

JAXA/ISAS's View on SpaceWire-RT Initial Protocol Definition

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Purpose of This Presentation

- ❖ The purpose of this presentation is to provide general comments on the SpaceWire-RT Initial Protocol Definition from the viewpoint of applying it to science missions of JAXA/ISAS.

Requirements

- ❖ JAXA/ISAS has the following requirements that are not met by “SpaceWire - Links, nodes, routers and networks.”
- ❖ Need for a Timely Service
 - We need a service to transfer data with a limited delay over a SpaceWire network.
 - This is required for distributing commands and collecting telemetry for real-time control purposes (e.g., real-time attitude control).
- ❖ Need for a Reliable Service
 - We need a service to transfer data reliably over a SpaceWire network (but not for every data type).
 - This is required for distributing critical commands and collecting asynchronous messages such as anomaly reports.

Required QoS Classes

- ❖ The following table summarizes the QoS classes we require.
- ❖ We will use almost all SpaceWire networks for sending commands (Packets or low level) and collecting telemetry in real-time and for collecting science data. Therefore, we will use every SpaceWire network in a synchronized way.
- ❖ However, there may be cases where SpaceWire networks only collect science data. In such cases, asynchronous

QoS Class	Description	Network	Note
Basic	Not ensure delivery, Not timely	Asynchronous	Not required
Best Effort	Not ensure delivery, Not timely		Not required
Assured	Reliable, Not timely		Not required
Reserved	Not ensure delivery, Timely	Synchronous	Required
Guaranteed	Reliable, Timely		Required

Required Functions

Category	Function	Note
Common Functions	User Application Interface	Required
	Segmentation Function	Required
	Address Translation	Required
	Error detection	Required
	Redundancy Function	Required
	Priority	Not Required: We use different channels for data with different priority levels
Asynchronous Network Functions	Retry	Not Required
	Flow Control	
	Encapsulation	
Scheduled Network Functions	Scheduling	Required (but we need asses to what extent these functions are required by projects)
	Retry	
	Flow Control	
	Time-Slot Timing	Required
	Encapsulation	Required

SpaceWire-RT Specification (1/2)

- ❖ We would appreciate it if SpaceWire-RT specified only features needed by projects, each in a concise way. For example, ...
- ❖ The Timely Service should be defined by specifying the following:
 - Definition of time slots (each signaled by a time-code)
 - Definition of channels
 - Rules for assigning slots to channels
- ❖ The Reliable Service should be defined by specifying the following:
 - Procedures for error detection
 - Procedures for retransmission
 - Procedures for redundancy control
 - Procedures for flow control

SpaceWire-RT Specification (2/2)

- ❖ Furthermore, it would be easier for the readers to understand the specification if the SpaceWire specification were organized with the following format (for example, see the TC Space Data Link Protocol Blue Book published by CCSDS):
 1. Overview (10-15 pages, not 67 pages)
 - ✓ Architecture, features, service types, addressing, etc.
 2. Service definition
 - ✓ Description on what each service provides for users
 - ✓ Definition of primitives
 3. Protocol specification
 - ✓ Definition of data units
 - ✓ Definition of procedures (functions)
 - ✓ Information on what procedures support what services, and dependency and relationship among procedures.