Network Operations Control Center (NOCC) Implementation Status Report

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This article provides information regarding the implementation of changes to the Network Operations Control Center (NOCC) required to support the Voyager Jupiter and Saturn Encounters and DSN enhancements designed to reduce maintenance and operations costs.

I. Voyager Jupiter

The Network Operations Control Center (NOCC) underwent various modifications to its distributed data processing network's hardware and software to support the Voyager Jupiter Encounters and the planned Voyager Saturn Encounters.

The hardware and software modifications in support of the Jupiter Encounter were primarily to increase the telemetry data handling capability and Intermediate Data Records production as required to support the two spacecraft operating at 115.2 kbps. The modifications to the Network in support of high-rate telemetry resulted in the addition of the third Network Log Processor (NLP), along with four additional magnetic tape drives supporting two additional wideband channels from the Deep Space Network.

Interfacing with the third NLP, the Network Data Processing Area (NDPA) was implemented with the third Network Communications Equipment (NCE), which served to route the real-time high-rate telemetry data to a third Telemetry Real-Time Monitor (RTM). In addition to the real-time high-rate telemetry upgrade, the NOCC was implemented with an additional Data Records Processor obtained from MIL-71 on temporary loan, along with four magnetic tape drives and a high-speed line printer to support the production of high-rate telemetry and radio science radio metric Intermediate Data Records (IDR) required to be delivered within twenty-four hours to project scientists. (Several thousand reels of magnetic tape IDRs were delivered to project users at the completion of the two Voyager Jupiter Encounters.)

Also, supporting the Voyager Jupiter Encounter real-time radio-science experiments, the NOCC was augmented with hardware and software for a second Video Assembly Processor with a high-resolution Digital Video Generator Assembly, video hardcopy device, and a second Tracking Real-Time Monitor supporting real-time graphical displays of closed-loop receiver radiometry parameters.

Thus, in support of the Voyager Jupiter Encounter, the NOCC was augmented with a total of six processors with their corresponding operational peripherals and software programs.

II. Voyager Saturn

At the completion of the Voyager Jupiter Encounter support, the NOCC continues the development and implementation of additional operational capabilities needed to

support the Voyager Saturn Encounters in late 1980 and 1981.

In support of the Voyager Saturn Encounter and DSN Operations, the NOCC is being augmented with the Radio Science Real-Time Monitor Processor (NRS-RTM) and supporting software. Also included will be the upgrade of the Video Assembly Processor (VAP) to provide two additional channels of high-resolution graphics.

The NRS-RTM, in conjunction with the upgraded VAP, will support the processing and generation of Real-Time Open-Loop Receiver Frequency Spectrum Graphical plots. These will be used by DSN operations and radio scientists during the encounter period. Another task of the NRS-RTM is the processing of Very Long Baseline Interferometry (VLBI) monitor data from the Deep Space Stations as required to coordinate the simultaneous data gathering of two Deep Space Stations. The two stations scheduled for a VLBI pass gather star source signals for non-real-time play-back to the Pasadena VLBI processing center. VLBI-processed data will be used in support of Voyager navigation to Saturn and beyond as well as to provide the DSN with accurate time-sync parameters.

Also, in support of Voyager 2 spacecraft up-link frequency tuning, various software programs in the Network's Support Subsystem and Tracking RTM were updated to support in the generation and monitoring of up-link frequency tuning predicts transmission to the Deep Space Stations equipped with the up-link Programmable Oscillator Control Assembly (POCA).

III. DSN Enhancements

In addition to the Voyager Jupiter and Saturn Encounter preparations and implementations, the NOCC was upgraded to support DSN operations and improve the Network's reliability and sustaining engineering costs through the following implementations:

(1) All NOCC processors are being upgraded to the DSN Standard Hardware Revision level as required to maintain the same configuration with the rest of the DSN processors deployed at each of the Deep Space Stations and at the Central Communications Terminal in Pasadena. This effort allows for sharing of DSN spares, test equipment and documentation, and minimizes the amount of special training required for the DSN maintenance personnel.

(2) All NOCC Software Operational Programs were modified for automatic Software Turn ON/OFF of the processor's Terminet I/O device. This modification is expected to reduce the high failure rate experienced in the Terminet bearings, ribbon control, and electronics.

(3) The NOCC Display Subsystem Software was modified to eliminate the original interface design which interlocked the Display Processor Software with the Real-Time Monitor (RTM) Processor Software. With the new Display-RTM interface design, displays may be added, modified, or subtracted from the RTMs without requiring simultaneous releases of RTM/Display Software programs.

(4) The NOCC Display Subsystem Varian Printer-Plotters were replaced with High-Speed Data-Products Line Printers. This modification eliminated a high failure rate assembly from the Network as well as providing the capability for a high-quality hardcopy print-out supporting DSN operations.

(5) The NOCC Display Subsystem Video Assembly Processor's RAMTEK Video Generator will be replaced with a high-resolution 21-channel Video Generator from Grinnell Corp. This upgrade was required to eliminate from the Network the RAMTEK Video Generator which did not have the capability to add the required five DTV Graphics channels in support of real-time radio science graphics. The RAMTEK assembly being deleted from the Network is no longer supported by the factory and spare parts could only be obtained at very high costs.

The replacement of the RAMTEK with Grinnell DTV assembly also allows the NOCC to reconfigure the radio science graphics and Alphanumerics Display Systems into full prime/backup systems not previously available.

(6) All NOCC Software program documentation (Software Operator's Manual (SOM), Software Specifications Document (SSD), and Software Test and Transfer (STT)) was updated and released to the new DSN Standard Practice requirements. This effort should minimize future NOCC software maintenance and sustaining costs.

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