QUALITY OF SERVICE REQUIREMENTS FOR A HIGHER LAYER PROTOCOL OVER SPACEWIRE TO SUPPORT SPACECRAFT OPERATIONS

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Short Paper

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ABSTRACT

SpaceWire has been used on several spacecraft as a means of high-rate data transfer between onboard components. It has the capability of moving data from onboard nodes to other onboard nodes and the capability for determining the route to be traversed in the network. However, it does not have the capability to provide different classes of quality of service (QoS) for different types of data flows. To operate spacecraft onboard components, several classes of data need to be transferred between onboard nodes and it will minimize the implementation efforts if these different classes of data can be transferred with a single network. Therefore, it is desirable for most spacecraft applications of SpaceWire if there is a higher-layer protocol that runs over SpaceWire and provides necessary classes of QoS for different types of data.

There are two important measures of QoS for spacecraft applications: latency and reliability. Data used to monitor and control components in real-time need to be transmitted over the network within a limited latency, while data related to science or mission products are not so sensitive to latency. Compressed data or messages used for monitoring or controlling onboard equipment need to be transferred reliably, and their loss needs to be detected immediately. Data generated periodically do not have to be protected against loss so severely.

This paper describes the QoS classes that need to be provided by a higher-layer protocol to support spacecraft operations, and proposes a simple mechanism to implement them.