SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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GLOBAL SENSOR NETWORK – CONCEPT TO DEMONSTRATION IN UNDER 2 YEARS

Abstract

The Institute for Telecommunications Research (ITR) at the University of South Australia has led a consortium to design a Global Sensor Network (GSN) system for remote sensor data gathering and communication using low earth orbit (LEO) microsatellites, with Canadian-based COM DEV acting as Mission Prime. The program has covered a broad range of activities, including mission design, communication system design, advanced waveform and receiver design, demonstration system implementation and field trials. The research and development was supported by the Australian federal government's Australian Space Research Program.

The program generated user requirements that led in the development of novel techniques for efficient one and two-way data communication with large numbers of remotely located sensors and devices. A key outcome was high bandwidth efficiency and minimized system and device costs. The system includes new architectures and waveform designs that provide a cost effective, scalable and flexible system. The system is able to support very large numbers of users that are simultaneously in the field of view of a LEO satellite, while maximizing use of precious satellite frequency spectrum.

Software defined radio technology and a rapid development methodology were used to achieve a successful bench demonstration with space hardware within 12 months of commencing waveform design. Less

than 12 months later the system was field trial proven using an aircraft as a satellite surrogate. Recently the system has been demonstrated in LEO satellite field trials in both Australia and Canada.

This paper describes the processes undertaken that enabled very rapid turn around, starting with requirements to architecture to simulation and demonstration involving an integrated team of researchers and engineers. In addition the paper will describe the technologies developed that enable the GSN to provide multiuser communications with high spectral efficiency. It also presents results from aircraft and satellite field trials that demonstrate support for heavily loaded multiuser scenarios.