USING SPACEWIRE IN A SECURELY PARTITIONED COMPUTING ARCHITECTURE

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Long Paper

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ABSTRACT

SciSys is leading an ongoing study, under ESA contract, into the development of a software platform which provides the capability to partition multiple applications in a safe and secure manner. The applications of such a platform include dual-use spacecraft shared by multiple payload developers and operators. As a baseline reference architecture, the study considers a dual use spacecraft with a single onboard computer handling both platform and payload operations.

This paper considers the requirements placed on an onboard communications system by such a securely partitioning architecture; both in terms of the spatial separation of data, and the temporal partitioning of shared resources such as communications links. As an increasingly popular communications technology, the applicability of SpaceWire to such a system is crucial, and the ability of a SpaceWire communications architecture to meet the requirements is considered in detail.

The resulting discussion elicits concrete requirements on both the hardware and software of the onboard interface architecture. A hardware-focussed analysis details mechanisms by which current SpaceWire hardware may be utilised by a securely partitioned computing platform, and presents key concepts which should be considered in future. Furthermore, link-level network partitioning is considered: both time-scheduling, such as in SpaceWire-(R)T; and other bandwidth partitioning mechanisms. A complementary analysis discusses the role of software services, such as SOIS and PUS, in a securely partitioned system, drawing on past experience with projects such as PRISM.

The paper concludes by summarising the central role that SpaceWire can play in a securely partitioned spacecraft architecture.