

Mini-packets: An Extension of the CCSDS Telemetry Standards for Planetary Missions

ABSTRACT

Planetary missions at JPL are implementing telemetry systems based on the Consultative Committee for Space Data Systems (CCSDS) packet telemetry standards. However, constraints on fixed downlink opportunities, small downlink rates and on-board data storage have resulted in an implementation of this standard which is schedule rather than demand driven. This seriously compromises the flexibility envisioned by the CCSDS packet telemetry standard designers. Specifically, under current implementations, spacecraft telemetry producers must encapsulate their telemetry data in packets of fixed size which are collected at a fixed rate. This approach, while matching packet telemetry to the limited resources of the spacecraft telemetry system, severely constrains the spacecraft's ability to allow data producers to independently determine and vary both the rate and amount of telemetry data they produce over time.

The problem was partially circumvented on the Mars Observer spacecraft through the use of an extension to the CCSDS packet telemetry standards called mini-packets. An improved implementation of mini-packets, implemented in the Cassini spacecraft telemetry system, is also providing some of the lost flexibility, as well as a set of secondary benefits. Specifically, the use of mini-packets on Cassini improves on the chosen implementation of the CCSDS standards in the following areas: increased flexibility in autonomous modification of spacecraft subsystem telemetry, more efficient use of limited engineering telemetry bandwidth and greater accuracy in measurement intercorrelation.