NASA TECH BRIEF

DSN Seven Day/Twelve Week Schedule Program

The problem:

To ensure that, consistent with efficient Deep Space Network (DSN) utilization, all tests and operations shall be scheduled and fully supported as nearly as possible in accordance with requested dates and times.

The solution:

The DSN Scheduling Program allocates resources of the DSN based on users' requirements. It is the final authority for scheduling operations within the DSN. It detects and identifies conflicts in requests for time and resources.

How it's done:

The DSN Seven Day/Twelve Week Schedule System is basically a system of request, review, and allocation. The system accepts requests for usage of DSN equipment and resources from flight project and DSN users. These requests are sorted, accumulated, and compared by means of the program. Non-conflicting requests are considered allocations, but conflicting requests detected by the program are reviewed with reallocation of resources based on known priorities. To accomplish its functions, the program needs three basic types of information:

1. What DSN resources, in terms of facility, station, area, equipment, and communications are available for scheduling.
2. Which items or what "configuration" of the DSN resources are required by a user to conduct a particular activity.
3. When and for how long the use of that particular configuration is requested.

With this type of information, the program allocates the DSN resources. The program can generate two types of schedules, depending upon the program input. These two schedules are the Seven Day Schedule and the Twelve Week Schedule.

The Seven Day Schedule generated by the program contains two seven-day schedules. The first week is a firm commitment of DSN resources. The second portion is a forecast of the second week. The allocations are made by specific day, hour, and minute, and are ordered in the output as a sequence of events. Each schedule contains several different extracts as well as a full sequence of events. The program may also be used to allocate the same resources at a lower level of time resolution to predict future DSN loading. In this case, allocations are made on an hours-per-week basis for each of the twelve weeks covered. To generate either type of schedule, the DSN resource definition remains the same. In both cases, conflicts are detected and identified.

The inputs for the Seven Day and Twelve Week Schedules differ in terms of time, as follows:
1. The Seven Day Schedule inputs must specify the exact day, hour, and minute of start and finish time requested for a particular configuration.
2. Twelve Week Schedule requests are made in terms of the hours per week of a specific week required for each particular resource configuration.

The output formats of the Seven Day and Twelve Week Schedules differ in terms of time and ordering, as follows:
1. The allocations in the Seven Day Schedule are actual time assignments by day, hour, and minute. The ordering is by start times, sequentially.
2. The Twelve Week Schedule lists allocations as total hours per specific week for each DSN element which is requested. The order of the listing is a function of the portion of the DSN requested and of the user. The output is broken into twelve sections, with one for each week covered in the schedule.

The method of conflict identification varies in the two schedules, as follows:

1. For the Seven Day Schedule conflicts are noted by time overlap, by element of the DSN.
2. In the Twelve Week Schedule the conflicts are identified as total time requests in excess of time available, by element of DSN.

Notes:

1. This program is written in COBOL language and partially in MAP language for use on the IBM-7094 computer. It can also be run on an IBM 7094/7040 Direct Couple System, but it would be undesirable for production to be done on Direct Couple System as a standard procedure, without extensive program redesign, since running time is approximately 50% greater on the direct couple system.
2. Extensive use has been made of sequential processing. This mode was chosen over a disk file type of operation because it ensures compatibility between running in a tape-oriented system and a disk-oriented system.

3. This program is necessary as authority for scheduling operations within the Deep Space Network which is responsible for two-way communications with unmanned spacecraft beginning approximately 10,000 miles from earth to interplanetary distances.
4. Inquiries concerning this innovation may be directed to:

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Patent status:

No patent action is contemplated by NASA.