SPACEFIBRE VIRTUAL CHANNELS AND FLOW CONTROL

Session: SpaceWire Standardisation?

Long Paper

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ABSTRACT

The SpaceFibre Outline Specification defines a mechanism for identifying virtual channels within a SpaceFibre link and performing flow control independently for each virtual channel. The SpaceFibre literature envisions the use of virtual channels for multiplexing multiple traffic flows and for providing quality of service features, but does not address the details necessary for standardized implementations.

The virtual channel concept as described in the SpaceFibre literature implements one buffer per virtual channel at each end of the SpaceFibre link. The buffer must be large enough to contain at least one SpaceFibre frame. The link receiver issues a flow-control ordered set for any virtual channel when the buffer for that virtual channel has room for at least one frame. The link transmitter sends a waiting data frame on a virtual channel if the number of flow-control ordered sets received for that virtual channel is greater than zero.

The ramifications of implementing virtual channels and flow control as defined by the SpaceFibre Outline Specification and described in the SpaceFibre literature are explored. The complexity and link efficiency of various SpaceFibre virtual channel and flow control implementation choices are evaluated and potential alternatives suggested. The topics addressed include: coupling of SpaceFibre link flow control to the individual virtual channels, synchronization of the number of active virtual channels between the SpaceFibre link transmitter and receiver, synchronization of the maximum virtual channel frame buffer capacity between the SpaceFibre link transmitter and receiver and the effects of various Quality of Service factors such as bounded latency and allocated bandwidth.