

ABSTRACT

THE NEXT GENERATION OF SPACE TELEMETRY AND TELECOMMAND STANDARDS

Adrian J. Hooke

**NASA Jet Propulsion laboratory
California Institute of Technology
Pasadena, California, U.S.A.**

A major component of the work of the international Consultative Committee for Space Data Systems (CCSDS) has been the standardization of data exchange through the communications channels which interconnect remote spacecraft with their supporting ground systems. The CCSDS Recommendations for Packet Telemetry, Telecommand and Advanced Orbiting Systems are in widespread use throughout the world space community and have already had significant impact on reducing mission operations costs.

The current CCSDS Recommendations provide the necessary underpinning for the automated, error-free exchange of data between space and ground. However, their scope is mainly limited to the lower layers of the well-known OSI communications model. Upper layer functions, such as the ability to aggregate both telecommand and telemetry data into recognizable files and transfer them end-to-end through the space data network in a reliable and secure manner, are most often the subject of expensive project-unique design.

Recognizing the critical role of standardization in satisfying the imperative to drastically reduce future space mission operations costs, efforts are now underway to define a "skinny stack" of upper layer space data communications protocols. These new standards will expand the current CCSDS telemetry and telecommand capabilities to provide a comprehensive set of data handling services which eliminate the need for project uniqueness. In the context of a joint program between NASA and the Department of Defense in the United States, and the Defence Research Agency in the United Kingdom, a set of five specifications for the next generation of standard space/ground communications protocols have been produced which cover the following technical areas:

- a) a space File Transfer protocol, based on the Internet ftp;
- b) a space Transport protocol, based on the Internet TCP/UDP;
- c) a space Security protocol, derived from the ISO NFS;
- d) a new space Network protocol which unites the concept of CCSDS Path service with more powerful connectionless routing service.
- e) a new space data link protocol which re-layers and rationalizes the current CCSDS Telemetry, Telecommand and AOS capabilities to better support international interoperability.

These five draft specifications are currently being proposed to CCSDS for development as a tightly integrated set of standard protocols which will satisfy the full spectrum of telemetry and telecommand data handling requirements of a new generation of small, focused government and commercial missions which, by nature of their fast gestation times, will require an extensive repertoire of standard "off the shelf" capabilities. Many of these missions will need these capabilities to be available by approximately mid-1997. To meet this need in that timeframe will require an extraordinary commitment of effort.

This paper will review the new stack of standard space communications protocols, and their impact on reducing the cost of designing and operating space missions.