Integration of the DSN Sequence of Events Generator

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This article reviews the concept, function, implementation, and operational status of the DSN sequence of events generator. The supporting software resides in IBM 360-75 as a part of the real-time mission support software system. The program title is "Sequence of Events Generator."

I. Introduction

The DSN sequence of events (SOE) is a part of the network allocation subsystem and provides a baseline sequence for use by the DSN operations and analysis functions in conducting minute-to-minute DSN operations. In the past, sequences of events were cumbersome, hand-manipulated manuscripts generated to support only critical phases of mission activity.

The software package used five years ago by the Lunar Orbiter Project to generate SOEs was the basis of the original SOE program. This program was nearly as cumbersome as the hand-generated method, since all events had to be coded for card punching. These data cards were then time ordered by hand prior to being input to the program. The program resided in the IBM 7094 and provided the capability of sequence numbering, page numbering, and adding titles to output pages.

The change from the old IBM 44/94 flight support system to the newer IBM 360-75s provided the time required to design a functional sequence of events program.

The Software Requirements Document (SRD) for the initial version of the Sequence of Events (SEG) program was issued in March, 1970. The SRD for the second and final version was issued in January, 1971.

II. Function

The new SEG provides a broad data base accumulated from all project and DSN user requirements. DSN, project, or combined sequences are generated using selective sort routines.

The sequence of events provides data which is sensitive to the nearest second. This timing accuracy was neces-

sary to reflect optimum spacecraft command transmission times as well as routine operational times such as view periods, two way transfers, etc.

Using a subsequence library designed into SEG, redundant, time-sequenced events can be cataloged and retrieved at will using a single input "trigger" card. Any number of special sequence sets can be implemented into the library to reduce input time and the redundant coding of cards.

Using file management techniques, many sequences may be written using different file names. These files may then be outputed individually, selectively merged, or as a large master SOE. High-speed transmission files for remote location may be created on either magnetic tape, disk pack, or both.

Any internal file containing input format, time-ordered input format or output format can be dumped to magnetic tape or disk pack for later restoration and use. Communications with SEG are through the 2260 I/O system and punched cards.

III. Implementation

It was determined that production of sequence of events would be the responsibility of the DSN scheduling group. Forms design, implementation, and program operation were hampered to some extent by the absence of documentation on SEG program capabilities.

Many times, unexpected program changes or "bugs" would appear in new versions of the software causing the redesign of input forms, cards or sometimes both to maintain communications with the program.

The current model of SEG meets the requirements set forth in the SRD dated January, 1971 with few exceptions. This model was documented and scheduled with sufficient visibility to allow revised forms and subsequence card libraries to be prepared prior to its implementation and inclusion in the operational software system.

IV. Operational Status

The DSN scheduling personnel are fully trained and are currently producing a sequence of events for DSN Operations on a daily basis. A weekly SOE is being generated which basically parallels the DSN 7-Day Schedule. This sequence provides the base data for the daily sequences. DSN Document 890-20 "Deep Space Network-Oriented Sequence of Events Generator User's Manual" has been published to provide a guide to users in operating the program at its peak efficiency.

The sequence of events generator has been fully integrated into the DSN scheduling subsystem. A sequence of events can be created for any user as specified in the *Standard Operating and User Procedures*. The daily sequence of events used by DSN operations has proved to be a valuable tool in conducting operations efficiently under any condition of loading.

SEG is a multi-user program. Present daily sequences are created by merging DSN-unique data with project sequence files from earlier runs. The master sequence is then selectively sorted to meet required support for that day.

References

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