

SPACE SYSTEMS SYMPOSIUM (D1)
Enabling Technologies for Space Systems (2)

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BENEFITS OF THE SPACEWIRE INTERNET TUNNEL

Abstract

The SpaceWire Internet Tunnel was developed by the University of Dundee under an ESA contract to allow satellites utilising SpaceWire as an onboard network to be “integrated virtually”. The concept of “virtual satellite integration” using SpaceWire was first proposed at the University of Dundee and involves connecting spacecraft components remotely using the Internet. This is achieved using the SpaceWire Internet Tunnel which replaces a SpaceWire link in the network with an Internet Tunnel.

There are a number of obvious benefits of this system. For example, integration testing can be performed at a much earlier stage making any problems found easier to correct, while time and money spent on travel can be reduced. However, there are also some limits in the testing that can be performed. For example, real-time testing is not always possible due to the bandwidth and latency limitations of the Internet.

To further evaluate these and any other benefits and limitations, a pilot study is being undertaken by ESA involving a number of consortia spread across Europe. This pilot, which is nearing its conclusion, is supported by the University of Dundee and STAR-Dundee, a spin-out of the University of Dundee. Each consortium is performing experiments, connecting equipment together using SpaceWire and exchanging information between these components. The components which are communicating are not located in a single lab however, but are connected remotely using the SpaceWire Internet Tunnel.

Throughout the experiments feedback has been provided by each consortium to ESA and the University of Dundee. On completion of the pilot activity each consortium will complete a report describing their experiences, listing the benefits and any limitations they encountered. The report will also indicate whether they feel virtual satellite integration is a concept worth pursuing and if the SpaceWire Internet Tunnel is a suitable implementation of that concept.

This paper describes the SpaceWire Internet Tunnel in detail, reporting some of the technical hurdles which were overcome to provide virtual satellite integration. Some of the benefits and limitations of the system identified by both the University of Dundee and those involved in the pilot activity are described, with the reasons for any limitations explained. Suggested improvements are also discussed. The paper concludes by considering the potential of virtual satellite integration and the SpaceWire Internet Tunnel based on the feedback of those involved in the pilot activity and the experiences of the University of Dundee.