Mars Reconnaissance Orbiter (MRO) - From Downlink to Archive

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In an orbit of 300 kilometers above the Martian surface, MRO will spend four Earth years in Mars orbit. Two years will be dedicated to science observations. MRO will carry a payload of six international scientific instruments and additional experiments with meter scale imaging, 20 meter resolution mineralogic mapping, and 6 meter ground sampling context imaging. MRO will seek to characterize Mars seasonal cycles, global atmospheric structure and upper atmosphere, gravity field, transport and surface changes. MRO will search sites for evidence of aqueous and/or hydrothermal activity, and study the Martian ice caps to profile the upper crust while searching for subsurface water and ground ice. MRO will map and explain in detail the stratigraphy, geologic structure, and composition of Mars surface features.

Planetary mission, such as MRO, are characterized by the need to receive, process, archive, and transmit remotely sensing data to geographically extended science and engineering teams. Science and Engineering Team members are located in industry, academic, and government centers all over the world.

JPL operates the Deep Space Network (DSN), a global set of large antennas to provide continuous monitoring of the signals from Space Science Missions. The data collected from MRO will be sent from the DSN to JPL. Spacecraft are designed to operate with only a few hours of power margin. Mission Science and Engineering teams must receive constant updates on instrument health, pointing, and data. The MRO mission requires that the Science and Engineering teams have their data 24 hours after receipt at the DSN. There is then a six month window during which the data are processed for archive and distribution to the planetary science community at large.

MRO will return in excess of 34Tb of data. This enormous amount of data requires new paradigms for all aspects of CCSDS File Delivery Product (CFDP) generation, Science Product Delivery, and Archive. Future Mars Missions will use the paradigms established for MRO to increase their science data return.

In this paper, we describe the pipeline being developed to provide MRO instrument health, pointing, and science data in a cost effective, reusable fashion that maximizes the use of automation, parallel processing, and data subscription services. The elements of this system include: 1. CFDP Product Generation, 2. The Raw Science Data Server (RSDS), 3. The Visualization and Analysis Test-bed (VAT), 4. The File Exchange Interface (FEI), and 5. The Planetary Data System (PDS).