STANDARDIZED, LOW COST COMMUNICATIONS FOR PLANETARY MISSIONS

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Abstract

For Deep Space Missions, the communications link plays a central role in three separate services: Communications, Navigation, and Radio-Science. In this article we discuss the increased efficiency and *reduced cost that can result from the planned consolidation of the three services into one suite of equipment, and the* utilization *of "guaranteed delivery" standard protocols to improve the Communications Service.*

As part of reducing the cost of operating Deep Space planetary missions, JPL has *developed and deployed a highly-accurate digital receiver* capable *of recovering telemetry at rates as high* as *26 Msymbols/sec. This receiver also provides the interim products needed for* navigation *(ranging and Doppler) and open-loop recording for radio-science. JPL is currently assessing the consolidation of all of these functions (receiving, telemetry, ranging, doppler, and open-loop recording) into a single rack that could be remotely controlled to support all the downlink functions of the mission. When deployed, it will provide an operationally-e fficient downlink processor that can be run from the mission's operations center,* as well as *from a Principal Investigator's office. An additional benefit will be the improved performance and reliability enabled* via *advanced technology (e.g. turbo-code decoder with a 2.5 dt3* advantage *over the standard CCSDS error-correcting code, almost doubling the available downlink rate). In a similar way, the uplink functions of Communications (command) and Navigation (Doppler ramping and ranging code generation) services will also be consolidated.*

A key feature of the implementation is providing the means *for embedding standard 7 CP/IP-like protocols for telemetry/command, with automatic acknowledgment and retransmission, This will revolutionize the mission support as the spacecraft will be able to buffer science data and pace its transmission until receipt is acknowledged by the ground system. In* a similar way, *the* spacecraft will *acknowledge receipt of commands, else commands will be automatically resent. This protocol is consistent with the thrust for more autonomous spacecraft - if will eliminate the manual process of validating the success of* transmissions and *scheduling refransmissions and increase the reliability of the communications service.*

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