



➤ **Converting From DDOR SASF to APF**

A computer program called “ddor_sasf2apf” converts delta-door (delta differential one-way range) request from an SASF (spacecraft activity sequence file) format to an APF (apgen plan file) format for use in the Mars Reconnaissance Orbiter (MRO) mission-planning-and-sequencing process. The APF is used as an input to “APGEN/AUTOGEN” in the MRO activity-planning and command-sequence-generating process to sequence the delta-door (DDOR) activity. The DDOR activity is a spacecraft tracking technique for determining spacecraft location.

The input to ddor_sasf2apf is an input request SASF provided by an observation team that utilizes DDOR. ddor_sasf2apf parses this DDOR SASF input, rearranging parameters and reformatting the request to produce an APF file for use in AUTOGEN and/or APGEN. The benefit afforded by ddor_sasf2apf is to enable the use of the DDOR SASF file earlier in the planning stage of the command-sequence-generating process and to produce sequences, optimized for DDOR operations, that are more accurate and more robust than would otherwise be possible.

This program was written by Roy E. Gladden, Teerapat Khanampornpan, and Forest W. Fisher of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45413.

➤ **Converting From CVF to AAF**

A computer program called “dsn config converter” automates what had been a manual process for updating the multi-mission adaptation file (multi.aaf) used by a multiple-mission-command-sequence-generating process comprised of a combination of the AUTOGEN and APGEN programs mentioned in the immediately preceding article. The program converts the dsn_config.cvf file that provides DSN (Deep Space Network) antenna configuration code mappings from a context variable file (CVF) format used in another part of the command genera-

tion process to an APGEN activity file (AAF) format used by AUTOGEN and APGEN.

Whereas previously, the information in the dsn_config.cvf file was manually encoded into the multi.aaf file, now the program automatically generates a dsn_config.aaf file from the dsn_config.cvf file. As part of this development effort the multi.aaf file was adapted to use the new dsn_config.aaf representations. Through this automation a tedious error-prone step has now been replaced by a quick and robust step.

This program was written by Roy E. Gladden, Teerapat Khanampornpan, and Forest W. Fisher of Caltech for NASA's Jet Propulsion Laboratory.

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➤ **Documenting AUTOGEN and APGEN Model Files**

A computer program called “autogen hypertext map generator” satisfies a need for documenting and assisting in visualization of, and navigation through, model files used in the AUTOGEN and APGEN software mentioned in the two immediately preceding articles. This program parses autogen script files, autogen model files, PERL scripts, and apgen activity-definition files and produces a hypertext map of the files to aid in the navigation of the model. This program also provides a facility for adding notes and descriptions, beyond what is in the source model represented by the hypertext map. Further, this program provides access to a summary of the model through variable, function, sub routine, activity and resource declarations as well as providing full access to the source model and source code. The use of the tool enables easy access to the declarations and the ability to traverse routines and calls while analyzing the model.

This program was written by Roy E. Gladden, Teerapat Khanampornpan, Forest W. Fisher, and Chris C. Del Guercio of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45424.

➤ **Sequence History Update Tool**

The Sequence History Update Tool performs Web-based sequence statistics archiving for Mars Reconnaissance Orbiter (MRO). Using a single UNIX command, the software takes advantage of sequencing conventions to automatically extract the needed statistics from multiple files. This information is then used to populate a PHP database, which is then seamlessly formatted into a dynamic Web page.

This tool replaces a previous tedious and error-prone process of manually editing HTML code to construct a Web-based table. Because the tool manages all of the statistics gathering and file delivery to and from multiple data sources spread across multiple servers, there is also a considerable time and effort savings. With the use of The Sequence History Update Tool what previously took minutes is now done in less than 30 seconds, and now provides a more accurate archival record of the sequence commanding for MRO.

This work was done by Teerapat Khanampornpan, Roy Gladden, Forest Fisher, and Chris Del Guercio of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45288.

➤ **Extraction and Analysis of Display Data**

The Display Audit Suite is an integrated package of software tools that partly automates the detection of Portable Computer System (PCS) Display errors. [PCS is a laptop computer used onboard the International Space Station (ISS).] The need for automation stems from the large quantity of PCS displays (6,000+, with 1,000,000+ lines of command and telemetry data). The Display Audit Suite includes data-extraction tools, automatic error detection tools, and database tools for generating analysis spreadsheets.

These spreadsheets allow engineers to more easily identify many different kinds of possible errors. The Suite supports over 40 independent analyses,

and complements formal testing by being comprehensive (all displays can be checked) and by revealing errors that are difficult to detect via test. In addition, the Suite can be run early in the development cycle to find and correct errors in advance of testing.

This software suite was developed by Chris Land of The Boeing Company and Kathryn Moye of the Dynacs Co. for Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-23630-1

➤ MRO DKF Post-Processing Tool

This software tool saves time and reduces risk by automating two labor-intensive and error-prone post-processing steps required for every DKF [DSN (Deep Space Network) Keyword File] that MRO (Mars Reconnaissance Orbiter) produces, and is being extended to post-process the corresponding TSOE (Text Sequence Of Events) as well. The need for this post-processing step stems from limitations in the seqgen modeling resulting in incorrect DKF generation that is then cleaned up in post-processing.

This work was done by Shanti Ayap of LMCO, and Forest Fisher, Roy Gladden, and Teerapat Khanampornpan of NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45481.

➤ Rig Diagnostic Tools

Rig Diagnostic Tools is a suite of applications designed to allow an operator to monitor the status and health of complex networked systems using a unique interface between Java applications and UNIX scripts. The suite consists of Java applications, C scripts, Vx-Works applications, UNIX utilities, C programs, and configuration files. The UNIX scripts retrieve data from the system and write them to a certain set of files. The Java side monitors these files and presents the data in user-friendly formats for operators to use in making troubleshooting decisions. This design allows for rapid prototyping and expansion of higher-level displays without affecting the basic data-gathering applications. The suite is designed to be extensible, with the ability to add new system components

in building block fashion without affecting existing system applications. This allows for monitoring of complex systems for which unplanned shutdown time comes at a prohibitive cost.

This program was written by Kerry M. Soileau of Johnson Space Center and John W. Baicy of The Boeing Co. Further information is contained in a TSP (see page 1). MSC-24158-1

➤ MRO Sequence Checking Tool

The MRO Sequence Checking Tool program, `mro_check`, automates significant portions of the MRO (Mars Reconnaissance Orbiter) sequence checking procedure. Though MRO has similar checks to the ODY's (Mars Odyssey) Mega Check tool, the checks needed for MRO are unique to the MRO spacecraft.

The MRO sequence checking tool automates the majority of the sequence validation procedure and check lists that are used to validate the sequences generated by MRO MPST (mission planning and sequencing team). The tool performs more than 50 different checks on the sequence. The automation varies from summarizing data about the sequence needed for visual verification of the sequence, to performing automated checks on the sequence and providing a report for each step. To allow for the addition of new checks as needed, this tool is built in a modular fashion.

This work was done by Forest Fisher, Roy Gladden, and Teerapat Khanampornpan of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45480.

➤ Science Activity Planner for the MER Mission

The Maestro Science Activity Planner is a computer program that assists human users in planning operations of the Mars Explorer Rover (MER) mission and visualizing scientific data returned from the MER rovers. Relative to its predecessors, this program is more powerful and easier to use. This program is built on the Java Eclipse open-source platform around a Web-browser-based user-interface paradigm to provide an intuitive user interface to Mars rovers and landers.

This program affords a combination of advanced display and simulation capabilities. For example, a map view of terrain can be generated from images acquired by the High Resolution Imaging Science Explorer instrument aboard the Mars Reconnaissance Orbiter spacecraft and overlaid with images from a navigation camera (more precisely, a stereoscopic pair of cameras) aboard a rover, and an interactive, annotated rover traverse path can be incorporated into the overlay. It is also possible to construct an overhead perspective mosaic image of terrain from navigation-camera images.

This program can be adapted to similar use on other outer-space missions and is potentially adaptable to numerous terrestrial applications involving analysis of data, operations of robots, and planning of such operations for acquisition of scientific data.

This program was written by Jeffrey S. Norris, Thomas M. Crockett, Jason M. Fox, Joseph C. Joswig, Mark W. Powell, Khawaja S. Shams, Recaredo J. Torres, Michael N. Wallick, and David S. Mittman of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45871.

➤ UAVSAR Flight-Planning System

A system of software partly automates planning of a flight of the Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) — a polarimetric synthetic-aperture radar system aboard an unpiloted or minimally piloted airplane. The software constructs a flight plan that specifies not only the intended flight path but also the setup of the radar system at each point along the path.

A user first specifies the desired image swath by specifying certain geographic and geometric features of the swath or the desired flight path. Using an input digital elevation map (DEM), the software predicts the image swath and sets such variables as a data window position (DWP). A raster backscatter classification file co-registered with the input DEM can be used to estimate radar attenuation settings. The software determines whether such radar constraints as those pertaining to duty cycles and data rates are obeyed, and de-