

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
Near-Earth and Interplanetary Communications (5)

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DESIGN AND HARDWARE IMPLEMENTATION OF CCSDS PROXIMITY-1 PROTOCOL FOR  
ROVER COMMUNICATION – DATA AND TIMING SERVICES**Abstract**

Proximity-1 is a short haul communication protocol defined by CCSDS (Consultative Committee for Space Data System) for communicating among space probes, landers, rovers, orbiting constellations and orbiting relays. Realized the protocol after arriving at an implementation profile, directives for protocol control, interfaces with flow control, selection of data services and MIB (management Information base) considering different mission scenarios. The responses, called notifications, from the protocol for its operation have been worked out for implementation. The telecommand and telemetry for rover are delivered through proximity protocol from/to the orbiter after establishing a link session between orbiter and rover. Proximity-1 protocol offers two types of data services, namely, expedited data service and sequence controlled data service to carry command and telemetry. Expedited service does not ensure delivery guarantee of SDUs (Service Data Units) whereas, Sequence controlled Service provides guaranteed in-order delivery of complete SDUs within a session. The data link layer of protocol is realized on an FPGA in VHDL. Vehicle controller (VC), that controls the protocol, is implemented on a PC for protocol validation. The timing services are also introduced in the protocol to provide time correlation and time derived ranging for space entities that are in communication. The design architecture and the different VHDL modules in the protocol implementation are described in the paper. The test methods used to validate the protocol for both services and the tools realized for the development and validation are presented.