
SpaceWire Protocol ID: What Does it Mean to You?

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Purpose

- **Describe latest work of SpaceWire (SpW) working group to promote upper level protocol standardization**
- **Latest work will be standardized under European Cooperation for Space Standardization (ECSS)**
 - **ECSS-E-50-11 (different from SpW standard)**
 - **Description of Protocol ID along with Remote Memory Access Protocol (RMAP)**

Background

- **SpW is defined at a low level**
 - Provides great flexibility
 - Simple interface
- **Consequence of low level definition - creates more work at system level**
 - Definition of upper level protocol riding over SpW
- **SpW addressing schemes allow two different packet formats to be presented to user interface**
 - Logical address present
 - No Logical address present
- **Consequence of different packet formats - creates difficulty in using SpW in a standardized way**

Results

- **SpW working group has defined a new packet format**
- **Compliment the existing SpW packet definition**
 - **Not part of the SpW standard**
 - **New ECSS standard**
- **Standardizes method for decoding:**
 - **Packet**
 - **Protocols**

New Packet Definition

- **Packet format presented to user interface**
 - **First byte is SpW Logical Address**
 - **Second byte is Protocol Identifier (ID)**
 - Number assignment by SpW working group
 - **Cargo**
 - Length independent
 - **End-of-packet marker**
 - Normal End-of-Packet marker (EOP)
 - Error-End-of-Packet marker (EEP)



Addressing

- **Default Logical address value of 254 decimal is used when destination Logical address is not known**
 - Logical address 254 Decimal is reserved in new standard
 - Logical address range 32-255
 - 255 Decimal is reserved in SpW standard
- **Path addressing requires source to insert Logical address to packet even though not used for routing**
 - Path addressing range 1-31 decimal
- **All SpW addressing schemes still supported with new packet definition**



Protocol ID

- **Protocol ID is used to identify the packet cargo format and define how the cargo is to be processed**
 - **Assignment made by the SpW working group**
 - Range is 1 to 239
 - **Experimental range not assigned by SpW working group**
 - 240-255
 - **Value of 0 shall indicate an extended Protocol ID field of 2 extra bytes**
 - 3 bytes total
 - **Value of all zero's shall be ignored**
 - **Single byte and extended protocols that are the same number shall be treated as the same protocol**
 - **Unknown protocols shall be consumed**
 - **User shall keep a count of unknown protocols received**



Protocols

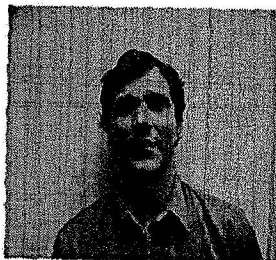
- **One protocol has currently been developed and assigned**
 - **Remote Memory Access Protocol (RMAP)**
 - Protocol ID value 1
 - Read and write memory mapped space over SpW
 - Single transactions and DMA
 - Allows register and FIFO accesses
 - Header CRC
 - Data CRC
 - Fields to allow reliable delivery (not defined)
 - **Many other protocols have been developed but not yet assigned**
 - General Access Protocol (GAP)
 - Very similar to RMAP
 - GOES-R Reliable Data Delivery Protocol (GRDDP)
 - Lunar Reconnaissance Orbiter (LRO) CCSDS protocol
 - Others in Europe

Authors



Glenn Rakow is the NASA representative to the SpaceWire working group. Since 1998 he has worked with government and the US industry in the development and enhancement of SpaceWire. He has been part of SpaceWire efforts with Swift, JWST, LRO and GOES-R as well as formulation mission support and technology developments incorporating SpaceWire. He earned a Bachelor of Science in Electrical Engineering from the University of Maryland, College Park, in 1988, and a Master of Science in Electrical Engineering from George Washington University, Washington D.C., in 1997.

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