruct the Notification Mechanism interface specified by user_intf to send a notification to the *destination using the route_entry*.
get_route_table	in: *NETIO_Interface_T* *netio_intf inout: *struct NETIO_AddressSeq* *address	RTI_BOOL	Instruct the Notification Mechanism interface *netio_intf* to return a sequence of *address* and *netmask* pairs this interface can send to.

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	inout: *struct NETIO_NetmaskSeq* *netmask		
bind	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *src_addr in: *struct NETIO_Address* *dst_addr in: *void* *port_entry out: *void* **bind_entry_out	RTI_BOOL	Instruct the Notification Mechanism interface specified by *user_intf* to start listening for messages on the address specified by *src_addr on the given port_entry.*
unbind	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *src_addr in: *struct NETIO_Address* *dst_addr in: *void* *port_entry in: *void* *bind_entry	RTI_BOOL	Instruct the Notification Mechanism interface specified by *user_intf* to stop listening for messages on the address specified by *src_addr*.
add_route	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *source in: *struct NETIO_Address* *destination out: *void* **route_entry_out	RTI_BOOL	Instruct the Notification Mechanism interface specified by *user_intf* to add a route from the *source* to the *destination*. The *route_entry_out* will be provided to the user later when calling *send*
delete_route	in: *NETIO_Interface_T* *user_intf in: *struct NETIO_Address* *source in: *struct NETIO_Address* *destination in: *void* *route_entry	RTI_BOOL	Instruct the Notification Mechanism interface specified by *user_intf* to remove a route from the *source* to the *destination*.
notify_recv_port	in: *NETIO_Interface_T* *user_intf	RTI_BOOL	Instruct the Notification Mechanism interface specified

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R-602.1			
	in: *void* *port_entry		by *user_intf* to notify the receive port specified by *port_entry*.
Rationale	RCC provides the definition of the ZCOPY_NotifUserInterfaceI structure. To implement the interface, functions need to be created that can be assigned to the attributes of the structure. The names of the functions created to implement the interface are arbitrary and are at the discretion of the implementer since function pointers are used to assign those functions to the member attributes.		

200.5.2.1.1 create_instance	
Create an instance of the Notification Mechanism interface with *upstream* as the owner.	
Rationale	

R-602.1.1	
The ZCOPY_NotifUserInterfaceI.create_instance operation **shall** return a non-NULL pointer to an instance of an interface of type NETIO_Interface_T on success.	
Rationale	The structure member ZCOPY_NotifUserInterfaceI.create_instance is used to allocate and instantiate any resources needed for the user's desired transport. The created NETIO_Interface_T instance will later be used to send packets of type NETIO_Packet_T. RCC will try to send packets using the ZCOPY_NotifUserInterfaceI.send operation. RCC will receive packets when this implementation calls the NETIO_DGRAM_Interface_upstream_receive operation with upstream as the *netio_intf* parameter, meaning that upstream has to be saved. The property parameter carries the information passed to the ZCOPY_NotifMechanism_register operation as the user properties. The property parameter can be used to provide properties needed by the ZCOPY_NotifUserInterfaceI.create_instance. The use of the property parameter is at the discretion of the implementer. A pointer to the property structure could have a NULL value. The user can leverage a derived type from the base type NETIO_Interface_T in order to save all the needed resources for the internal operation of the interface (such as the upstream parameter), but will have to return a pointer to a downcast version of it.

R-602.1.2	
The ZCOPY_NotifUserInterfaceI.create_instance operation **shall** return NULL on failure.	
Rationale	The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • Insufficient memory for allocations • Resources are not available • Insufficient access permissions • Improper values for parameters

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R-602.1.3	
The PSL **shall** not use the *upstream* NETIO_Interface_T parameter to call RCC APIs in the implementation of ZCOPY_NotifUserInterfaceI.create_instance.	
Rationale	The instance of an interface of type NETIO_Interface_T is not fully initialized by the time the ZCOPY_NotifUserInterfaceI.create_instance is called by RCC.

200.5.2.1.2 reserve_address	
Rationale	

R-602.1.11	
The ZCOPY_NotifUserInterfaceI.reserve_address operation **shall** cause the interface specified by *user_intf* to configure resources for listening to messages on address *src_addr and* return a pointer to a port entry specified by *port_entry_out* and return RTI_TRUE on success.	
Rationale	When an interface reserves an address, the interface will setup the resources needed to listen for messages sent to that address from the address indicated by *source.*

R-602.1.12	
The ZCOPY_NotifUserInterfaceI.reserve_address operation **shall** return NULL through the port entry specified by *port_entry_out* and return RTI_FALSE on failure.	
Rationale	The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • Insufficient memory • Resources are not available • Insufficient access permissions • Improper values for parameters

200.5.2.1.3 release_address	
Rationale	

R-602.1.21
The ZCOPY_NotifUserInterfaceI.release_address operation **shall** cause the interface specified by *user_intf* to release resources associated with the port entry specified by *port_entry* used for listening to messages on address *src_addr* and return RTI_TRUE on success.

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R-602.1.21	
Rationale	When an interface releases an address, the interface will release the resources needed to listen for messages sent to that address from the address indicated by *src_addr.* This operation is the compliment of ZCOPY_NotifUserInterfaceI.reserve_address*.*

R-602.1.22
The ZCOPY_NotifUserInterfaceI.release_address operation **shall** return RTI_FALSE on failure.
Rationale The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • Resources already released • Insufficient access permissions • Improper values for parameters

200.5.2.1.4 resolve_address	
Rationale	

R-602.1.31
The ZCOPY_NotifUserInterfaceI.resolve_address operation **shall** set *address_value* to a valid address for the Notification Mechanism interface specified by *user_intf,* set the value pointed to by *invalid* to RTI_FALSE, **AND** return RTI_TRUE on success.
Rationale An address is valid when it meets the requirements of the user's desired transport. The possible failure modes are implementation dependent and are specified by the implementer.The *invalid* parameter should always return RTI_FALSE based on the current design of the PIL. This allows other transports to resolve the address if the implementation of the Notification Mechanism transport does not understand how to interpret the address. The *address_string* parameter provided by RCC can be used by the Platform Integrator to determine the *address_value.*

R-602.1.32
The ZCOPY_NotifUserInterfaceI.resolve_address operation **shall** return RTI_FALSE on failure.
Rationale The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of failures can include: • Improper values for *address_string*

200.5.2.1.5 send

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200.5.2.1.5 send	
Rationale	

R-602.1.41
The ZCOPY_NotifUserInterfaceI.send operation **shall** cause the interface specified by *user_intf* to send a notification from the source specified by *source* to the destination specified by *destination* using the route entry specified by *route_entry* and return RTI_TRUE on success.
Rationale

R-602.1.42	
The ZCOPY_NotifUserInterfaceI.send operation **shall** return RTI_FALSE on failure.	
Rationale	Failure modes are determined by the implementer of this method. Examples of failures can include: • An invalid *route_entry* pointer • Failure to acquire exclusive access to Notification Mechanism's shared memory • Failure to post a notification in the shared memory

200.5.2.1.6 get_route_table	
Rationale	

R-602.1.51	
On success the ZCOPY_NotifUserInterfaceI.get_route_table operation **shall**: • retrieve a sequence of all addresses as *address* and a sequence of all netmasks as *netmask* from the routing table to which the Notification Mechanism interface specified by *netio_intf* can send • return RTI_TRUE	
Rationale	The ZCOPY_NotifUserInterfaceI.get_route_table operation is used to retrieve the current route table associated with the interface *netio_intf* and this information will be used by RCC to determine if the interface is able to send packets to a specific NETIO_Address destination. The implementor is responsible for determining and storing the routes applicable for the desired transport. Some platforms may have fixed routes while others may be determined dynamically. The route table could be stored separately from the netio_intf or in conjunction with it - as a part of the property user_property (optionally provided during the registration of the Notification Transport, i.e. ZCOPY_NotifMechanism_register function call) which automatically associates property data with the registered Notification Transport.

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R-602.1.52	
The ZCOPY_NotifUserInterfaceI.get_route_table operation **shall** not modify the *address* and *netmask* sequences and return RTI_FALSE on failure.	
Rationale	The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • Invalid pointers to the parameters (i.e. NULL pointers) • Insufficient access permissions

200.5.2.1.7 bind	
Rationale	

R-602.1.61	
The ZCOPY_NotifUserInterfaceI.bind operation shall cause the implementation to listen for notification messages and return RTI_TRUE on success.	
Rationale	RCC provides several parameters that the Platform Integrator may use if required by their implementation of the Notification Mechanism. *user_intf*, *src_addr*, *dst_addr*, and *port_entry* contain useful state information that the Platform Integrator may use in the implementation of the ZCOPY_NotifUserInterfaceI.bind operation. *bind_entry_out* can be used by the Platform Integrator to provide a reference to a bind entry utilized within the ZCOPY_NotifUserInterfaceI.bind operation.

R-602.1.62	
The ZCOPY_NotifUserInterfaceI.bind operation **shall** return RTI_FALSE on failure.	
Rationale	The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • Insufficient memory • Resources are not available • Insufficient access permissions • Improper values for parameters

200.5.2.1.8 unbind	
Rationale	

R-602.1.71
The ZCOPY_NotifUserInterfaceI.unbind operation **shall** return RTI_TRUE.

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R-602.1.71	
Rationale	RCC provides the ZCOPY_NotifUserInterfaceI.unbind operation interface as a mechanism that allows Platform Integrators to stop listening to messages from the address *src_addr* on the Notification Mechanism interface specified by *user_intf.* If the Platform Integrator's implementation of the Notification Mechanism supports the ability to stop listening to messages, then they will use the ZCOPY_NotifUserInterfaceI.unbind operation to implement the unbind behavior. The ZCOPY_NotifUserInterfaceI.unbind operation will always return RTI_TRUE on completion. If there are any errors that occur during the ZCOPY_NotifUserInterfaceI.unbind operation, then the Platform Integrator is responsible for handling errors as part of the implementation. If, however, the Platform Integrator's implementation does not support the unbind behavior or if the Platform Integrator does not wish to support the unbind behavior, then the Platform Integrator should cause the ZCOPY_NotifUserInterfaceI.unbind operation to return RTI_TRUE. *user_intf*, *src_addr*, *dst_addr*, *port_entry,* and *bind_entry* contain useful state information that the Platform Integrator may use in the implementation of the ZCOPY_NotifUserInterfaceI.unbind operation.

200.5.2.1.9 add_route	
Rationale	

R-602.1.81
The ZCOPY_NotifUserInterfaceI.add_route operation **shall** cause the interface specified by *user_intf* to add a route from the source specified by *source* to the destination specified by *destination and* return a pointer to a route entry specified by *route_entry_out* and return RTI_TRUE on success.
Rationale The *route_entry_out* will be provided to the user later when calling the ZCOPY_NotifUserInterfaceI.send operation. The ZCOPY_NotifUserInterfaceI.add_route operation provides a mechanism for routing notifications to the *destination* address.

R-602.1.82
The ZCOPY_NotifUserInterfaceI.add_route operation **shall** return NULL through the port entry specified by *route_entry_out* and return RTI_FALSE on failure.

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R-602.1.82	
Rationale	The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • Insufficient memory • Resources are not available • Insufficient access permissions • Improper values for parameters

200.5.2.1.10 delete_route	
Rationale	

R-602.1.91
The ZCOPY_NotifUserInterfaceI.delete_route operation **shall** cause the interface specified by *user_intf* to remove the *route_entry* from the source specified by *source* and the destination specified by *destination* and return RTI_TRUE on success.
Rationale

R-602.1.92	
The ZCOPY_NotifUserInterfaceI.delete_route operation **shall** return RTI_FALSE on failure.	
Rationale	The Platform Integrator determines what failure mechanisms are relevant to their transport implementation. Examples of potential failures are: • An invalid *route_entry* pointer • Failure to remove the route to the Notification Mechanism's shared memory

200.5.2.1.11 notify_recv_port	
Rationale	

R-602.1.101
The ZCOPY_NotifUserInterfaceI.notify_recv_port operation **shall** cause the interface specified by *user_intf* to notify the receive port specified by *port_entry* and return RTI_TRUE on success.
Rationale

R-602.1.102
The ZCOPY_NotifUserInterfaceI.notify_recv_port operation **shall** return RTI_FALSE on failure.

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R-602.1.102	
Rationale	Failure modes are determined by the implementer of this method. Examples of failures can include: • An invalid *port_entry* pointer • Failure to issue a notification

200.5.2.2 Concurrency	
Rationale	

R-606.1	
The following ZCOPY_NotifUserInterfaceI operations shall be reentrant and thread-safe: • ZCOPY_NotifUserInterfaceI.create_instance • ZCOPY_NotifUserInterfaceI.reserve_address • ZCOPY_NotifUserInterfaceI.release_address • ZCOPY_NotifUserInterfaceI.resolve_address • ZCOPY_NotifUserInterfaceI.send • ZCOPY_NotifUserInterfaceI.get_route_table • ZCOPY_NotifUserInterfaceI.bind • ZCOPY_NotifUserInterfaceI.unbind • ZCOPY_NotifUserInterfaceI.add_route • ZCOPY_NotifUserInterfaceI.delete_route • ZCOPY_NotifUserInterfaceI.notify_recv_port	
Rationale	An operation is thread-safe if it guarantees safe execution by multiple threads at the same time, either multitasking or real parallelism. A function is reentrant if it can be interrupted at any point during its execution and then safely called again before its previous invocations complete execution, such as a recursive function.

4 PSL Platform Notes and Build Instructions	
This section describes the steps required to build the Platform Support Library (PSL) and integrate it with the Platform Independent Library (PIL). These steps include which options are used to build the PIL and how to configure the Platform, including: • How the PIL is built • How the PSL is built • How the libraries are built • Which compiler, version, and tools are used • Lists of compilation and linking flags • Calling conventions used	
Rationale	

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4.1 Instructions for Using RCC for ARMv8 Architecture

RTI Connext Cert for ARMv8 is available as a static Platform Independent Library (PIL). This section describes how to build and link a Platform Support Library (PSL) with the static PIL.

Rationale

4.1.1 The Platform Independent Library

The RTI Connext Cert Platform Independent Library (RCC PIL) is delivered as two static libraries that are built using the QNX qcc 12.2.0 (for QOS 8.0) and 8.3.0 (for QOS 2.2.1) compilers with the following options:

C compiler option	Description
-Vgcc/12.2.0,gcc_ntoaarch64le (for 12.2.0) or -Vgcc/8.3.0,gcc_ntoaarch64le (for 8.3.0)	Specifies: • the compiler name as gcc, • the compiler version number as 12.2.0 or 8.3.0, and • the target name as gcc_ntoaarch64le.
-std=c99	Specifies the language standard to C99.
-Winit-self	Warns about uninitialized variables which are initialized with themselves.
-fno-strict-aliasing	Disables optimizations based on the strict aliasing rule in C and C++
-Wmissing-declarations	Warns if a global function is defined without a previous declaration.
-Wall	Enables all the warnings about constructions that some users consider questionable, and that are easy to avoid (or modify to prevent the warning), even in conjunction with macros.
-Wextra	Prints extra warning messages for some events.
-Wpedantic	Issues all the warnings demanded by strict ISO C and ISO C++.
-Wshadow	Warns when a local variable shadows another local variable, parameter, or global variable, or when a built-in function is shadowed.
-Wcast-align	Warns when a pointer is cast such that the required alignment of the target is increased.
-Wunused	Warns when a variable, function, parameter, label, or value is unused.
-Wconversion	Warns if a prototype causes a type conversion that is different from what would happen to the same argument in the absence of a prototype.
-Wsign-conversion	Warns about implicit conversions that may change the sign of an integer value, like assigning a signed integer expression to an unsigned integer variable.

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4.1.1 The Platform Independent Library

-Wlogical-op	Warns about suspicious uses of logical operators in expressions.
-Wdouble-promotion	Gives a warning when a value of type float is implicitly promoted to double.
-DNDEBUG	Excludes debug information.
-O2	Enables a high level of code optimization to improve program speed
-fpic	Generates position-independent code

Rationale

4.1.2 The Platform Support Library

The RTI Connext Cert Platform Support Library (RCC PSL) must be built to be binary compatible with the RCC Platform Independent Library (RCC PIL). This means that the same compiler preprocessor options used to build the RCC PIL must be used to build the RCC PSL.

In addition, the following compiler preprocessor options must be used:

C compiler option	Description
-DRTI_CERT	Enable the RCC CERT profile. Failure to specify this option will result in undefined behavior.
-DRTI_PSL	Enable support to build an RCC PSL. All OSAPI implementations must be compiled with this option. NOTE: An integration with NETIO_DGRAM is considered to be a DDS application and should use the -DRTI_PIL option instead.
-DOSAPI_CC_DEF_H=<name file with compiler definitions>	If QCC is used, then replace this option with -DOSAPI_CC_DEF_H=osapi/osapi_cc_qcc.h This assumes that that the compiler include path includes <installation directory>/rti_me_cert.1.0/include/rti_me
-DRTI_LITTLE_ENDIAN	Enables support for a little-endian CPU.
-DNDEBUG	This option must be specified in order to be able to build an RCC PSL that is compatible with the RCC PIL.
-I<install directory>/rti_me_cert.1.0/include/rti_me	Location of header files required to build RCC applications and platform support libraries.

Rationale

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4.1.3 Compiling and Linking

4.1.3.1 Compiling the application

Use the following compiler definitions when compiling the code that links with the RCC PIL and RCC PSL:

C compiler option	Description
-DRTI_CERT	Enables the RCC CERT profile. Failure to specify this option will result in undefined behavior.
-DRTI_PIL	Enables support for compiling an application that uses the RCC. NOTE: An integration with NETIO_DGRAM is considered to be a DDS application and should use the -DRTI_PIL option.
-DOSAPI_CC_DEF_H=<name file with compiler definitions>	If QCC is used, then replace this option with -DOSAPI_CC_DEF_H=osapi/osapi_cc_qcc.h. This is the same file that is used to build the RCC PIL. This assumes that the compiler include path includes <install directory>/rti_me_cert.1.0/include/rti_me.
-DRTI_LITTLE_ENDIAN	Enables support for a little endian CPU.
-DNDEBUG	This option must be specified in order for an application to link with the RCC PSL and RCC PIL.
-I<install directory>/rti_me_cert.1.0/include/rti_me	Location of header files required to build RCC applications and platform support libraries.

Rationale

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4.1.3.2 Linking a DDS application with an RCC PIL and RCC PSL

The following artifacts are assumed to be available for linking:

Artifact	Description
`ddsapp`	A DDS application library.
`rcc_netio`	An RCC NETIO_DGRAM integration. NOTE: It is recommended to not implement an RCC NETIO_DGRAM integration and RCC OSAPI integration in the same library, as that will require a two-pass linking procedure.
`rcc_psl`	An RCC OSAPI implementation.

When linking, the libraries must be listed in the following order:

```
ddsapp rcc_netio rti_mez rcc_psl
```

Rationale

300 RCC Untyped API

The DDS specification states that "DDS uses typed interfaces (i.e., interfaces that take into account the actual data types) to the extent possible.". The rtiddsgen utility provided by RCC automatically generates the typed interfaces as required by the specification.

To support these typed interfaces, RCC provides generic versions of these interfaces “under the hood”. In this document, we refer to these interfaces as the RCC Untyped API. The RCC Untyped API support includes writing and reading of user data samples, as well as a sequence type for storing them. The Platform Integrator may leverage the RCC Untyped API, but RTI strongly suggests using the code as generated by rtiddsgen.

The RCC Untyped API requirements are not obligatory. They are provided in the Integration Manual for completeness, in case the Platform Integrator chooses to invoke the RCC Untyped API without the assistance of rtiddsgen.

Rationale

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300.1 RCC Untyped API DataWriter usage	
RCC Untyped API DataWriter usage	
Rationale	

R-800.0

Users of the following RCC Untyped DataWriter functions that expect a sample parameter of the type void * **shall** provide a pointer to a valid object of the Foo type as expected by the NDDS_Type_Plugin implementation for the DataWriter.

Function	**Parameters**	**Type**
register_instance	in: *DDS_DataWriter* *self in: *void* *instance_data	DDS_InstanceHandle_t
register_instance_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data in: *struct DDS_Time_t* *source_timestamp	DDS_InstanceHandle_t
unregister_instance	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle	DDS_ReturnCode_t
unregister_instance_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle in: *struct DDS_Time_t* *source_timestamp	DDS_ReturnCode_t
write	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle	DDS_ReturnCode_t
write_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle in: *struct DDS_Time_t* *source_timestamp	DDS_ReturnCode_t
dispose	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle	DDS_ReturnCode_t
dispose_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle in: *struct DDS_Time_t* *source_timestamp	DDS_ReturnCode_t

Rationale	The RCC Untyped DataWriter API uses the untyped void * type for writing a user data sample.

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300.2 RCC Untyped DataReader API usage with sequences	
RCC Untyped DataReader API usage with sequences	
Rationale	

R-800.1

Users of the following RCC Untyped DataReader functions that expect a parameter of the type struct DDS_UntypedSampleSeq * **shall** provide a pointer to a struct FooSeq object that was cast to a pointer to a struct DDS_UntypedSampleSeq object, with the Foo type as expected by the NDDS_Type_Plugin implementation for the DataReader.

Function	**Parameters**	**Type**
read	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *signed 32-bit integer* max_samples in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t
take	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *DDS_Long* max_samples in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t
read_instance	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *DDS_Long* max_samples in: *DDS_InstanceHandle_t* handle in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t
take_instance	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *DDS_Long* max_samples in: *DDS_InstanceHandle_t* handle in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t

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R-800.1		
return_loan	in: *DDS_DataReader* reader in: *struct DDS_UntypedSampleSeq* *samples in: *struct SampleInfoSeq* *sample_info	DDS_ReturnCode_t
Rationale	The RCC Untyped DataReader API uses an untyped sequence struct DDS_UntypedSampleSeq for holding generic samples. The untyped sample sequence is compatible with the publicly documented, strongly typed struct FooSeq type as generated by rtiddsgen, with the Foo type as expected by the NDDS_Type_Plugin implementation for the DataReader. Here, compatible means that, on the platforms supported by RCC, they have the same number of members, in the same order, with the same data sizes, and their padding and alignment requirements are identical.	

Data Fields

FooSeq Struct Reference

Sequence Support

<<interface>> <<generic>> <<cert>> A type-safe, ordered collection of elements. The type of these elements is referred to in this documentation as "Foo". More...

Data Fields

Foo *	**_contiguous_buffer** Pointer to array of contiguous or discontiguous data.
DDS_UnsignedLong	**_maximum** Maximum size of the sequence.
DDS_UnsignedLong	**_length** Actual length of the sequence that contains data.
DDS_Long	**_element_size** Size of data element in the sequence.
void *	**_token1** Reserved for internal use.
void *	**_token2** Reserved for internal use.
DDS_UnsignedLong	**max_alloc_size** The maximum allocation for pointer elements (string,wstring) Only in debug librarires.
DDS_Char	**_flags** Reserved for internal use.

Most DataReader functions provided by the RCC Untyped API expect a pointer to a struct DDS_UntypedSampleSeq object for returning samples to the caller.

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300.3 RCC Untyped DataReader API usage with individual samples	
RCC Untyped DataReader API usage with individual samples	
Rationale	

R-800.2	
Users of the following RCC Untyped DataReader functions that expect a sample parameter of the type void * **shall** provide a pointer to a valid object of the Foo type as expected by the NDDS_Type_Plugin implementation for the DataReader.	

Function	**Parameters**	**Type**
read_next_sample	in: *DDS_DataReader* reader inout: *void **sample inout: struct DDS_SampleInfo *sample_info	DDS_ReturnCode_t
take_next_sample	in: *DDS_DataReader* reader inout: *void **sample inout: *struct DDS_SampleInfo **sample_info	DDS_ReturnCode_t
lookup_instance	in: *DataReader* reader in: *void **key_holder	DDS_InstanceHandle_t

Rationale	Some RCC Untyped DataReader API functions use the untyped void * type for returning a single user data sample.

300.4 RCC Untyped API Zero Copy v2 DataWriter usage	
RCC Untyped API Zero Copy v2 DataWriter usage	
Rationale	

R-800.3	
Users of the following RCC Untyped Zero Copy v2 DataWriter function that expects a sample parameter of the type void ** **shall** provide a pointer to a valid void * object.	

Function	**Parameters**	**Type**
get_loan	in: DDS_DataWriter *self inout: void **instance_data	DDS_ReturnCode_t

Rationale	For DataWriters associated with a sample type that is configured for Zero Copy v2, the function get_loan is intended to obtain a pointer to a valid object of the Foo type as expected by the NDDS_Type_Plugin implementation for the DataWriter and provide it to the user.

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R-800.4

Users of the following RCC Untyped Zero Copy v2 DataWriter function that expects a sample parameter of the type void * **shall** provide a pointer to a valid object of the Foo type as expected by the NDDS_Type_Plugin implementation for the DataWriter.

Function	Parameters	Type
discard_loan	in: DDS_DataWriter *self in: void *instance_data	DDS_ReturnCode_t

Rationale	It applies to the Zero Copy v2 DataWriter function listed above, in addition to the functions mentioned in R-800.0.

PSL_OSAPI

Heap

QTS-R-521.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Heap_allocate_buffer has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Heap_allocate_buffer has the following signature:

Operations	Parameters	Type
OSAPI_Heap_allocate_buffer	out: *char* **buffer in: *RTI_SIZE_T* size in: *OSAPI_Alignment_T* alignment	void

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QTS-R-521.1.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Heap_allocate_buffer allocates memory.

TC.1

- **Preconditions:**
  - OSAPI_Heap_allocate_buffer succeeds when called.
- **Actions:**
  - call OSAPI_Heap_allocate_buffer.
- **Check that:**
  - the address of the allocated memory area has been returned via the *buffer* parameter.
  - the allocated memory area is aligned to *alignment*.
  - the allocated memory area is of *size* contiguous bytes, each of which has been set to zero.

QTS-R-521.1.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Heap_allocate_buffer fails.

TC.1

- **Preconditions:**
  - OSAPI_Heap_allocate_buffer fails when called.
- **Actions:**
  - call OSAPI_Heap_allocate_buffer.
- **Check that:**
  - a NULL pointer is returned via the *buffer* parameter.

Mutex

QTS-R-522.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_new has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Mutex_new has the following signature:

Operations	Parameters	Type
OSAPI_Mutex_new	in: *void*	OSAPI_Mutex_T*

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QTS-R-522.1.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_new successfully creates a new mutex.

TC.1

- **Preconditions:**
  - OSAPI_Mutex_new succeeds when called.
- **Actions:**
  - call OSAPI_Mutex_new.
- **Check that:**
  - OSAPI_Mutex_new returns a pointer to the newly created mutex.
  - the newly created mutex can guarantee exclusive access.

QTS-R-522.1.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_new fails to create a new mutex.

TC.1

- **Preconditions:**
  - OSAPI_Mutex_new fails when called.
- **Actions:**
  - call OSAPI_Mutex_new.
- **Check that:**
  - OSAPI_Mutex_new returns NULL.

QTS-R-522.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_take has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Mutex_take has the following signature:

Operations	Parameters	Type
OSAPI_Mutex_take	in: OSAPI_Mutex_T *mutex	RTI_BOOL

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QTS-R-522.2.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_take takes an unlocked mutex.
- **[TC.2]** Operation OSAPI_Mutex_take takes a mutex locked by the current thread.

TC.1

- **Preconditions:**
  - OSAPI_Mutex_take succeeds when called.
  - *mutex* is unlocked.
- **Actions:**
  - call OSAPI_Mutex_take with *mutex*.
- **Check that:**
  - OSAPI_Mutex_take returns RTI_TRUE.
  - the current execution context is made owner of *mutex*.

TC.2

- **Preconditions:**
  - OSAPI_Mutex_take succeeds when called.
  - *mutex* is locked by the current thread.
- **Actions:**
  - call OSAPI_Mutex_take with *mutex*.
- **Check that:**
  - OSAPI_Mutex_take returns RTI_TRUE.
  - the current execution context remains owner of *mutex*.

QTS-R-522.2.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_take fails to take a mutex.

TC.1

- **Preconditions:**
  - *mutex* is unable to be taken.
- **Actions:**
  - call OSAPI_Mutex_take.
- **Check that:**
  - OSAPI_Mutex_take returns RTI_FALSE.

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QTS-R-522.2.4

Analysis

The requirement is met when:

- **[TC.1]** OSAPI_Mutex_take locks an unlocked mutex on success.

TC.1

- **Preconditions:**
  - *mutex* is unlocked.
  - OSAPI_Mutex_take succeeds when called.
- **Actions:**
  - call OSAPI_Mutex_take with *mutex*.
- **Check that:**
  - *mutex* is locked by the current execution context.

QTS-R-522.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_give has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Mutex_give has the following signature:

Operations	Parameters	Type
OSAPI_Mutex_give	in: OSAPI_Mutex_T *mutex	RTI_BOOL

QTS-R-522.3.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_give successfully gives a mutex.

TC.1

- **Preconditions:**
  - *mutex* is able to be given.
- **Actions:**
  - call OSAPI_Mutex_give.
- **Check that:**
  - OSAPI_Mutex_give returns RTI_TRUE.

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QTS-R-522.3.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Mutex_give fails to give a mutex.

TC.1

- **Preconditions:**
  - *mutex* is unable to be given.
- **Actions:**
  - call OSAPI_Mutex_give.
- **Check that:**
  - OSAPI_Mutex_give returns RTI_FALSE.

QTS-R-522.3.3

Analysis

The requirement is met when:

- **[TC.1]** A locked mutex is given as many times as it was taken and becomes unlocked.

TC.1

- **Preconditions:**
  - *mutex* is locked by the current execution context.
    - *mutex* has been successfully taken by the current execution context X times.
    - *mutex* has been successfully given by the current execution context X-1 times.
  - OSAPI_Mutex_give succeeds when called
- **Actions:**
  - call OSAPI_Mutex_give with *mutex*.
- **Check that:**
  - *mutex* is unlocked.

Semaphore

QTS-R-523.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_new has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Semaphore_new has the following signature:

Operations	Parameters	Type
OSAPI_Semaphore_new	in: *void*	OSAPI_Semaphore_T*

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QTS-R-523.1.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_new successfully creates a new semaphore.

TC.1

- **Preconditions:**
  - OSAPI_Semaphore_new succeeds when called.
- **Actions:**
  - call OSAPI_Semaphore_new.
- **Check that:**
  - OSAPI_Semaphore_new returns a pointer to the newly created semaphore.
  - the newly created semaphore is in an unsignaled state.

QTS-R-523.1.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_new fails to create a new semaphore.

TC.1

- **Preconditions:**
  - OSAPI_Semaphore_new fails when called.
- **Actions:**
  - call OSAPI_Semaphore_new.
- **Check that:**
  - OSAPI_Semaphore_new returns NULL

QTS-R-523.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_take has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Semaphore_take has the following signature:

Operations	Parameters	Type
OSAPI_Semaphore_take	in: *OSAPI_Semaphore_T* *self in: *RTI_INT32* timeout out: *RTI_INT32* *fail_reason	RTI_BOOL

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QTS-R-523.2.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_take succeeds with a NULL *fail_reason* parameter.
- **[TC.2]** Operation OSAPI_Semaphore_take succeeds with a non-NULL *fail_reason* parameter.

TC.1

- **Preconditions:**
  - *fail_reason* is NULL.
  - semaphore *self* can be taken.
- **Actions:**
  - call OSAPI_Semaphore_take.
- **Check that:**
  - OSAPI_Semaphore_take returns RTI_TRUE.

TC.2

- **Preconditions:**
  - *fail_reason* is not NULL.
  - semaphore *self* can be taken.
- **Actions:**
  - call OSAPI_Semaphore_take.
- **Check that:**
  - OSAPI_Semaphore_take returns RTI_TRUE.
  - *fail_reason*'s value is set to OSAPI_SEMAPHORE_RESULT_OK.

QTS-R-523.2.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_take times out with a NULL *fail_reason* parameter.
- **[TC.2]** Operation OSAPI_Semaphore_take times out with a non-NULL *fail_reason* parameter.

TC.1

- **Preconditions:**
  - *fail_reason* is NULL.
  - the attempt to take semaphore *self* will time out during the call.
- **Actions:**
  - call OSAPI_Semaphore_take.
- **Check that:**
  - OSAPI_Semaphore_take returns RTI_TRUE.

TC.2

- **Preconditions:**
  - *fail_reason* is not NULL.
  - the attempt to take semaphore *self* will time out during the call.
- **Actions:**
  - call OSAPI_Semaphore_take.
- **Check that:**
  - OSAPI_Semaphore_take returns RTI_TRUE.
  - *fail_reason*'s value is set to OSAPI_SEMAPHORE_RESULT_TIMEOUT.

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QTS-R-523.2.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_take fails with a NULL *fail_reason* parameter.
- **[TC.2]** Operation OSAPI_Semaphore_take fails with a non-NULL *fail_reason* parameter.

TC.1

- **Preconditions:**
  - *fail_reason* is NULL.
  - OSAPI_Semaphore_take fails for any reason besides an expired timeout when called.
- **Actions:**
  - call OSAPI_Semaphore_take.
- **Check that:**
  - OSAPI_Semaphore_take returns RTI_FALSE.

TC.2

- **Preconditions:**
  - *fail_reason* is not NULL.
  - OSAPI_Semaphore_take fails for any reason besides an expired timeout when called.
- **Actions:**
  - call OSAPI_Semaphore_take.
- **Check that:**
  - OSAPI_Semaphore_take returns RTI_FALSE.
  - *fail_reason*'s value is set to OSAPI_SEMAPHORE_RESULT_ERROR.

QTS-R-523.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_give has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Semaphore_give has the following signature:

Operations	Parameters	Type
OSAPI_Semaphore_give	in: *OSAPI_Semaphore_T* *self	RTI_BOOL

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QTS-R-523.3.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_give succeeds.

TC.1

- **Preconditions:**
  - semaphore *self* can be successfully given.
- **Actions:**
  - call OSAPI_Semaphore_give.
- **Check that:**
  - OSAPI_Semaphore_give returns RTI_TRUE.

QTS-R-523.3.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Semaphore_give fails.

TC.1

- **Preconditions:**
  - OSAPI_Semaphore_give fails when called.
- **Actions:**
  - call OSAPI_Semaphore_give.
- **Check that:**
  - OSAPI_Semaphore_give returns RTI_FALSE.

Process

QTS-R-524

Analysis

The requirement is met when:

- **[TC.1]** The OSAPI_Process_getpid operation has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_Process_getpid operation has the following signature:

Operations	Parameters	Type
OSAPI_Process_getpid	void	OSAPI_ProcessId

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QTS-R-524.1

Analysis

The requirement is met when:

- **[TC.1]** the **OSAPI_Process_getpid** operation returns the process ID of the caller.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - call the **OSAPI_Process_getpid** operation.
- **Check that:**
  - the process ID of the caller is returned.

Memory

QTS-R-525.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_copy has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Memory_copy has the following signature:

Operations	Parameters	Type
OSAPI_Memory_copy	out: *void* *dest in: *const void* *src in: *RTI_SIZE_T* size	void

QTS-R-525.1.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_copy copies memory successfully.

TC.1

- **Preconditions:**
  - *src* and *dest* are non-overlapping memory regions of *size* bytes.
- **Actions:**
  - call OSAPI_Memory_copy.
- **Check that:**
  - The *size* bytes currently in *dest* are a copy of the *size* bytes in *src*.

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QTS-R-525.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_zero has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Memory_zero has the following signature:

Operations	Parameters	Type
OSAPI_Memory_zero	out: *void* *mem in: *RTI_SIZE_T* size	void

QTS-R-525.2.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_zero zeroes memory correctly.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - call OSAPI_Memory_zero.
- **Check that:**
  - Every byte in the memory region [*mem*, *mem* + *size* - 1] is set to zero.

QTS-R-525.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_compare has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Memory_compare has the following signature:

Operations	Parameters	Type
OSAPI_Memory_compare	in: *const void* *left in: *const void* *right in: *RTI_SIZE_T* size	RTI_INT32

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QTS-R-525.3.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_compare returns that *left* is less than *right*.

TC.1

- **Preconditions:**
  - the memory region defined by [*left*, *left* + *size* - 1] is less than the one defined by [*right*, *right* + *size* - 1] when interpreted as a sequence of 8-bit values.
- **Actions:**
  - call OSAPI_Memory_compare.
- **Check that:**
  - OSAPI_Memory_compare returns a value less than zero.

QTS-R-525.3.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_compare returns that *left* is equal to *right*.

TC.1

- **Preconditions:**
  - the memory region defined by [*left*, *left* + *size* - 1] is equal to the one defined by [*right*, *right* + *size* - 1] when interpreted as a sequence of 8-bit values.
- **Actions:**
  - call OSAPI_Memory_compare.
- **Check that:**
  - OSAPI_Memory_compare returns zero.

QTS-R-525.3.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_compare returns that *left* is greater than *right*.

TC.1

- **Preconditions:**
  - the memory region defined by [*left*, *left* + *size* - 1] is greater than the one defined by [*right*, *right* + *size* - 1] when interpreted as a sequence of 8-bit values.
- **Actions:**
  - call OSAPI_Memory_compare.
- **Check that:**
  - OSAPI_Memory_compare returns a value greater than zero.

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QTS-R-525.4

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_move has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Memory_move has the following signature:

Operations	Parameters	Type
OSAPI_Memory_move	out: *void* *dest in: *const void* *source in: *RTI_SIZE_T* size	void

QTS-R-525.4.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_move successfully moves overlapping memory.
- **[TC.2]** Operation OSAPI_Memory_move successfully moves non-overlapping memory.

TC.1

- **Preconditions:**
  - *source* and *dest* are distinct overlapping *size*-byte memory regions.
    - [TC.1.1] *source* begins within *dest*.
    - [TC.1.2] *dest* begins within *source*.
- **Actions:**
  - call OSAPI_Memory_move.
- **Check that:**
  - the *size* bytes currently stored in *dest* are equal to the bytes initially stored in *source*.

TC.2

- **Preconditions:**
  - *source* and *dest* are non-overlapping *size*-byte memory regions.
- **Actions:**
  - call OSAPI_Memory_move.
- **Check that:**
  - the *size* bytes currently stored in *dest* are equal to the bytes initially stored in *source*.

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QTS-R-525.5

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_fndchr has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Memory_fndchr has the following signature:

Operations	Parameters	Type
OSAPI_Memory_fndchr	in: *const void **s in: *RTI_INT32* c in: *RTI_SIZE_T* size	void *

QTS-R-525.5.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_fndchr successfully finds the character *c*.

TC.1

- **Preconditions:**
  - the memory region defined as [*s*, *s* + *size*- 1] contains at least one instance of the byte *c*.
- **Actions:**
  - call OSAPI_Memory_fndchr.
- **Check that:**
  - OSAPI_Memory_fndchr returns a pointer to the first instance of the byte *c*.

QTS-R-525.5.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_Memory_fndchr fails to find the character *c*.

TC.1

- **Preconditions:**
  - the memory region defined as [*s*, *s* + *size* - 1] does not contain an instance of the byte *c*.
- **Actions:**
  - call OSAPI_Memory_fndchr.
- **Check that:**
  - OSAPI_Memory_fndchr returns NULL.

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String

QTS-R-525.6

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_length has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_String_length has the following signature:

Operations	Parameters	Type
OSAPI_String_length	in: *const char **s	RTI_SIZE_T

QTS-R-525.9

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_nlength has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_String_nlength has the following signature:

Operations	Parameters	Type
OSAPI_String_nlength	in: *const char **s	RTI_SIZE_T
	in: *RTI_SIZE_T* max_length	

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QTS-R-525.9.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_nlength returns the length of a string.
- **[TC.2]** Operation OSAPI_String_nlength returns max_length if there is not null terminator within the max_length

TC.1

- **Preconditions:**
  - *s* is an ASCIIZ string.
  - *s* is within the given max_length
- **Actions:**
  - call OSAPI_String_nlength.
- **Check that:**
  - OSAPI_String_nlength returns the length of *s*, excluding the NUL terminator.

TC.2

- **Preconditions:**
  - *s* is an ASCIIZ string.
  - *s* is bigger than the given max_length
- **Actions:**
  - call OSAPI_String_nlength.
- **Check that:**
  - OSAPI_String_nlength returns the length of max_length

QTS-R-525.9.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_nlength returns the length of 0 if the string provided s is NULL.

TC.1

- **Preconditions:**
  - *s* is an NULL string.
- **Actions:**
  - call OSAPI_String_nlength.
- **Check that:**
  - OSAPI_String_nlength returns the length of 0

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QTS-R-525.6.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_length returns the length of a string.

TC.1

- **Preconditions:**
  - *s* is an ASCIIZ string.
- **Actions:**
  - call OSAPI_String_length.
- **Check that:**
  - OSAPI_String_length returns the length of *s*, excluding the NUL terminator.

QTS-R-525.7

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_cmp has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_String_cmp has the following signature:

Operations	Parameters	Type
OSAPI_String_cmp	in: *const char* *l in: *const char* *r	RTI_INT32

QTS-R-525.7.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_cmp returns less than 0 when *l* is less than *r*.

TC.1

- **Preconditions:**
  - the ASCIIZ string *l* is lexicographically less than the ASCIIZ string *r* when taken as a sequence of unsigned 8-bit values.
- **Actions:**
  - call OSAPI_String_cmp.
- **Check that:**
  - OSAPI_String_cmp returns a value less than 0.

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QTS-R-525.7.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_cmp returns 0 when *l* is equal to *r*.

TC.1

- **Preconditions:**
  - the ASCIIZ string *l* is lexicographically equal to the ASCIIZ string *r* when taken as a sequence of unsigned 8-bit values.
- **Actions:**
  - call OSAPI_String_cmp.
- **Check that:**
  - OSAPI_String_cmp returns 0.

QTS-R-525.7.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_cmp returns greater than 0 when *l* is greater than *r*.

TC.1

- **Preconditions:**
  - the ASCIIZ string *l* is lexicographically greater than the ASCIIZ string *r* when taken as a sequence of unsigned 8-bit values.
- **Actions:**
  - call OSAPI_String_cmp.
- **Check that:**
  - OSAPI_String_cmp returns a value greater than 0.

QTS-R-525.8

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_ncmp has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_String_ncmp has the following signature:

Operations	Parameters	Type
OSAPI_String_ncmp	in: *const char* *l in: *const char* *r in: *RTI_SIZE_T* num	RTI_INT32

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QTS-R-525.8.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_ncmp returns less than 0 when the first *num* bytes of *l* are less than the first *num* bytes of *r*.
- **[TC.2]** Operation OSAPI_String_ncmp returns less than 0 when *l* is shorter than *r* and has less than *num* bytes.

TC.1

- **Preconditions:**
  - *l* and *r* are longer than *num*.
  - the first *num* bytes of ASCIIZ string *l* are lexicographically less than the first *num* bytes of ASCIIZ string *r* when taken as a sequence of unsigned 8-bit values.
- **Actions:**
  - call OSAPI_String_ncmp.
- **Check that:**
  - OSAPI_String_ncmp returns a value less than 0.

TC.2

- **Preconditions:**
  - *l* is shorter than *r* and *num*.
  - the bytes of *l* and *r*, until reaching *l*'s NUL terminator, are lexicographically equal.
- **Actions:**
  - call OSAPI_String_ncmp.
- **Check that:**
  - OSAPI_String_ncmp returns a value less than 0.

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QTS-R-525.8.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_ncmp returns 0 when the first *num* bytes of *l* are equal to the first *num* bytes of *r*.
- **[TC.2]** Operation OSAPI_String_ncmp returns 0 when *l* and *r* have less than *num* bytes and are equal.

TC.1

- **Preconditions:**
  - *l* and *r* are longer than *num*.
  - the first *num* bytes of ASCIIZ string *l* is lexicographically equal to the first *num* bytes of ASCIIZ string *r* when taken as a sequence of unsigned 8-bit values.
- **Actions:**
  - call OSAPI_String_ncmp.
- **Check that:**
  - OSAPI_String_ncmp returns 0.

TC.2

- **Preconditions:**
  - *l* and *r* are shorter than *num*.
  - the ASCIIZ string *l* is lexicographically equal to the ASCIIZ string *r*, up to and including their NUL terminators, when taken as a sequence of unsigned 8-bit values.
  - **[TC.2.1]** the bytes following the NUL terminator of *l* and *r*, until *num* bytes from the start of each string, are not equal.
  - **[TC.2.2]** the bytes following the NUL terminator of *l* and *r*, until *num* bytes from the start of each string, are equal.
- **Actions:**
  - call OSAPI_String_ncmp.
- **Check that:**
  - OSAPI_String_ncmp returns 0.

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QTS-R-525.8.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_String_ncmp returns greater than 0 when the first *num* bytes of *l* are greater than than the first *num* bytes of *r*.
- **[TC.2]** Operation OSAPI_String_ncmp returns greater than 0 when *r* is shorter than *l* and has less than *num* bytes.

TC.1

- **Preconditions:**
  - *l* and *r* are longer than *num*.
  - the first *num* bytes of ASCIIZ string *l* are lexicographically greater than the first *num* bytes of ASCIIZ string *r* when taken as a sequence of unsigned 8-bit values.
- **Actions:**
  - call OSAPI_String_ncmp.
- **Check that:**
  - OSAPI_String_ncmp returns a value greater than 0.

TC.2

- **Preconditions:**
  - *r* is shorter than *l* and *num*.
  - the bytes of *l* and *r*, until reaching *r*'s NUL terminator, are lexicographically equal.
- **Actions:**
  - call OSAPI_String_ncmp.
- **Check that:**
  - OSAPI_String_ncmp returns a value greater than 0.

OSAPI_System

QTS-R-526.0

Analysis

The requirement is met when an instance of the OSAPI_SystemI structure implements:

- **[TC.1]** *get_timer_resolution* operation.
- **[TC.2]** *get_time* operation.
- **[TC.3]** *start_timer* operation.
- **[TC.4]** *generate_uuid* operation.
- **[TC.5]** *get_hostname* operation.
- **[TC.6]** *initialize* operation.
- **[TC.7]** *get_ticktime* operation.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_SystemI structure implements the *get_timer_resolution* operation returning RTI_INT32 value and not accepting any parameters.

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TC.2

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_SystemI structure implements the *get_time* operation returning RTI_BOOL value and accepting the following parameters:
    - in: OSAPI_SystemTime *now

TC.3

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_SystemI structure implements the *start_timer* operation returning RTI_BOOL value and accepting the following parameters:
    - in: OSAPI_Timer_T self
    - in: OSAPI_TimerTickHandlerFunction tick_handler

TC.4

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_SystemI structure implements the *generate_uuid* operation returning RTI_BOOL value and accepting the following parameters:
    - out: struct OSAPI_SystemUUID *uuid_out

TC.5

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_SystemI structure implements the *get_hostname* operation returning RTI_BOOL value and accepting the following parameters:
    - out: char *const hostname

TC.6

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_SystemI structure implements the *initialize* operation returning RTI_BOOL value and not accepting any parameters.

TC.7

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- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_SystemI structure implements the *get_ticktime* operation returning RTI_BOOL value and accepting the following parameters:
    - out: RTI_INT32 *sec
    - out: RTI_UINT32 *nanosec

QTS-R-526.1

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.start_timer* operation configures the OSAPI_System instance to start invoking the *tick_handler* method parameter on the self OSAPI_Timer_T at the frequency returned by the OSAPI_SystemI.get_timer_resolution operation, and returns RTI_TRUE on success.

TC.1

- **Preconditions:**
  - the *OSAPI_SystemI.get_timer_resolution* operation can be invoked successfully.
- **Actions:**
  - call the OSAPI_SystemI.start_timer method.
- **Check that:**
  - OSAPI_System instance is configured to start invoking the *tick_handler* method parameter on the *self* OSAPI_Timer_T at the frequency returned by the *OSAPI_SystemI.get_timer_resolution* operation, and
  - RTI_TRUE is returned.

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Analysis

The requirement is met when the *OSAPI_SystemI.start_timer* operation does not configure the OSAPI_System instance to start invoking the *tick_handler* method and returns RTI_FALSE:

- **[TC.1]** on failure.
- **[TC.2]** when the system has not been initialized.

TC.1

- **Preconditions:**
  - the *OSAPI_SystemI.start_timer* operation fails.
- **Actions:**
  - call the *OSAPI_SystemI.start_timer* operation.
- **Check that:**
  - the *OSAPI_SystemI.start_timer* operation does not configure the OSAPI_System instance to start invoking the *tick_handler* method, and
  - the *OSAPI_SystemI.start_timer* operation returns RTI_FALSE.

TC.2

- **Preconditions:**
  - the system has not been initialized.
- **Actions:**
  - call the *OSAPI_SystemI.start_timer* operation.
- **Check that:**
  - the *OSAPI_SystemI.start_timer* operation does not configure the OSAPI_System instance to start invoking the *tick_handler* method, and
  - the *OSAPI_SystemI.start_timer* operation returns RTI_FALSE.

QTS-R-526.1.2

Analysis

The requirement is met when:

- **[TC.1]** The Platform Integration calls the *tick_handler* method for each of the OSAPISYSTEM_MAX_TIMERS instances at least at the timer resolution rate returned by the OSAPI_SystemI.get_timer_resolution operation.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - The Platform Integration calls the *tick_handler* method for each of the OSAPISYSTEM_MAX_TIMERS instances at least at the timer resolution rate returned by the OSAPI_SystemI.get_timer_resolution operation.

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QTS-R-526.2

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_timer_resolution* operation returns a value greater than 0 (zero) for the resolution of the clock used by the system timer.

TC.1

- **Preconditions:**
  - the system has been initialized.
- **Actions:**
  - call the *OSAPI_SystemI.get_timer_resolution* operation.
- **Check that:**
  - the *OSAPI_SystemI.get_timer_resolution* operation returns a value greater than 0 (zero) for the resolution of the clock used by the system timer.

QTS-R-526.3

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_timer_resolution* operation returns 0 if the system has not been initialized.

TC.1

- **Preconditions:**
  - the system has not been initialized.
- **Actions:**
  - call the *OSAPI_SystemI.get_timer_resolution* operation.
- **Check that:**
  - the *OSAPI_SystemI.get_timer_resolution* operation returns 0.

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QTS-R-526.4

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_time* operation updates the memory pointed to by the *now* pointer and returns *RTI_TRUE* on success.
- **[TC.2]** The *OSAPI_SystemI.get_time* operation returns the current system time as OSAPI_SystemTime.

TC.1

- **Preconditions:**
  - a successful call of the *OSAPI_SystemI.get_time* operation can be performed.
- **Actions:**
  - call the *OSAPI_SystemI.get_time* operation.
- **Check that:**
  - the *OSAPI_SystemI.get_time* operation updates the memory pointed to by the *now* pointer, and
  - the *OSAPI_SystemI.get_time* operation returns RTI_TRUE.

TC.2

- **Preconditions:**
  - a successful call of the *OSAPI_SystemI.get_time* operation can be performed.
- **Actions:**
  - call the *OSAPI_SystemI.get_time* operation.
- **Check that:**
  - the *now* pointer points to the current system time as OSAPI_SystemTime.

QTS-R-526.4.1

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_time* operation provides for the current system time a positive number of seconds and the number of nanoseconds in the range of 0 - 999999999.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the *OSAPI_SystemI.get_time* operation provides for the current system time a positive number of seconds and the number of nanoseconds in the range of 0 - 999999999

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QTS-R-526.4.2

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_time* operation returns RTI_FALSE when the current system time is invalid (seconds).
- **[TC.2]** The *OSAPI_SystemI.get_time* operation returns RTI_FALSE when the current system time is invalid (nanoseconds).

TC.1

- **Preconditions:**
  - seconds in the current system time are negative
- **Actions:**
  - call the *OSAPI_SystemI.get_time* operation
- **Check that:**
  - the *OSAPI_SystemI.get_time* operation returns RTI_FALSE

TC.2

- **Preconditions:**
  - nanoseconds in the current system time are outside of the range 0 - 999999999
- **Actions:**
  - call the *OSAPI_SystemI.get_time* operation
- **Check that:**
  - the *OSAPI_SystemI.get_time* operation returns RTI_FALSE

QTS-R-526.5

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_time* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *OSAPI_SystemI.get_time* operation fails.
- **Actions:**
  - call the *OSAPI_SystemI.get_time* operation.
- **Check that:**
  - the *OSAPI_SystemI.get_time* operation returns RTI_FALSE.

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QTS-R-526.6

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.initialize* operation initializes the system and returns RTI_TRUE.

TC.1

- **Preconditions:**
  - It is possible to initialize the system.
- **Actions:**
  - call the *OSAPI_SystemI.initialize* operation.
- **Check that:**
  - the system is intiailized, and
  - the *OSAPI_SystemI.initialize* operation returns RTI_TRUE.

QTS-R-526.7

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.initialize* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *OSAPI_SystemI.initialize* operation fails.
- **Actions:**
  - call the *OSAPI_SystemI.initialize* operation.
- **Check that:**
  - the *OSAPI_SystemI.initialize* operation returns RTI_FALSE.

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QTS-R-526.8

Analysis

The requirement is met when the operation *OSAPI_SystemI.generate_uuid* :

- **[TC.1]** updates the memory pointed to by the *uuid_out* pointer and returns RTI_TRUE on success.
- **[TC.2]** provides a system id that is unique in the system and returns it through the *uuid_out* pointer.

TC.1

- **Preconditions:**
  - it is possible to provide a system id.
- **Actions:**
  - call the *OSAPI_SystemI.generate_uuid* operation.
- **Check that:**
  - the memory pointed to by the *uuid_out* pointer gets updated, and
  - the *OSAPI_SystemI.generate_uuid* operation returns RTI_TRUE.

TC.2

- **Preconditions:**
  - it is possible to provide a system id.
- **Actions:**
  - call the *OSAPI_SystemI.generate_uuid* operation.
- **Check that:**
  - the *uuid_out* pointer points to an unique id in the system.

QTS-R-526.9

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.generate_uuid* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *OSAPI_SystemI.generate_uuid* operation fails.
- **Actions:**
  - call the *OSAPI_SystemI.generate_uuid* operation.
- **Check that:**
  - the *OSAPI_SystemI.generate_uuid* operation returns RTI_FALSE.

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QTS-R-526.10

Analysis

The requirement is met when the *OSAPI_SystemI.get_hostname* operation, on successful call, returns a hostname and RTI_TRUE value when:

- **[TC.1]** the hostname in bytes is less than or equal to OSAPI_SYSTEM_MAX_HOSTNAME bytes.
- **[TC.2]** the hostname in bytes is greater than OSAPI_SYSTEM_MAX_HOSTNAME bytes.

TC.1

- **Preconditions:**
  - It is possible to get the hostname, and
    - **[TC.1.1]** the hostname in bytes is less than OSAPI_SYSTEM_MAX_HOSTNAME bytes,
    - **[TC.1.2]** the hostname in bytes is equal to OSAPI_SYSTEM_MAX_HOSTNAME bytes.
- **Actions:**
  - call the *OSAPI_SystemI.get_hostname* operation.
- **Check that:**
  - the hostname is provided through the *hostname* pointer, and
  - the *OSAPI_SystemI.get_hostname* operation returns RTI_TRUE.

TC.2

- **Preconditions:**
  - It is possible to get the hostname, and
  - the hostname in bytes is greater than OSAPI_SYSTEM_MAX_HOSTNAME bytes.
- **Actions:**
  - call the *OSAPI_SystemI.get_hostname* operation.
- **Check that:**
  - only the OSAPI_SYSTEM_MAX_HOSTNAME bytes of the hostname are provided through the *hostname* pointer, and
  - the *OSAPI_SystemI.get_hostname* operation returns RTI_TRUE.

QTS-R-526.11

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_hostname* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *OSAPI_SystemI.get_hostname* operation fails.
- **Actions:**
  - call the *OSAPI_SystemI.get_hostname* operation.
- **Check that:**
  - RTI_FALSE is returned.

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QTS-R-526.13

Analysis

The requirement is met when the *OSAPI_SystemI.get_ticktime* operation on success:

- **[TC.1]** updates the memory pointed to by the *sec* and *nanosec* pointers and returns RTI_TRUE.
- **[TC.2]** returns the number of seconds and nanoseconds through the *sec* and *nanosec* pointers in increments of the timer resolution since the system started.

TC.1

- **Preconditions:**
  - it is possible to get the system tick time.
- **Actions:**
  - call the *OSAPI_SystemI.get_ticktime* operation.
- **Check that:**
  - the memory regions pointed to by the *sec* and *nanosec* pointers are updated, and
  - the *OSAPI_SystemI.get_ticktime* operation returns RTI_TRUE.

TC.2

- **Preconditions:**
  - it is possible to get the system tick time.
- **Actions:**
  - call the *OSAPI_SystemI.get_ticktime* operation.
- **Check that:**
  - the time returned by the *OSAPI_SystemI.get_ticktime* operation through the *sec* and *nanosec* pointers represents the time since the system started in the increments of the system timer resolution.

QTS-R-526.14

Analysis

The requirement is met when:

- **[TC.1]** The *OSAPI_SystemI.get_ticktime* operation returns RTI_FALSE on failure,
- **[TC.2]** The *OSAPI_SystemI.get_ticktime* operation returns RTI_FALSE when the system has not been initialized.

TC.1

- **Preconditions:**
  - the *OSAPI_SystemI.get_ticktime* operation fails.
- **Actions:**
  - call the *OSAPI_SystemI.get_ticktime* operation.
- **Check that:**
  - the *OSAPI_SystemI.get_ticktime* operation returns RTI_FALSE.

TC.2

- **Preconditions:**
  - the system has not been initialized.
- **Actions:**
  - call the *OSAPI_SystemI.get_ticktime* operation.
- **Check that:**
  - the *OSAPI_SystemI.get_ticktime* operation returns RTI_FALSE.

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QTS-R-526.15

Analysis

The requirement is met when:

- **[TC.1]** The OSAPI_System_get_native_interface operation has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_System_get_native_interface operation has the following signature:

Operations	Parameters	Type
OSAPI_System_get_native_interface	out: OSAPI_SystemI *intf	void

QTS-R-526.15.1

Analysis

The requirement is met when:

- **[TC.1]** the **OSAPI_System_get_native_interface** operation returns a pointer to an OSAPI_SystemI object through the *intf* parameter, that implements the OSAPI_SystemI interface.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - call the **OSAPI_System_get_native_interface** operation.
- **Check that:**
  - the pointer returned by the **OSAPI_System_get_native_interface** operation through the *intf* parameter, points to an object implementing the OSAPI_SystemI interface.

QTS-R-526.15.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_System_get_native_interface operation returns without updating the parameter *intf* if *intf* is 'nil'.

1.1.1.1.1 TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - call the OSAPI_System_get_native_interface operation providing 'nil' as the *intf* parameter.
- **Check that:**
  - the function returns without updating the *intf* paramteter.

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QTS-R-526.16

Analysis

The requirement is met when:

- **[TC.1]** the global variable *OSAPI_System_gv_System* is defined.
- **[TC.2]** the global variable *OSAPI_System_gv_System* is declared as a pointer to a type OSAPI_System.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the global variable *OSAPI_System_gv_System* is defined.

TC.2

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the global variable *OSAPI_System_gv_System* is declared as a pointer to a type OSAPI_System.

QTS-R-526.17

Analysis

The requirement is met when:

- **[TC.1]** the PSL has an instance of the OSAPI_System object.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the PSL has an instance of the OSAPI_System object.

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QTS-R-526.18

Analysis

The requirement is met when:

- **[TC.1]** the PSL initializes its instance of the OSAPI_System object with OSAPI_System_INITIALIZER.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the PSL initializes its instance of the OSAPI_System object with OSAPI_System_INITIALIZER.

Concurrency

QTS-R-527.1

Analysis

The requirement is met when:

- **[TC.1]** The listed PSL operations are reentrant and thread-safe.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the following PSL operations are reentrant and thread safe:
    - OSAPI_Heap_allocate_buffer
    - OSAPI_Mutex_new
    - OSAPI_Mutex_take
    - OSAPI_Mutex_give
    - OSAPI_Semaphore_new
    - OSAPI_Semaphore_take
    - OSAPI_Semaphore_give
    - OSAPI_Process_getpid
    - OSAPI_Memory_copy
    - OSAPI_Memory_zero
    - OSAPI_Memory_compare
    - OSAPI_Memory_fndchr
    - OSAPI_Memory_move
    - OSAPI_String_length
    - OSAPI_String_cmp
    - OSAPI_String_ncmp
    - OSAPI_SystemI.get_timer_resolution
    - OSAPI_SystemI.get_time

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- OSAPI_SystemI.start_timer
- OSAPI_SystemI.generate_uuid
- OSAPI_SystemI.get_hostname
- OSAPI_SystemI.initialize
- OSAPI_SystemI.get_ticktime

Debug support

QTS-R-528.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_Log_get_last_error_code operation has specified signature when debugging is enabled

TC.1

- **Preconditions:**
  - debugging is enabled
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Log_get_last_error_code has the following signature:

Operations	Parameters	Type
OSAPI_Log_get_last_error_code	in: void	RTI_INT32

QTS-R-528.1.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_Log_get_last_error_code operation returns the last error code tracked by the platform

TC.1

- **Preconditions:**
  - debugging is enabled
  - there are at least two different error codes tracked by the platform
- **Actions:**
  - call OSAPI_Log_get_last_error_code
- **Check that:**
  - OSAPI_Log_get_last_error_code operation returns the last error code tracked by the platform

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Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_Log_get_last_error_code operation is defined when debugging is enabled.
- **[TC.2]** the OSAPI_Log_get_last_error_code operation is not defined when debugging is not enabled.

TC.1

- **Preconditions:**
  - debugging is enabled
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Log_get_last_error_code is defined

TC.2

- **Preconditions:**
  - debugging is not enabled
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Log_get_last_error_code is not defined

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Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_Log_set_last_error_code operation has specified signature when debugging is enabled

TC.1

- **Preconditions:**
  - debugging is enabled
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Log_set_last_error_code has the following signature:

Operations	Parameters	Type
OSAPI_Log_set_last_error_code	in: RTI_INT32 err	void

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Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_Log_set_last_error_code operation sets the last error code tracked by the platform to the value of the parameter *err*

TC.1

- **Preconditions:**
  - debugging is enabled
  - there are at least two different error codes tracked by the platform
- **Actions:**
  - call OSAPI_Log_set_last_error_code with *err*
- **Check that:**
  - OSAPI_Log_set_last_error_code operation sets the last error code tracked by the platform to the value of the parameter *err*

QTS-R-528.10.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_Log_set_last_error_code operation is defined when debugging is enabled.
- **[TC.2]** the OSAPI_Log_set_last_error_code operation is not defined when debugging is not enabled.

TC.1

- **Preconditions:**
  - debugging is enabled
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Log_set_last_error_code is defined

TC.2

- **Preconditions:**
  - debugging is not enabled
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_Log_set_last_error_code is not defined

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PSL_NETIO_DGRAM

DGRAM_transport_plugin_API

QTS-R-550.1

Analysis

The requirement is met when:

- **[TC.1]** An instance of the NETIO_DGRAM_InterfaceI structure is created and its member attributes have assigned function pointers that implement interfaces as per the table.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - an instance of the NETIO_DGRAM_InterfaceI structure is created and its member attributes have been assigned function pointers to functions that implement the interfaces as per the table below:

NETIO_DGRAM_InterfaceI Attribute	**Parameters**	**Type**
create_instance	in: NETIO_Interface_T *upstream in: void *property	NETIO_Interface_T*
get_interface_list	in: NETIO_Interface_T *user_intf inout: struct NETIO_DGRAM_InterfaceTableEntrySeq *if_table	RTI_BOOL
release_address	in: NETIO_Interface_T *self in: struct NETIO_Address *src_addr	RTI_BOOL
resolve_address	in: NETIO_Interface_T *netio_intf in: const struct NETIO_DGRAM_InterfaceTableEntry *if_entry in: const char *address_string out: struct NETIO_Address *address_value out: RTI_BOOL *invalid	RTI_BOOL
send	in: NETIO_Interface_T *self in: struct NETIO_Interface *source in: struct NETIO_Address *destination in: NETIO_Packet_T *packet	RTI_BOOL
get_route_table	in: NETIO_Interface_T *netio_intf inout: struct NETIO_AddressSeq *address inout: struct NETIO_NetmaskSeq *netmask	RTI_BOOL
bind_address	in: NETIO_Interface_T *user_intf	RTI_BOOL

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	in: struct NETIO_Address *source	

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Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.create_instance* operation returns a non-NULL pointer on success

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.create_instance* operation succeeds when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.create_instance* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.create_instance* operation returns a non-NULL pointer to an instance of an interface of type NETIO_Interface_T

QTS-R-550.1.1.1

Analysis

The requirement is met when:

- **[TC.1]** The PSL does not use *upstream* NETIO_Interface_T parameter to call RCC APIs in the implementation of *NETIO_DGRAM_InterfaceI.create_instance.*

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the PSL does not use *upstream* NETIO_Interface_T parameter to call RCC APIs in the implementation of *NETIO_DGRAM_InterfaceI.create_instance.*

QTS-R-550.1.2

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.create_instance* operation returns NULL on failure.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.create_instance* operation fails when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.create_instance* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.create_instance* operation returns NULL

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QTS-R-550.1.3

Analysis

The requirement is met when the *NETIO_DGRAM_InterfaceI.get_interface_list* operation returns the available network interfaces, that meet the specified cirteria, and RTI_TRUE on success.

The criteria are met when the following logic is met:

A and **B** and **C** and (**D1** or **D2**)

Where each criterion is defined as follows:

A - <*entry.address*> is not within <*entry.multicast_group*>

B - <*entry.multicast_group.netmask.bits*> is not less than 0 and not greater than 128

C - <*entry.multicast_group.netmask.mask*> all array elements are zeroes

D1 - <*entry.locator_kind*> is greater than 0 and less than NETIO_ADDRESS_RTPS_RESERVED_LOW

D2 - <*entry.locator_kind*> is greater than NETIO_ADDRESS_RTPS_RESERVED_HIGH

test case	A	B	C	D1	D2
TC.1	T	T	T	T	F
TC.2	T	T	T	F	T

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.get_interface_list* operation succeeds when called
  - there are at least two available interfaces in which at least one, but not all, meet the criteria:
    - the interfaces only meet the criteria in the following way:
      - **A** - <*entry.address*> is not within <*entry.multicast_group*>
      - **B** - <*entry.multicast_group.netmask.bits*> is not less than 0 and not greater than 128
      - **C** - <*entry.multicast_group.netmask.mask*> all array elements are zeroes
      - **D1** - <*entry.locator_kind*> is greater than 0 and less than NETIO_ADDRESS_RTPS_RESERVED_LOW
      - **!D2** - <*entry.locator_kind*> is NOT greater than NETIO_ADDRESS_RTPS_RESERVED_HIGH
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.get_interface_list* operation
- **Check that:**
  - the available network interfaces, that meet the criteria, for the NETIO_DGRAM interface passed in *user_intf* are returned through the *if_table* parameter
  - the *NETIO_DGRAM_InterfaceI.get_interface_list* operation returns RTI_TRUE

TC.2

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.get_interface_list* operation succeeds when called
  - there are at least two available interfaces in which at least one, but not all, meet the criteria:
    - the interfaces only meet the criteria in the following way:
      - **A** - <*entry.address*> is not within <*entry.multicast_group*>

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- **B** - <*entry.multicast_group.netmask.bits*> is not less than 0 and not greater than 128
- **C** - <*entry.multicast_group.netmask.mask*> all array elements are zeroes
- **!D1** - <*entry.locator_kind*> is NOT greater than 0 or NOT less than NETIO_ADDRESS_RTPS_RESERVED_LOW
- **D2** - <*entry.locator_kind*> is greater than NETIO_ADDRESS_RTPS_RESERVED_HIGH

- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.get_interface_list* operation
- **Check that:**
  - the available network interfaces, that meet the criteria, for the NETIO_DGRAM interface passed in *user_intf* are returned through the *if_table* parameter
  - the *NETIO_DGRAM_InterfaceI.get_interface_list* operation returns RTI_TRUE

QTS-R-550.1.3.1

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.get_interface_list* operation returns RTI_TRUE without updating the *if_table* sequence when there are no available interfaces.

TC.1

- **Preconditions:**
  - there are no interfaces available
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.get_interface_list* operation
- **Check that:**
  - the *if_table* sequence is not updated
  - the *NETIO_DGRAM_InterfaceI.get_interface_list* operation returns RTI_TRUE

QTS-R-550.1.4

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.get_interface_list* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.get_interface_list* operation fails when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.get_interface_list* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.get_interface_list* operation returns RTI_FALSE

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QTS-R-550.1.5

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.release_address* operation causes interface to stop listening to messages from the address and returns RTI_TRUE on success.

TC.1

- **Preconditions:**
  - the NETIO_DGRAM interface specified by *self* has been listening to messages from the address *src_addr*
  - the *NETIO_DGRAM_InterfaceI.release_address* operation succeeds when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.release_address* operation
- **Check that:**
  - the NETIO_DGRAM interface specified by *self* stopped listening to messages from the address *src_addr*
  - the *NETIO_DGRAM_InterfaceI.release_address* operation returns RTI_TRUE

QTS-R-550.1.6

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.release_address* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.release_address* operation fails when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.release_address* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.release_address* operation returns RTI_FALSE

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QTS-R-550.1.7

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.resolve_address* operation converts an address that is a valid address for the NETIO_DGRAM interface and returns RTI_TRUE on successful conversion.

TC.1

- **Preconditions:**
  - the *address_string* is a valid address for the NETIO_DGRAM interface specified by *netio_intf*
  - the *NETIO_DGRAM_InterfaceI.resolve_address* operation converts address successfully when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.resolve_address* operation
- **Check that:**
  - the *address_string* is converted to an *address_value* using the locator kind information stored in the interface table *if_entry*
  - the value pointed by *invalid* is set to RTI_FALSE
  - the *NETIO_DGRAM_InterfaceI.resolve_address* operation returns RTI_TRUE

QTS-R-550.1.7.1

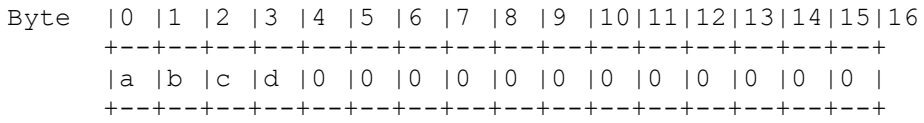
Analysis

The requirement is met when:

- **[TC.1]** The NETIO_DGRAM_InterfaceI.resolve_address operation converts the *address_string* from dotted notation "a.b.c.d" to *address_value.value.address.octet* when the locator_kind of the interface entry *if_entry* is NETIO_ADDRESS_KIND_UDPv4 and the *address_string* is an IPv4 address

TC.1

- **Preconditions:**
  - the locator_kind of the interface entry *if_entry* is NETIO_ADDRESS_KIND_UDPv4
  - the *address_string* is an IPv4 address
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.resolve_address* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.resolve_address* operation converts the *address_string* from the dotted notation "a.b.c.d" to *address_value.value.address.octet* in the following form in network order:



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QTS-R-550.1.8

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.resolve_address* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.resolve_address* operation fails when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.resolve_address* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.resolve_address* operation returns RTI_FALSE

QTS-R-550.1.8.1

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.resolve_address* operation sets the value pointed by *invalid* to RTI_TRUE on a failure caused by *address_string* being an invalid address for *netio_intf*.
- **[TC.2]** The *NETIO_DGRAM_InterfaceI.resolve_address* operation sets the value pointed by *invalid* to RTI_FALSE on a failure caused by other reason than *address_string* being an invalid address for *netio_intf*.

TC.1

- **Preconditions:**
  - the *address_string* is an invalid address for the NETIO_DGRAM interface specified by *netio_intf*
  - when called, the *NETIO_DGRAM_InterfaceI.resolve_address* operation fails due to *address_string* being invalid address for the *netio_intf*
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.resolve_address* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.resolve_address* operation sets the value pointed by *invalid* to RTI_TRUE

TC.2

- **Preconditions:**
  - the *address_string* is a valid address for the NETIO_DGRAM interface specified by *netio_intf*
  - when called, the *NETIO_DGRAM_InterfaceI.resolve_address* operation fails due to other reason than *address_string* being invalid address for the *netio_intf*
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.resolve_address* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.resolve_address* operation sets the value pointed by *invalid* to RTI_FALSE

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QTS-R-550.1.9

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.send* operation sends the packet from *source* to the *destination* using *self* and returns RTI_TRUE on success.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.send* operation succeeds when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.send* operation
- **Check that:**
  - the *packet* is sent from *source* to the *destination* using the NETIO_Interface_T object *self*
  - the *NETIO_DGRAM_InterfaceI.send* operation returns RTI_TRUE

QTS-R-550.1.10

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.send* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.send* operation fails when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.send* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.send* operation returns RTI_FALSE

QTS-R-550.1.11

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.get_route_table* operation retrieves a sequence of all addresses and a sequence of all netmasks from the routing table and returns RTI_TRUE on success.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.get_route_table* operation succeeds when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.get_route_table* operation
- **Check that:**
  - a sequence of all addresses and a sequence of all netmasks from the routing table, that the NETIO_DGRAM interface can send to, are retrieved as *address* and *netmask* respectively
  - the *NETIO_DGRAM_InterfaceI.get_route_table* operation returns RTI_TRUE

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QTS-R-550.1.12

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.get_route_table* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.get_route_table* operation fails when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.get_route_table* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.get_route_table* operation returns RTI_FALSE

QTS-R-550.1.13

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.bind_address* operation causes interface to listen for messages from the addresses and returns RTI_TRUE on success.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.bind_address* operation succeeds when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.bind_address* operation
- **Check that:**
  - the interface specified by *user_intf* listens for messages from the address specified by *source*
  - the *NETIO_DGRAM_InterfaceI.bind_address* operation returns RTI_TRUE

QTS-R-550.1.14

Analysis

The requirement is met when:

- **[TC.1]** The *NETIO_DGRAM_InterfaceI.bind_address* operation returns RTI_FALSE on failure.

TC.1

- **Preconditions:**
  - the *NETIO_DGRAM_InterfaceI.bind_address* operation fails when called
- **Actions:**
  - call the *NETIO_DGRAM_InterfaceI.bind_address* operation
- **Check that:**
  - the *NETIO_DGRAM_InterfaceI.bind_address* operation returns RTI_FALSE

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QTS-R-550.1.15

Analysis

The requirement is met when:

- **[TC.1]** The Platform Integrator uses NETIO_DGRAM_Interface_upstream_receive operation to forward a NETIO_Packet_T *packet* and a NETIO_Address *source* to the upstream interface specified by the *netio_intf* parameter upon reception of data from the platform's network stack.

TC.1

- **Preconditions:**
  - the platform received data on the network stack
- **Actions:**
  - N/A
- **Check that:**
  - the Platform Integrator uses the NETIO_DGRAM_Interface_upstream_receive operation to forward a NETIO_Packet_T *packet* that contains payload data received from the network and a NETIO_Address *source* to the upstream interface specified by the *netio_intf* parameter

Concurrency

QTS-R-551.1

Analysis

The requirement is met when:

- **[TC.1]** The listed functions are reentrant and thread-safe.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the listed functions are reentrant and thread-safe:
    - *NETIO_DGRAM_InterfaceI.create_instance*
    - *NETIO_DGRAM_InterfaceI.get_interface_list*
    - *NETIO_DGRAM_InterfaceI.release_address*
    - *NETIO_DGRAM_InterfaceI.resolve_address*
    - *NETIO_DGRAM_InterfaceI.send*
    - *NETIO_DGRAM_InterfaceI.get_route_table*
    - *NETIO_DGRAM_InterfaceI.bind_address*

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PSL_Data_Types

QTS-R-560.1

Analysis

The requirement is met when the following data types have their minimum alignment met, and are accessed atomically where noted:

- **[TC.1]** RTI_INT8, minimum alignment 8 bit, atomic access.
- **[TC.2]** RTI_UINT8, minimum alignment 8 bit, atomic access.
- **[TC.3]** RTI_INT16, minimum alignment 16 bit, atomic access.
- **[TC.4]** RTI_UINT16, minimum alignment 16 bit, atomic access.
- **[TC.5]** RTI_INT32, minimum alignment 32 bit, atomic access.
- **[TC.6]** RTI_UINT32, minimum alignment 32 bit, atomic access.
- **[TC.7]** RTI_INT64, minimum alignment 32 bit.
- **[TC.8]** RTI_UINT64, minimum alignment 32 bit.
- **[TC.9]** RTI_FLOAT32, minimum alignment 32 bit.
- **[TC.10]** RTI_DOUBLE64, minimum alignment 32 bit.
- **[TC.11]** RTI_DOUBLE128, minimum alignment 8 bit.
- **[TC.12]** RTI_BOOL, minimum alignment 32 bit, atomic access.
- **[TC.13]** RTI_SIZE_T, minimum alignment 32 bit, atomic access.
- **[TC.14]** OSAPI_Alignment_T, minimum alignment 32 bit, atomic access.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_INT8 data type:
    - has minimum required alignment (in bits): 8,
    - is accessed atomically.

TC.2

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_UINT8 data type:
    - has minimum required alignment (in bits): 8,
    - is accessed atomically.

TC.3

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_INT16 data type:

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- has minimum required alignment (in bits): 16,
- is accessed atomically.

TC.4

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_UINT16 data type:
    - has minimum required alignment (in bits): 16,
    - is accessed atomically.

TC.5

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_INT32 data type:
    - has minimum required alignment (in bits): 32,
    - is accessed atomically.

TC.6

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_UINT32 data type:
    - has minimum required alignment (in bits): 32,
    - is accessed atomically.

TC.7

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_INT64 data type has minimum required alignment (in bits): 32.

TC.8

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_UINT64 data type has minimum required alignment (in bits): 32.

TC.9

- **Preconditions:**
  - N/A

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- **Actions:**
  - N/A
- **Check that:**
  - the RTI_FLOAT32 data type has minimum required alignment (in bits): 32.

TC.10

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_DOUBLE64 data type has minimum required alignment (in bits): 32.

TC.11

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_DOUBLE128 data type has minimum required alignment (in bits): 8.

TC.12

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_BOOL data type:
    - has minimum required alignment (in bits): 32,
    - is accessed atomically.

TC.13

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the RTI_SIZE_T data type:
    - has minimum required alignment (in bits): 32,
    - is accessed atomically.

TC.14

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the OSAPI_Alignment_T data type:
    - has minimum required alignment (in bits): 32,
    - is accessed atomically.

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PSL_Type_Plugin

QTS-R-700.0

Analysis

The requirement is met when:

- **[TC.1]** an instance of the NDDS_Type_Plugin structure is created with the specified member attributes assigned function pointers to functions that implement the interfaces described as per the table

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - an instance of the NDDS_Type_Plugin structure is created with the following member attributes assigned function pointers to functions that implement the interfaces described in the table below:

NDDS_Type_Plugin Attribute	Parameters	Type
serialize_data	in: *struct CDR_Stream_t* *stream in: *const void* *sample in: *void* *param	*RTI_BOOL*
deserialize_data	in: *struct CDR_Stream_t* *stream out: *void* *sample in: *void* *param	*RTI_BOOL*
serialize_key	in: *struct CDR_Stream_t* *stream in: *const void* *sample in: *void* *param	*RTI_BOOL*
deserialize_key	in: *struct CDR_Stream_t* *stream out: *void* *sample in: *void* *param	*RTI_BOOL*
get_serialized_sample_max_size	in: *struct NDDS_Type_Plugin* *plugin in: *RTI_UINT32* current_alignment in: *void* *param	*RTI_UINT32*
get_serialized_key_max_size	in: *struct NDDS_Type_Plugin* *plugin in: *RTI_UINT32* current_alignment in: *void* *param	*RTI_UINT32*
create_sample	in: *struct NDDS_Type_Plugin* *plugin out: *void* **sample in: *void* *param	*RTI_BOOL*
delete_sample	in: *struct NDDS_Type_Plugin* *plugin in: *void* *sample in: *void* *param	*RTI_BOOL*
copy_sample	in: *struct NDDS_Type_Plugin* *plugin	*RTI_BOOL*

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	out: *void **dst in: *void **src in: *void **param	
get_key_kind	in: *struct NDDS_Type_Plugin **plugin in: *void **param	*NDDS_TypePluginKeyKind*
instance_to_keyhash	in: *struct NDDS_Type_Plugin **plugin in: *struct CDR_Stream_t **stream out: *DDS_KeyHash_t **key_hash in: *const void **instance in: *void **param	*RTI_BOOL*
create_typed_datareader	in: *void **reader	*void**
create_typed_datawriter	in: *void **writer	*void**
delete_typed_datareader	in: *void **wrapper	*void*
delete_typed_datawriter	in: *void **wrapper	*void*

serialize_data

QTS-R-700.1

Analysis

The requirement is met when:

- **[TC.1]** serialize_data operation serializes a sample into a Stream_t instance.

TC.1

- **Preconditions:**
  - A created sample.
- **Action:**
  - Call the serialize_data operation on a created sample.
- **Check that:**
  - The given sample is serialized into a Stream_t instance by using serialization rules defined by the CDR specification.

deserialize_data

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QTS-R-700.2

Analysis

The requirement is met when:

- **[TC.1]** deserialize_data operation deserializes a sample from a Stream_t instance.

TC.1

- **Preconditions:**
  - A serialized sample to a Stream_t instance.
  - The instance contains data serialized by using rules defined in the CDR specification.
- **Action:**
  - Call the deserialize_data operation on a sample from a Stream_t instance.
- **Check that:**
  - A sample is deserialized from a Stream_t instance.

get_serialized_sample_max_size

QTS-R-700.3

Analysis

The requirement is met when:

- **[TC.1]** get_serialized_sample_max_size operation retrieves the maximum size (in bytes) of a sample when serialized into network representation, using serialization rules defined by the CDR specification.

TC.1

- **Preconditions:**
  - N/A
- **Action:**
  - Call the get_serialized_sample_max_size operation.
- **Check that:**
  - The maximum size (in bytes) of a serialized sample is returned.

create_sample

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QTS-R-700.4

Analysis

The requirement is met when:

- **[TC.1]** create_sample operation retrieves a sample.

TC.1

- **Preconditions**:
  - N/A
- **Action:**
  - Call the create_sample operation.
- **Check that:**
  - A sample is retrieved.

copy_sample

QTS-R-700.5

Analysis

The requirement is met when:

- **[TC.1]** copy_sample operation performs a deep copy of all attributes from one sample to another.

TC.1

- **Preconditions:**
  - A created sample.
- **Action:**
  - Call the copy_sample operation on a created sample.
- **Check that:**
  - A deep copy of all attributes from one sample to another is performed.

serialize_key

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QTS-R-700.6

Analysis

The requirement is met when:

- **[TC.1]** serialize_key operation serializes a key provided as sample into a Stream_t instance.

TC.1

- **Preconditions:**
  - A key provided as sample.
- **Action:**
  - Call the serialize_key operation on a created key provided as sample.
- **Check that:**
  - The given key provided as sample is serialized into a Stream_t instance by using serialization rules defined by the CDR specification.

deserialize_key

QTS-R-700.7

Analysis

The requirement is met when:

- **[TC.1]** deserialize_key operation deserializes a key from a Stream_t instance.

TC.1

- **Preconditions:**
  - A serialized key provided as a sample to a Stream_t instance.
  - The instance contains data serialized by using rules defined in the CDR specification.
- **Action:**
  - Call the deserialize_key operation on a serialized key provided as a sample from a Stream_t instance.
- **Check that:**
  - A key provided as a sample is deserialized from a Stream_t instance.

get_serialized_key_max_size

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QTS-R-700.8

Analysis

The requirement is met when:

- **[TC.1]** get_serialized_key_max_size operation retrieves the maximum size (in bytes) of a key when serialized into network representation, using serialization rules defined by the CDR specification.

TC.1

- **Preconditions:**
  - N/A
- **Action:**
  - Call the get_serialized_key_max_size operation.
- **Check that:**
  - The maximum size (in bytes) of a serialized key provided as a sample is returned.

get_key_kind

QTS-R-700.9

Analysis

The requirement is met when:

- **[TC.1] PluginHelper_get_key_kind** function defined in RCC is used as the implementation of the get_key_kind operation.

TC.1

- **Preconditions:**
  - N/A
- **Action:**
  - N/A
- **Check that:**
  - **PluginHelper_get_key_kind** function defined in RCC is used as the implementation of the get_key_kind operation.

instance_to_keyhash

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QTS-R-700.10

Analysis

The requirement is met when:

- **[TC.1] PluginHelper_instance_to_keyhash** function defined in RCC is used as the implementation of the instance_to_keyhash operation.

TC.1

- **Preconditions:**
  - N/A
- **Action:**
  - N/A
- **Check that:**
  - **PluginHelper_instance_to_keyhash** function defined in RCC is used as the implementation of the instance_to_keyhash operation.

PSL_Zero_Copy

Zero Copy PSL OSAPI

SHMEM Segment

QTS-R-601.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_exists has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_exists has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_exists	in: *const char* *name	RTI_BOOL

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QTS-R-601.1.1

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_exists returns RTI_TRUE when the OSAPI_SharedMemorySegment referenced by the *name* parameter exists.

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment referenced by the *name* parameter exists
- **Actions:**
  - call OSAPI_SharedMemorySegment_exists with *name*
- **Check that:**
  - OSAPI_SharedMemorySegment_exists returns RTI_TRUE

QTS-R-601.1.2

Analysis

The requirement is met when the operation OSAPI_SharedMemorySegment_exists returns RTI_FALSE when:

- **[TC.1]** the OSAPI_SharedMemorySegment referenced by the *name* parameter does not exist
- **[TC.2]** the existence of the OSAPI_SharedMemorySegment referenced by the *name* parameter cannot be determined

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment referenced by the *name* parameter does not exist
- **Actions:**
  - call OSAPI_SharedMemorySegment_exists with *name*
- **Check that:**
  - OSAPI_SharedMemorySegment_exists returns RTI_FALSE

TC.2

- **Preconditions:**
  - the OSAPI_SharedMemorySegment referenced by the *name* parameter exists
  - the existence of the OSAPI_SharedMemorySegment referenced by the *name* parameter cannot be determined
- **Actions:**
  - call OSAPI_SharedMemorySegment_exists with *name*
- **Check that:**
  - OSAPI_SharedMemorySegment_exists returns RTI_FALSE

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QTS-R-601.2

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_get_max_size has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_get_max_size has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_get_max_size	in: *void*	RTI_UINT64

QTS-R-601.2.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_get_max_size operation returns the maximum number of bytes an OSAPI_SharedMemorySegment can hold.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - call OSAPI_SharedMemorySegment_get_max_size
- **Check that:**
  - the OSAPI_SharedMemorySegment_get_max_size returns the maximum number of bytes an OSAPI_SharedMemorySegment can hold

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QTS-R-601.3

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_is_owner_alive has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_is_owner_alive has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_is_owner_alive	in: *struct OSAPI_SharedMemorySegmentHandle* *handle out: *RTI_BOOL* *alive	RTI_BOOL

QTS-R-601.3.1

Analysis

The requirement is met when the OSAPI_SharedMemorySegment_is_owner_alive operation, upon success, returns RTI_TRUE and :

- **[TC.1]** sets *alive* to RTI_TRUE when the owner of the OSAPI_SharedMemorySegment referenced by its *handle* parameter is alive
- **[TC.2]** sets *alive* to RTI_FALSE when the owner of the OSAPI_SharedMemorySegment referenced by its *handle* parameter is not alive

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_is_owner_alive succeeds when called
  - the owner of the OSAPI_SharedMemorySegment referenced by its *handle* parameter is alive
- **Actions:**
  - call OSAPI_SharedMemorySegment_is_owner_alive with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_is_owner_alive returns RTI_TRUE
  - parameter *alive* is set to RTI_TRUE

TC.2

- **Preconditions:**
  - OSAPI_SharedMemorySegment_is_owner_alive succeeds when called
  - the owner of the OSAPI_SharedMemorySegment referenced by its *handle* parameter is not alive
- **Actions:**
  - call OSAPI_SharedMemorySegment_is_owner_alive with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_is_owner_alive returns RTI_TRUE
  - parameter *alive* is set to RTI_FALSE

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QTS-R-601.3.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_is_owner_alive operation returns RTI_FALSE when the liveliness of the OSAPI_SharedMemorySegment owner referenced by the *handle* parameter cannot be determined.

TC.1

- **Preconditions:**
  - the liveliness of the OSAPI_SharedMemorySegment owner referenced by the *handle* parameter cannot be determined when the operation OSAPI_SharedMemorySegment_is_owner_alive is called
- **Actions:**
  - call OSAPI_SharedMemorySegment_is_owner_alive with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_is_owner_alive returns RTI_FALSE

QTS-R-601.4

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegmentHandle_get_size has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegmentHandle_get_size has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegmentHandle_get_size	in: *OSAPI_SHMEM_MODE* mode	RTI_SIZE_T

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Analysis

The requirement is met when the OSAPI_SharedMemorySegmentHandle_get_size operation returns the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT of the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter when:

- **[TC.1]** the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter is not divisible by OSAPI_SHARED_MEMORY_ALIGNMENT
- **[TC.2]** the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter is divisible by OSAPI_SHARED_MEMORY_ALIGNMENT

TC.1

- **Preconditions:**
  - the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter is not divisible by OSAPI_SHARED_MEMORY_ALIGNMENT
- **Actions:**
  - call OSAPI_SharedMemorySegmentHandle_get_size with *mode*
- **Check that:**
  - the OSAPI_SharedMemorySegmentHandle_get_size returns the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT that is higher than the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter.

TC.2

- **Preconditions:**
  - the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter is divisible by OSAPI_SHARED_MEMORY_ALIGNMENT
- **Actions:**
  - call OSAPI_SharedMemorySegmentHandle_get_size with *mode*
- **Check that:**
  - the OSAPI_SharedMemorySegmentHandle_get_size returns the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT that is equal to the number of bytes of an OSAPI_SharedMemorySegmentHandle for the mode specified by the *mode* parameter.

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QTS-R-601.5

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegmentHeader_get_size has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegmentHeader_get_size has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegmentHeader_get_size	in: *OSAPI_SHMEM_MODE* mode	RTI_SIZE_T

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QTS-R-601.5.1

Analysis

The requirement is met when the OSAPI_SharedMemorySegmentHeader_get_size operation returns the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT of the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the *mode* parameter, when:

- **[TC.1]** the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the *mode* parameter is not divisible by OSAPI_SHARED_MEMORY_ALIGNMENT
- **[TC.2]** the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the *mode* parameter is divisible by OSAPI_SHARED_MEMORY_ALIGNMENT

TC.1

- **Preconditions:**
  - the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the *mode* parameter is not divisible by OSAPI_SHARED_MEMORY_ALIGNMENT
- **Actions:**
  - call OSAPI_SharedMemorySegmentHeader_get_size with *mode*
- **Check that:**
  - the OSAPI_SharedMemorySegmentHeader_get_size returns the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT that is higher than the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the *mode* parameter.

TC.2

- **Preconditions:**
  - the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the *mode* parameter is divisible by OSAPI_SHARED_MEMORY_ALIGNMENT
- **Actions:**
  - call OSAPI_SharedMemorySegmentHeader_get_size with *mode*
- **Check that:**
  - the OSAPI_SharedMemorySegmentHeader_get_size returns the minimum multiple of OSAPI_SHARED_MEMORY_ALIGNMENT that is equal to the number of bytes of an OSAPI_SharedMemorySegmentHeader for the mode specified by the *mode* parameter.

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QTS-R-601.6

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_create_impl has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_create_impl has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_create_impl	inout: *struct OSAPI_SharedMemorySegmentHandle* *handle in: *const char* *name in: *RTI_UINT64* size in: *OSAPI_SHMEM_MODE* mode out: *RTI_BOOL* *exists	RTI_BOOL

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QTS-R-601.6.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_create_impl creates a new initialized OSAPI_SharedMemorySegment in lockable mode, and acquires a lock to the created shared memory segment, sets parameters and returns RTI_TRUE
- **[TC.2]** the OSAPI_SharedMemorySegment_create_impl creates a new initialized OSAPI_SharedMemorySegment in not lockable mode, and sets parameters and returns RTI_TRUE

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_create_impl succeeds when called
  - *mode* is lockable
- **Actions:**
  - call OSAPI_SharedMemorySegment_create_impl with *handle, name, size, mode* and *exists*
- **Check that:**
  - the OSAPI_SharedMemorySegment_create_impl:
    - creates a new initialized OSAPI_SharedMemorySegment that is:
      - accessible to other processes,
      - named according to the name specified by the *name* parameter,
      - of a size that is equal to or greater than the size specified by the *size* parameter,
      - with a mode specified by the *mode* parameter
    - acquires a lock to the created shared memory segment
    - populates the *handle* with the OSAPI_SharedMemorySegment information
    - sets the *exists* parameter to RTI_FALSE
    - returns RTI_TRUE

TC.2

- **Preconditions:**
  - OSAPI_SharedMemorySegment_create_impl succeeds when called
  - *mode* is not lockable
- **Actions:**
  - call OSAPI_SharedMemorySegment_create_impl with *handle, name, size, mode* and *exists*
- **Check that:**
  - the OSAPI_SharedMemorySegment_create_impl:
    - creates a new initialized OSAPI_SharedMemorySegment that is:
      - accessible to other processes,
      - named according to the name specified by the *name* parameter,
      - of a size that is equal to or greater than the size specified by the *size* parameter,
      - with a mode specified by the *mode* parameter
    - populates the *handle* with the OSAPI_SharedMemorySegment information
    - sets the *exists* parameter to RTI_FALSE
    - returns RTI_TRUE

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QTS-R-601.6.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_create_impl operation sets the *exists* parameter to RTI_TRUE and returns RTI_FALSE, when there is already an OSAPI_SharedMemorySegment in the system identified by the name specified by the *name* parameter

TC.1

- **Preconditions:**
  - there is already an OSAPI_SharedMemorySegment in the system identified by the name specified by the *name* parameter
- **Actions:**
  - call OSAPI_SharedMemorySegment_create_impl with *name* and *exists*
- **Check that:**
  - the OSAPI_SharedMemorySegment_create_impl:
    - sets the *exists* parameter to RTI_TRUE
    - returns RTI_FALSE

QTS-R-601.6.3

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_create_impl operation returns RTI_FALSE when it cannot create the new OSAPI_SharedMemorySegment

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_create_impl operation cannot create the new OSAPI_SharedMemorySegment when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_create_impl
- **Check that:**
  - the OSAPI_SharedMemorySegment_create_impl returns RTI_FALSE

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QTS-R-601.7

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_delete_impl has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_delete_impl has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_delete_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL

QTS-R-601.7.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_delete_impl deletes the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter, and returns RTI_TRUE.

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_delete_impl succeeds when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_delete_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_delete_impl:
    - deletes the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter
    - returns RTI_TRUE

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QTS-R-601.7.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_delete_impl returns RTI_FALSE when it cannot delete the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment_delete_impl operation cannot delete the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_delete_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_delete_impl returns RTI_FALSE

QTS-R-601.8

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_attach_impl has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_attach_impl has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_attach_impl	inout: *struct OSAPI_SharedMemorySegmentHandle* *handle in: *const char* *name, in: *OSAPI_SHMEM_MODE* mode out: *OSAPI_SHMEM_ATTACH_STATUS* status_out	RTI_BOOL

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QTS-R-601.8.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_attach_impl attaches the OSAPI_SharedMemorySegmentHandle specified by the *handle* parameter, in the mode specified by the *mode* parameter, to an existing OSAPI_SharedMemorySegment with a name equal to the *name* parameter, and sets *status_out* and returns RTI_TRUE

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_attach_impl succeeds when called
  - *status_out* is not NULL
- **Actions:**
  - call OSAPI_SharedMemorySegment_attach_impl with *handle, mode, name* and *status_out*
- **Check that:**
  - the OSAPI_SharedMemorySegment_attach_impl :
    - attaches the OSAPI_SharedMemorySegmentHandle specified by the *handle* parameter, in the mode specified by the *mode* parameter, to an existing OSAPI_SharedMemorySegment with a name equal to the *name* parameter
    - sets *status_out* to OSAPI_SHMEM_ATTACH_STATUS_OK
    - returns RTI_TRUE

QTS-R-601.8.2

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_attach_impl returns RTI_FALSE when it OSAPI_SharedMemorySegment_attach_impl operation cannot attach, in the mode specified by the *mode* parameter, to an existing OSAPI_SharedMemorySegment with a name equal to the *name* parameter

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment_attach_impl operation cannot attach, in the mode specified by the *mode* parameter, to an existing OSAPI_SharedMemorySegment with a name equal to the *name* parameter when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_attach_impl with *handle, mode, name* and *status_out*
- **Check that:**
  - the OSAPI_SharedMemorySegment_attach_impl returns RTI_FALSE

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QTS-R-601.8.3

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_attach_impl sets *status_out* and returns RTI_TRUE when the OSAPI_SharedMemorySegment_attach_impl operation is invoked with a *name* that does not correspond to any existing OSAPI_SharedMemorySegment name

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment_attach_impl operation is provided with a *name* that does not correspond to any existing OSAPI_SharedMemorySegment name
  - *status_out* is not NULL
- **Actions:**
  - call OSAPI_SharedMemorySegment_attach_impl with *handle, mode, name* and *status_out*
- **Check that:**
  - the OSAPI_SharedMemorySegment_attach_impl:
    - sets *status_out* to OSAPI_SHMEM_ATTACH_STATUS_SEGMENT_NOT_FOUND
    - returns RTI_TRUE

QTS-R-601.9

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_detach_impl has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_detach_impl has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_detach_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL

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QTS-R-601.9.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_detach_impl detaches the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter, and returns RTI_TRUE.

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_detach_impl succeeds when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_detach_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_detach_impl:
    - detaches the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter
    - returns RTI_TRUE

QTS-R-601.9.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_detach_impl returns RTI_FALSE when it cannot detach the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment_detach_impl operation cannot detach the OSAPI_SharedMemorySegment referenced by the handle specified by the *handle* parameter when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_detach_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_detach_impl returns RTI_FALSE

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QTS-R-601.10

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_lock_impl has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_lock_impl has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_lock_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle out: *OSAPI_SHMEM_STATUS* *status_out	RTI_BOOL

QTS-R-601.10.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_lock_impl operation locks the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter when the OSAPI_SharedMemorySegment is not locked yet.

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter is not locked yet
- **Actions:**
  - call OSAPI_SharedMemorySegment_lock_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_lock_impl locks the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter

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QTS-R-601.10.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_lock_impl operation blocks the calling execution context until the lock is released and then locks the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter when the OSAPI_SharedMemorySegment is already locked

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter is already locked
- **Actions:**
  - call OSAPI_SharedMemorySegment_lock_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_lock_impl blocks the calling execution context until the lock is released and then locks the OSAPI_SharedMemorySegment

QTS-R-601.10.3

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_lock_impl operation returns OSAPI SHMEM_STATUS_OK through *status_out* parameter and returns RTI_TRUE when it succeeds

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_lock_impl succeeds when called

  Actions:
  - call OSAPI_SharedMemorySegment_lock_impl with *status_out*
- **Check that:**
  - the OSAPI_SharedMemorySegment_lock_impl:
    - returns OSAPI_SHMEM_STATUS_OK through *status_out* parameter
    - returns RTI_TRUE

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QTS-R-601.10.4

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_lock_impl operation returns OSAPI OSAPI_SHMEM_STATUS_OWNER_DEAD through *status_out* parameter when the previous owner of the OSAPI_SharedMemorySegment terminated while holding a lock on the OSAPI_SharedMemorySegment

TC.1

- **Preconditions:**
  - the owner of the OSAPI_SharedMemorySegment terminated while holding a lock on the OSAPI_SharedMemorySegment

  Actions:
  - call OSAPI_SharedMemorySegment_lock_impl with *status_out* on a OSAPI_SharedMemorySegment that was held by the owner that was terminated
- **Check that:**
  - the OSAPI_SharedMemorySegment_lock_impl:
    - returns OSAPI_SHMEM_STATUS_OWNER_DEAD through *status_out* parameter

QTS-R-601.10.5

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_lock_impl operation returns RTI_FALSE when the OSAPI_SharedMemorySegment cannot be locked

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment cannot be locked
- **Actions:**
  - call OSAPI_SharedMemorySegment_lock_impl
- **Check that:**
  - the OSAPI_SharedMemorySegment_lock_impl returns RTI_FALSE

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QTS-R-601.11

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_unlock_impl has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_unlock_impl has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_unlock_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL

QTS-R-601.11.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_unlock_impl unlocks the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter and returns RTI_TRUE

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_unlock_impl succeeds when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_unlock_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_unlock_impl:
    - unlocks the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter
    - returns RTI_TRUE

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QTS-R-601.11.2

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_unlock_impl operation returns RTI_FALSE when the OSAPI_SharedMemorySegment cannot be unlocked

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment cannot be unlocked

  Actions:
  - call OSAPI_SharedMemorySegment_unlock_impl
- **Check that:**
  - the OSAPI_SharedMemorySegment_unlock_impl returns RTI_FALSE

QTS-R-601.12

Analysis

The requirement is met when:

- **[TC.1]** Operation OSAPI_SharedMemorySegment_mark_consistent_impl has the specified signature.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - OSAPI_SharedMemorySegment_mark_consistent_impl has the following signature:

Operations	Parameters	Type
OSAPI_SharedMemorySegment_mark_consistent_impl	in: *struct OSAPI_SharedMemorySegmentHandle* *handle	RTI_BOOL

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QTS-R-601.12.1

Analysis

The requirement is met when:

- **[TC.1]** the OSAPI_SharedMemorySegment_mark_consistent_impl marks the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter as consistent and returns RTI_TRUE

TC.1

- **Preconditions:**
  - OSAPI_SharedMemorySegment_mark_consistent_impl succeeds when called
- **Actions:**
  - call OSAPI_SharedMemorySegment_mark_consistent_impl with *handle*
- **Check that:**
  - the OSAPI_SharedMemorySegment_mark_consistent_impl:
    - marks the OSAPI_SharedMemorySegment referenced by its handle specified by the *handle* parameter as consistent
    - returns RTI_TRUE

QTS-R-601.12.2

Analysis

The requirement is met when the OSAPI_SharedMemorySegment_mark_consistent_impl operation returns RTI_FALSE when:

- **[TC.1]** the OSAPI_SharedMemorySegment cannot be marked as consistent
- **[TC.2]** the support for robust locking is not enabled

TC.1

- **Preconditions:**
  - the OSAPI_SharedMemorySegment cannot be marked as consistent
  - the support for robust locking is enabled
- **Actions:**
  - call OSAPI_SharedMemorySegment_mark_consistent_impl
- **Check that:**
  - the OSAPI_SharedMemorySegment_mark_consistent_impl returns RTI_FALSE

TC.2

- **Preconditions:**
  - the support for robust locking is not enabled

  Actions:
  - call OSAPI_SharedMemorySegment_mark_consistent_impl
- **Check that:**
  - the OSAPI_SharedMemorySegment_mark_consistent_impl returns RTI_FALSE

Type Plugin

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QTS-R-604.0

Analysis

The requirement is met when:

- **[TC.1]** an instance of the NDDS_Type_Plugin structure for Zero Copy Transport is created with the specified additional member attributes assigned function pointers to functions that implement the interfaces described as per the table

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - an instance of the NDDS_Type_Plugin structure for Zero Copy Transport is created with the following additional member attributes assigned function pointers to functions that implement the interfaces described in the table below:

NDDS_Type_Plugin Attribute	Parameters	Type
get_loan	in: *void* *managed_pool out: *void*** sample_out	*ReturnCode_t*
discard_loan	in: *void* *managed_pool in: *RTI_UINT32* sample_id	*RTI_BOOL*
create_managed_pool	in: *struct NDDS_Type_Plugin* *plugin in: *void* *datawriter in: *void* *param out: *void* **managed_pool_out	*RTI_BOOL*
delete_managed_pool	in: *void* *managed_pool	*void*
get_sample_id	in: *void* *managed_pool in: *const void* *user_data out: *RTI_UINT32* *sample_id_out	*RTI_BOOL*
needs_opaque_samples	in: *void* *reader in: *void* *param	*RTI_BOOL*

QTS-R-604.1

Analysis

The requirement is met when:

- **[TC.1]** The get_loan operation requests a loan of a sample from a managed pool of samples.

TC.1

- **Preconditions:**
  - N/A
- **Action:**
  - Call the get_loan operation.
- **Check that:**
  - The get_loan operation requests a loan of a sample from a managed pool of sample.

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QTS-R-604.2

Analysis

The requirement is met when:

- **[TC.1]** The discard_loan operation returns a loaned sample previously retrieved by get_loan operation to a managed pool of samples.

TC.1

- **Preconditions:**
  - A sample that was retrieved by the get_loan operation.
- **Action:**
  - Call the discard_loan operation with the sample ID of the loaned sample.
- **Check that:**
  - The discard_loan operation returns the loaned sample to the managed pool of samples.

QTS-R-604.3

Analysis

The requirement is met when:

- **[TC.1]** The create_managed_pool operation creates a managed pool of samples if it is needed.

TC.1

- **Preconditions:**
  - The creation of a managed pool of samples is needed.
- **Action:**
  - Call the create_managed_pool operation.
- **Check that:**
  - The create_managed_pool operation creates a managed pool of samples.

QTS-R-604.4

Analysis

The requirement is met when:

- **[TC.1]** The get_sample_id operation looks up the unique ID of a loaned sample given its user data memory region.

TC.1

- **Preconditions:**
  - A loaned sample.
- **Action:**
  - Call the get_sample_id operation with the address of user data of the loaned sample.
- **Check that:**
  - The get_sample_id operation looks up the unique ID of a loaned sample.

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QTS-R-604.5

Analysis

The requirement is met when:

- **[TC.1]** The needs_opaque_samples operation checks whether the additional opaque samples are needed.

TC.1

- **Preconditions:**
  - N/A
- **Action:**
  - Call the needs_opaque_samples operation.
- **Check that:**
  - The needs_opaque_samples operation checks whether the additional opaque samples are needed.

Concurrency

QTS-R-605.1

Analysis

The requirement is met when:

- **[TC.1]** the listed PSL operations are reentrant and thread-safe

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - The following PSL operations are reentrant and thread-safe:
    - *OSAPI_SharedMemorySegment_exists*
    - *OSAPI_SharedMemorySegment_get_max_size*
    - *OSAPI_SharedMemorySegment_is_owner_alive*
    - *OSAPI_SharedMemorySegmentHandle_get_size*
    - *OSAPI_SharedMemorySegmentHeader_get_size*
    - *OSAPI_SharedMemorySegment_create_impl*
    - *OSAPI_SharedMemorySegment_delete_impl*
    - *OSAPI_SharedMemorySegment_attach_impl*
    - *OSAPI_SharedMemorySegment_detach_impl*
    - *OSAPI_SharedMemorySegment_lock_impl*
    - *OSAPI_SharedMemorySegment_unlock_impl*
    - *OSAPI_SharedMemorySegment_mark_consistent_impl*

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Zero Copy Notification Transport

Notification transport plugin API

QTS-R-602.1

Analysis

The requirement is met when:

- **[TC.1]** an instance of the ZCOPY_NotifUserInterfaceI structure is created and its member attributes have assigned function pointers that implement interfaces as per the table

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - an instance of the ZCOPY_NotifUserInterfaceI structure is created and its member attributes have been assigned function pointers to functions that implement the interfaces as per the table below:

ZCOPY_NotifUserInterfaceI Attribute	Parameters	Type
create_instance	in: NETIO_Interface_T *upstream in: void *property	NETIO_Interface_T*
reserve_address	in: NETIO_Interface_T *user_intf in: struct NETIO_Address *src_addr out: void** port_entry_out	RTI_BOOL
release_address	in: NETIO_Interface_T *user_intf in: struct NETIO_Address *src_addr in: void* port_entry	RTI_BOOL
resolve_address	in: NETIO_Interface_T *user_intf in: const char *address_string out: struct NETIO_Address *address_value out: RTI_BOOL *invalid	RTI_BOOL
send	in: NETIO_Interface_T *user_intf in: struct NETIO_Address *source in: struct NETIO_Address *destination in: void* route_entry	RTI_BOOL
get_route_table	in: NETIO_Interface_T *netio_intf inout: struct NETIO_AddressSeq *address inout: struct NETIO_NetmaskSeq *netmask	RTI_BOOL
bind	in: NETIO_Interface_T *user_intf in: struct NETIO_Address *src_addr	RTI_BOOL

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	in: struct NETIO_Address *dst_addr in: void *port_entry out: void **bind_entry_out	
unbind	in: NETIO_Interface_T *user_intf in: struct NETIO_Address *src_addr in: struct NETIO_Address *dst_addr in: void *port_entry in: void *bind_entry	RTI_BOOL
add_route	in: NETIO_Interface_T *user_intf in: struct NETIO_Address *source in: struct NETIO_Address *destination out: void** route_entry_out	RTI_BOOL
delete_route	in: NETIO_Interface_T *user_intf in: struct NETIO_Address *source in: struct NETIO_Address *destination in: void* route_entry	RTI_BOOL
notify_recv_port	in: NETIO_Interface_T *user_intf in: void* port_entry	RTI_BOOL

create_instance

QTS-R-602.1.1

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.create_instance* operation returns a non-NULL pointer on success

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.create_instance* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.create_instance* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.create_instance* operation returns a non-NULL pointer to an instance of an interface of type NETIO_Interface_T

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QTS-R-602.1.2

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.create_instance* operation returns NULL on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.create_instance* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.create_instance* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.create_instance* operation returns NULL

QTS-R-602.1.3

Analysis

The requirement is met when:

- **[TC.1]** the PSL does not use *upstream* NETIO_Interface_T parameter to call RCC APIs in the implementation of *ZCOPY_NotifUserInterfaceI.create_instance.*

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - the PSL does not use *upstream* NETIO_Interface_T parameter to call RCC APIs in the implementation of *ZCOPY_NotifUserInterfaceI.create_instance.*

reserve_address

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QTS-R-602.1.11

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.reserve_address* operation causes the interface specified by *user_intf* to configure resources for listening to messages on address *src_add* and returns a pointer to a port entry specified by *port_entry_out* and returns RTI_TRUE on success

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.reserve_address* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.reserve_address* operation with *user_intf* and *src_addr*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.reserve_address* operation:
    - causes the interface specified by *user_intf* to configure resources for listening to messages on address *src_add*
    - returns a pointer to a port entry specified by *port_entry_out*
    - returns RTI_TRUE

QTS-R-602.1.12

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.reserve_address* operation returns NULL through the port entry specified by *port_entry_out* and returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.reserve_address* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.reserve_address* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.reserve_address* operation returns:
    - NULL through the port entry specified by *port_entry_out*
    - RTI_FALSE

release_address

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QTS-R-602.1.21

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.release_address* operation causes the interface specified by *user_intf* to release resources associated with the port entry specified by *port_entry* used for listening to messages on address *src_addr* and returns RTI_TRUE on success

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.release_address* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.release_address* operation with *user_intf*, *port_entry* and *src_addr*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.release_address* operation:
    - causes the interface specified by *user_intf* to release resources associated with the port entry specified by *port_entry* used for listening to messages on address *src_addr*
    - returns RTI_TRUE

QTS-R-602.1.22

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.release_address* operation returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.release_address* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.release_address* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.release_address* operation returns RTI_FALSE

resolve_address

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QTS-R-602.1.32

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.resolve_address* operation returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.resolve_address* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.resolve_address* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.resolve_address* operation returns RTI_FALSE

QTS-R-602.1.31

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.resolve_address* operation sets *address_value* to a valid address for the Notification Mechanism interface specified by *user_intf,* sets the value pointed to by *invalid* to RTI_FALSE, and returns RTI_TRUE on success

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.resolve_address* operation converts address successfully when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.resolve_address* operation with *user_intf, address_value* and *invalid*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.resolve_address* operation:
    - sets *address_value* to a valid address for the Notification Mechanism interface specified by *user_intf*
    - sets the value pointed by *invalid* to RTI_FALSE
    - returns RTI_TRUE

send

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QTS-R-602.1.41

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.send* operation causes the interface specified by *user_intf* to send a notification from the source specified by *source* to the destination specified by *destination* using the route entry specified by *route_entry* and returns RTI_TRUE

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.send* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.send* operation with *user_intf, source, destination* and *route_entry*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.send* operation:
    - cause the interface specified by *user_intf* to send a notification from the source specified by *source* to the destination specified by *destination* using the route entry specified by *route_entry*
    - return RTI_TRUE

QTS-R-602.1.42

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.send* operation returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.send* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.send* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.send* operation returns RTI_FALSE

get_route_table

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QTS-R-602.1.51

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.get_route_table* operation retrieves a sequence of all addresses as *address* and a sequence of all netmasks as *netmask* from the routing table to which the Notification Mechanism interface specified by *netio_intf* can send to, and returns RTI_TRUE on success

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.get_route_table* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.get_route_table* operation with *address, netmask* and *netio_intf*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.get_route_table* operation:
    - retrieves a sequence of all addresses as *address* and a sequence of all netmasks as *netmask* from the routing table to which the Notification Mechanism interface specified by *netio_intf* can send to
    - returns RTI_TRUE

QTS-R-602.1.52

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.get_route_table* operation does not modify the *address* and *netmask* sequences and returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.get_route_table* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.get_route_table* operation with *address* and *netmask*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.get_route_table* operation:
    - does not modify the *address* and *netmask* sequences
    - returns RTI_FALSE

bind

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QTS-R-602.1.61

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.bind* operation causes the implementation to listen for notification messages and returns RTI_TRUE on success

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.bind* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.bind* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.bind* operation:
    - causes the implementation to listen for notification messages
    - returns RTI_TRUE

QTS-R-602.1.62

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.bind* operation returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.bind* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.bind* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.bind* operation returns RTI_FALSE

unbind

QTS-R-602.1.71

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.unbind* operation returns RTI_TRUE.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.unbind* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.unbind* operation returns RTI_TRUE

add_route

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QTS-R-602.1.81

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.add_route* operation causes the interface specified by *user_intf* to add a route from the source specified by *source* to the destination specified by *destination*, returns a pointer to a route entry specified by *route_entry_out* and returns RTI_TRUE

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.add_route* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.add_route* operation with *user_intf, source*, *destination* and *route_entry_out*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.add_route* operation:
    - causes the interface specified by *user_intf* to add a route from the source specified by *source* to the destination specified by *destination*
    - returns a pointer to a route entry specified by *route_entry_out*
    - returns RTI_TRUE

QTS-R-602.1.82

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.add_route* operation returns NULL through the port entry specified by *route_entry_out* and returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.add_route* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.add_route* operation with *route_entry_out*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.add_route* operation:
    - returns NULL through the port entry specified by *route_entry_out*
    - returns RTI_FALSE

delete_route

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QTS-R-602.1.91

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.delete_route* operation causes the interface specified by *user_intf* to remove the *route_entry* from the source specified by *source* and the destination specified by *destination* and return RTI_TRUE

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.delete_route* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.delete_route* operation with *user_intf, route_entry*, *source* and *destination*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.delete_route* operation:
    - causes the interface specified by *user_intf* to remove the *route_entry* from the source specified by *source* and the destination specified by *destination*
    - returns RTI_TRUE

QTS-R-602.1.92

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.delete_route* operation returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.delete_route* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.delete_route* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.delete_route* operation returns RTI_FALSE

notif_recv_port

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QTS-R-602.1.101

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation causes the interface specified by *user_intf* to notify the receive port specified by *port_entry* and returns RTI_TRUE

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation succeeds when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation with *user_intf* and *port_entry*
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation:
    - causes the interface specified by *user_intf* to notify the receive port specified by *port_entry*
    - returns RTI_TRUE

QTS-R-602.1.102

Analysis

The requirement is met when:

- **[TC.1]** the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation returns RTI_FALSE on failure

TC.1

- **Preconditions:**
  - the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation fails when called
- **Actions:**
  - call the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation
- **Check that:**
  - the *ZCOPY_NotifUserInterfaceI.notify_recv_port* operation returns RTI_FALSE

Concurrency

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QTS-R-606.1

Analysis

The requirement is met when:

- **[TC.1]** the listed ZCOPY_NotifUserInterfaceI operations are reentrant and thread-safe

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - The following ZCOPY_NotifUserInterfaceI operations are reentrant and thread-safe:
    - *ZCOPY_NotifUserInterfaceI.create_instance*
    - *ZCOPY_NotifUserInterfaceI.reserve_address*
    - *ZCOPY_NotifUserInterfaceI.release_address*
    - *ZCOPY_NotifUserInterfaceI.resolve_address*
    - *ZCOPY_NotifUserInterfaceI.send*
    - *ZCOPY_NotifUserInterfaceI.get_route_table*
    - *ZCOPY_NotifUserInterfaceI.bind*
    - *ZCOPY_NotifUserInterfaceI.unbind*
    - *ZCOPY_NotifUserInterfaceI.add_route*
    - *ZCOPY_NotifUserInterfaceI.delete_route*
    - *ZCOPY_NotifUserInterfaceI.notify_recv_port*

RCC_Untyped_API

QTS-R-800.0

Analysis

The requirement is met when:

- **[TC.1]** the users of the listed functions provides proper parameter.

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - Users of the following RCC Untyped DataWriter functions that expect a sample parameter of the type void * provides a pointer to a valid object of the Foo type as expected by the NDDS_Type_Plugin implementation for the DataWriter:

Function	Parameters	Type
register_instance	in: *DDS_DataWriter* *self in: *void* *instance_data	DDS_InstanceHandle_t
register_instance_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data	DDS_InstanceHandle_t

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	in: *struct DDS_Time_t* *source_timestamp	
unregister_instance	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle	DDS_ReturnCode_t
unregister_instance_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle in: *struct DDS_Time_t* *source_timestamp	DDS_ReturnCode_t
write	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle	DDS_ReturnCode_t
write_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle in: *struct DDS_Time_t* *source_timestamp	DDS_ReturnCode_t
dispose	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle	DDS_ReturnCode_t
dispose_w_timestamp	in: *DDS_DataWriter* *self in: *void* *instance_data in: *DDS_InstanceHandle_t* *handle in: *struct DDS_Time_t* *source_timestamp	DDS_ReturnCode_t

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Analysis

The requirement is met when:

- **[TC.1]** the users of the listed functions provides proper parameter

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**

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- Users of the following RCC Untyped DataReader functions that expect a parameter of the type struct DDS_UntypedSampleSeq * provides a pointer to a struct FooSeq object that was cast to a pointer to a struct DDS_UntypedSampleSeq object, with the Foo type as expected by the NDDS_Type_Plugin implementation for the DataReader:

Function	Parameters	Type
read	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *signed 32-bit integer* max_samples in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t
take	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *DDS_Long* max_samples in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t
read_instance	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *DDS_Long* max_samples in: *DDS_InstanceHandle_t* handle in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t
take_instance	in: *DDS_DataReader* reader inout: *struct DDS_UntypedSampleSeq* *samples inout: *struct SampleInfoSeq* *sample_info in: *DDS_Long* max_samples in: *DDS_InstanceHandle_t* handle in: *DDS_SampleStateMask* sample_states in: *DDS_ViewStateMask* view_states in: *DDS_InstanceStateMask* instance_states	DDS_ReturnCode_t
return_loan	in: *DDS_DataReader* reader in: *struct DDS_UntypedSampleSeq* *samples in: *struct SampleInfoSeq* *sample_info	DDS_ReturnCode_t

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QTS-R-800.2

Analysis

The requirement is met when:

- **[TC.1]** the users of the listed functions provides proper parameter

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - Users of the following RCC Untyped DataReader functions that expect a sample parameter of the type void * provides a pointer to a valid object of the Foo type as expected by the NDDS_Type_Plugin implementation for the DataReader:

Function	Parameters	Type
read_next_sample	in: *DDS_DataReader* reader inout: *void* *sample inout: struct DDS_SampleInfo *sample_info	DDS_ReturnCode_t
take_next_sample	in: *DDS_DataReader* reader inout: *void* *sample inout: *struct DDS_SampleInfo* *sample_info	DDS_ReturnCode_t
lookup_instance	in: *DataReader* reader in: *void* *key_holder	DDS_InstanceHandle_t

QTS-R-800.3

Analysis

The requirement is met when:

- **[TC.1]** the users of the listed functions provides proper parameter

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - Users of the following RCC Untyped Zero Copy v2 DataWriter function that expects a sample parameter of the type void ** provides a pointer to a valid void * object:

Function	Parameters	Type
get_loan	in: DDS_DataWriter *self inout: void **instance_data	DDS_ReturnCode_t

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QTS-R-800.4

Analysis

The requirement is met when:

- **[TC.1]** the users of the listed functions provides proper parameter

TC.1

- **Preconditions:**
  - N/A
- **Actions:**
  - N/A
- **Check that:**
  - Users of the following RCC Untyped Zero Copy v2 DataWriter function that expects a sample parameter of the type void * provides a pointer to a valid object of the Foo type as expected by the NDDS_Type_Plugin implementation for the DataWriter:

Function	Parameters	Type
discard_loan	in: DDS_DataWriter *self in: void *instance_data	DDS_ReturnCode_t

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Document Change Log		
Version	Date	Description
3.2	08/21/2026	Updated RTI Connext Cert version to 2.4.16.1. Updated section 4.1.1. Added section 300 RCC Untyped API. Added descriptions to 300.1, 300.2, 300.3, and 300.4. Added RCC_Untyped_API test specifications QTS-R-800.0 through QTS-R-800.4. Minor formatting changes.
3.1	02/27/2026	Updated RTI Connext Cert version to 2.4.16.1 ER1. Updated sections 4.1 and 4.1.1.
3.0	09/12/2025	Updated Zero Copy Transfer requirements.
2.1	12/18/2024	Updated QTS-R-526.10.
2.0	12/09/2024	Added Zero Copy Transfer requirements and Test Specifications.
1.1	10/06/2023	Updated PSL Platform Notes and Build Instructions.
1.0	09/08/2023	First release version. Updated requirements and test specs.

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