THE SPACEWIRE INTERNET TUNNEL AND THE ADVANTAGES IT PROVIDES FOR SPACECRAFT INTEGRATION

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Long Paper

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ABSTRACT

The SpaceWire Internet Tunnel is a tool developed by the University of Dundee that allows SpaceWire components to be virtually integrated using the Internet. This has the potential to save both time and money as it allows integration testing and the correction of any identified problems to be performed at an earlier stage in development.

An ESA funded pilot activity to determine the benefits of virtual spacecraft integration and the SpaceWire Internet Tunnel was recently completed. This involved three consortia spread across Europe using the Tunnel to perform experiments virtually. On completion of these experiments, each consortium evaluated both the virtual spacecraft integration concept and the SpaceWire Internet Tunnel.

While this pilot activity was being conducted, the University of Dundee and STAR-Dundee provided support to the activity while also working on new developments of the Tunnel concept. The feedback provided by ESA and the users of the Tunnel resulted in a number of improvements being made to both the SpaceWire Internet Tunnel software and hardware.

A separate software application was also written to address limitations when establishing connections over the Internet. The SpaceWire Internet Tunnel Server addresses firewall restrictions encountered by Tunnel users and simplifies the process of establishing Tunnel connections.

This paper describes in detail the SpaceWire Internet Tunnel Server and the recent additions to the SpaceWire Internet Tunnel. An analysis of the feedback from the pilot activity is presented, while issues which have been addressed through improvements to the software and hardware are noted. Finally, the benefits and potential limitations of virtual spacecraft integration are listed, as are the mechanisms used by the SpaceWire Internet Tunnel to address these limitations.