

PAYLOAD OPERATIONS INTEGRATION CENTER REMOTE OPERATIONS CAPABILITIES

Michelle Schneider, NASA, Marshall Space Flight Center
Catherine C. Lapenta, NASA, Marshall Space Flight Center

ABSTRACT

The Payload Operations Integration Center (POIC) provides the capability for International Space Station (ISS) payload users to operate their payloads at their home sites. The capabilities include the ability to send commands and receive telemetry from their ISS payload. In addition, the POIC provides a software toolkit entitled Telescience Resource Kit (TReK). TReK provides both local ground support system services and an interface to utilize remote services provided by the Payload Operations Integration Center (POIC). Both the POIC remote capabilities and the TReK capabilities are discussed in this paper.

INTRODUCTION

The Payload Operations Integration Center (POIC) is an International Space Station (ISS) ground system that manages the execution of on-orbit ISS payloads and payload support systems in coordination with the Space Station Control Center (SSCC), the distributed International Partner (IP) Payload Control Centers (PCC), Telescience Support Centers (TSC's), and other remote user facilities. The POIC contains several data and network systems that provide various capabilities to the remote user community. These systems are the Payload Data Services System (PDSS), the Enhanced Huntsville Operations Support Center (HOSC) System (EHS), and the Payload Planning System (PPS). PDSS acquires, stores, and distributes ISS telemetry to the POIC cadre, International Partners, Telescience Support Centers and other remote user facilities. The EHS performs command processing and real-time and near real-time telemetry processing for simulation, training, and flight operations. The PPS provides a set of software tools to automate planning and scheduling of payload activities. These systems work in concert, as depicted in Figure 1, to allow remote users the ability to send commands and receive telemetry from their ISS payloads.

Copyright © 2001 by the American Institute of Aeronautics and Astronautics, Inc. No copyright is asserted in the United States under Title 17, U.S. Government has a royalty-free license to exercise all rights under the copyright claimed herein for Government Purposes. All other rights are reserved by the copyright owner.

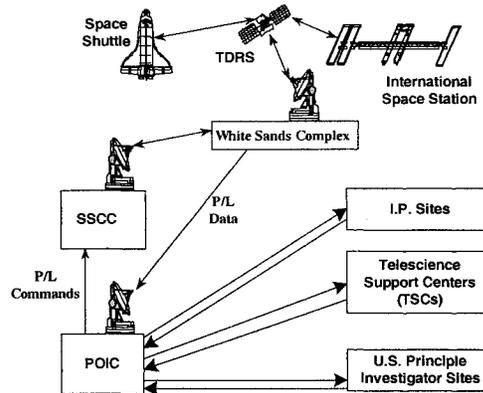


Figure 1 Overview of ISS Payload Telemetry and Command Flow

POIC REMOTE TELEMETRY DISTRIBUTION CAPABILITIES

Figure 2 depicts the ISS telemetry flow from the ISS to the remote user sites along with the different packet formats that are available to the remote user. The PDSS distributes packetized data in the PDSS Payload Consultative Committee on Space Data Systems (CCSDS) format. PDSS utilizes User Datagram Protocol (UDP) to deliver the packets to the remote user site. Details regarding the packet format can be found in section 8 of the POIC to Generic User Interface Definition Document Volume 1, Revision B (SSP 50305). Associated with the PDSS Payload CCSDS packet is the PDSS User Data Summary Message (UDSM). The UDSM is transmitted to the remote user when there is a Loss of Signal (LOS) condition between White Sands and the POIC or between ISS and White Sands. The UDSM contains data quality information for the remote user such as the number of CCSDS packets transmitted during the last reporting period and number of packet sequence count errors. The PDSS UDSM is also transported to the remote user site using UDP.

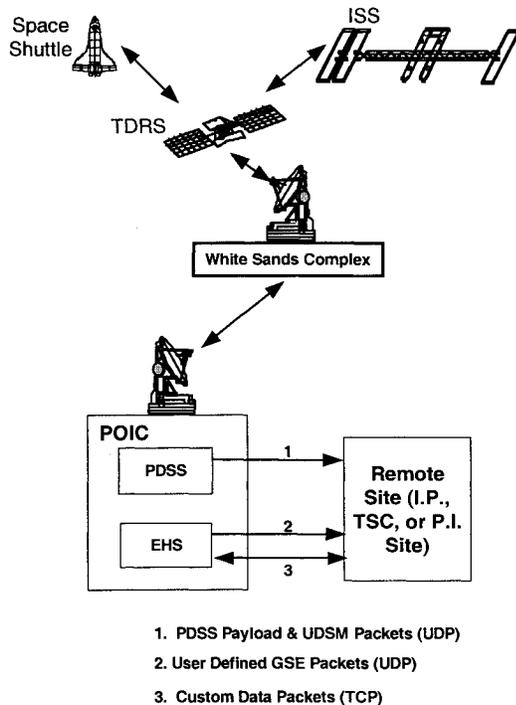


Figure 2 ISS Telemetry Flow and Available Packet Types

Remote users receive their payload science data in the PDSS Payload CCSDS format. Remote users may also choose to receive from PDSS the ISS payload health and status packets that contain payload health and status parameters from all active payloads onboard the ISS. PDSS also distributes the ISS flight ancillary data packets that contain information about onboard systems and the onboard environment. However, both the payload health and status packets and the ISS flight ancillary packets contain tens of thousands of parameters that the remote user may not require thus using the remote user's limited bandwidth and processing power needlessly. The POIC has developed within the EHS two telemetry distribution mechanisms to allow the remote user to create a user-defined packet that contains a subset of telemetry parameters. The first telemetry distribution mechanism is the Ground Support Equipment (GSE) packet. Users logon to the EHS system via a web interface to create the content of the GSE packet. Users can select parameters from the EHS telemetry database to be placed in their GSE packet. Most parameters that are in the EHS telemetry database are available to all users. Typical parameters include the remote user's payload health and status parameters and useful

flight ancillary data like cabin temperature or pressure or whatever is of value to the user's experiment. Once the user's GSE packet is defined, a file is created that contains information that will help the user extract the parameters from the GSE packet. The remote user will use the file transfer protocol to send this file to their remote computer so that it can be incorporated in the remote user's local telemetry processing software. After the remote user's system is ready to accept the GSE packet, the user can initiate the GSE packet generation and distribution via the EHS web interface. The GSE packet is sent to the user via UDP. The GSE packet definition file format and the GSE packet format is described in the POIC to Generic User Interface Definition Document Volume 1, Revision B (SSP 50305).

The other telemetry distribution mechanism is the Custom Data Packet (CDP). Like the GSE packet, a CDP can contain any telemetry parameter from the EHS telemetry database that the user has access to. However, a CDP is defined, generated and distributed in an entirely different manner than the GSE packet. A CDP is defined, generated and distributed to the remote user's site by the remote user's software sending a series of formatted messages to the EHS. The CDP process is thus automated and does not require a person to define, initiate and terminate the telemetry delivery process. It does however require that the remote user program their system to send and receive the appropriate messages. The CDP message and packet formats are described in the POIC to Generic User Interface Definition Document Volume 1, Revision B (SSP 50305). The CDP is sent to the remote user using Transmission Control Protocol (TCP) not UDP.

POIC REMOTE COMMAND CAPABILITIES

The POIC provides remote commanding capabilities that allow a remote user the ability to send commands to their ISS payloads, and receive command responses, POIC command system status, and POIC command configuration information. All remote user commands, responses and command information flow over the command connection between the remote user site and the POIC as depicted in Figure 3. Once a command reaches the POIC, it is sent from the POIC to the SSCC and then to the ISS.

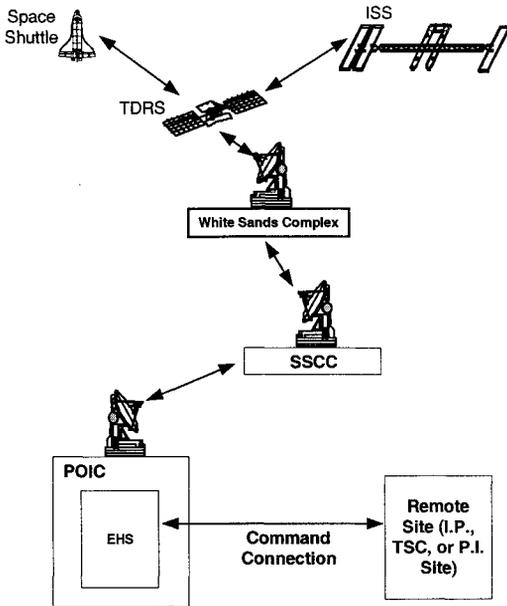


Figure 3 ISS Command Flow

The POIC provides three types of command requests: a remotely generated command request, a remotely initiated command request, and an update command request. The remotely generated command request allows the remote user to send the entire command uplink bit-pattern to the POIC. The entire command uplink bit-pattern includes a predefined header and a modifiable data field. This allows flexibility on the remote user side by allowing the user to change the data field of the command at their remote site within their ground support equipment.

The remote user can also send a remotely initiated command. Unlike the remotely generated command, the remotely initiated command contains a predefined header and the name of the command mnemonic that is to be uplinked to the ISS. Upon receipt of this type of command request, the EHS will build the remote user's command uplink bit-pattern from the information in the EHS command database. Remote users provide this information in the Payload Data Library's (PDL) Command and Data Handling dataset during the pre-flight preparation process. If the remote user selects the option to use the remotely initiated command and the command has modifiable fields, the user can update these fields from their remote site using the update command request capability. The remote user sends the modifiable field definitions to the EHS command database prior to initiation of the remotely initiated

command.

No matter which method is selected, the remote user receives command responses. Command responses indicate whether the remote user's command is successfully uplinked through to the POIC, SSCC, ISS and their payload. In addition to command responses, the remote user receives command system status, command configuration, and command system configuration information from the POIC. Examples of the type of information available within these messages include whether the remote user is enabled to command, a listing of all commands available to the user and their enablement status, and details on the configuration of the POIC command server. The POIC to Generic User Interface Definition Document (SSP 50305), Volume 2 describes in detail the remote commanding interface.

REMOTE USER OPERATING LOCATIONS

The POIC resides at the Marshall Space Flight Center within the Huntsville Operations Support Center (HOSC). The United States Operations Center (USOC) also resides within the HOSC and provides an ISS host facility where payload users can choose to control and monitor the operations of their onboard payloads instead of being located remotely. The USOC users are provided with EHS workstations, access to POIC networks, facility space, and POIC voice and video systems. However this option is not the preferred option for ISS payload operations. The POIC and the Space Station Utilization program are emphasizing remote operations. Users choosing remote operations are provided several data system options for performing telemetry processing and commanding at their location. The options are:

- Use the Telescience Resource Kit (TReK) software as described in the following sections.
- Develop software on payload-unique Ground Support Equipment using the POIC to Generic User Interface Definition Document (SSP 50305) to develop telemetry and command interfaces.
- Combination of the two options.

Regardless of what option the remote user selects, all remote users will use the POIC web applications to perform a variety of payload operations tasks. These POIC web applications include:

- Payload Information Management System (PIMS)
- Payload Planning System

- Initiating/Terminating GSE packets
- Defining GSE packets
- Detailed listing of commands uplinked through the POIC
- Real-time display of commands recently uplinked
- ISS Ground Track Display
- Acquisition of Signal (AOS)/Loss of Signal (LOS) Display

Additional information about each of these capabilities can be found in the POIC Capabilities Document (SSP 50304).

TELESCIENCE RESOURCE KIT

The Telescience Resource Kit (TReK) is a suite of PC-based software applications that can be used to monitor and control a payload on board the International Space Station (ISS). TReK provides both local ground support system services and an interface to utilize remote services provided by the Payload Operations Integration Center (POIC). For example, TReK can be used to receive payload data distributed by the POIC and to perform local data functions such as processing the data, storing it in local files, and forwarding it to other computer systems. The TReK software is available free of charge from the Marshall Space Flight Center.

TELEMETRY SOURCES

TReK can receive and process data from several different sources. As shown in Figure 4, TReK typically receives data from the POIC, the Suitcase Simulator, and the TReK Training Simulator application. The POIC distributes PDSS Payload packets, PDSS UDSM packets, CDP packets, and GSE packets. TReK can also receive CCSDS packets from a Suitcase Simulator system. Since data sources such as the POIC and Suitcase Simulator are not always available, TReK includes a telemetry simulator tool (Training Simulator application) that can be used to generate data. TReK can receive data from all of these sources simultaneously.

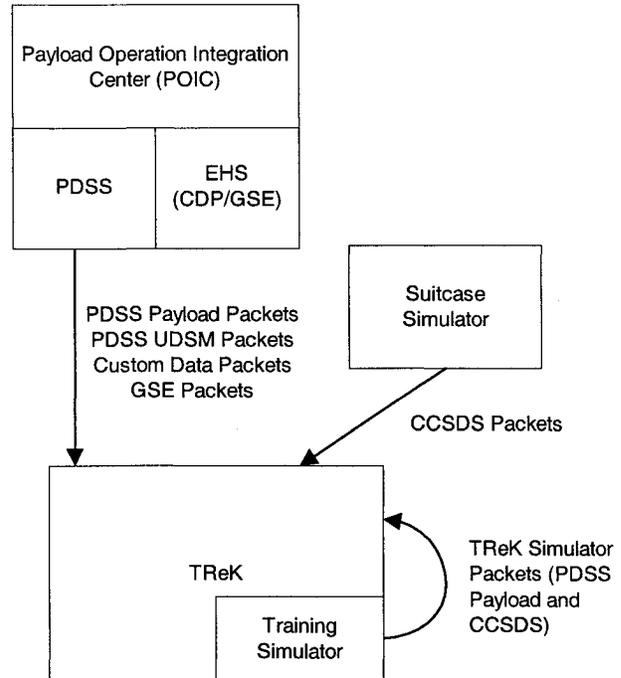


Figure 4 TReK Telemetry Sources

TELEMETRY SOFTWARE

Figure 5 shows an overview of the TReK telemetry software. There are three applications and one library that provide telemetry services: Training Simulator, Telemetry Processing, Telemetry Database, and the Telemetry Application Programming Interface (API) library.

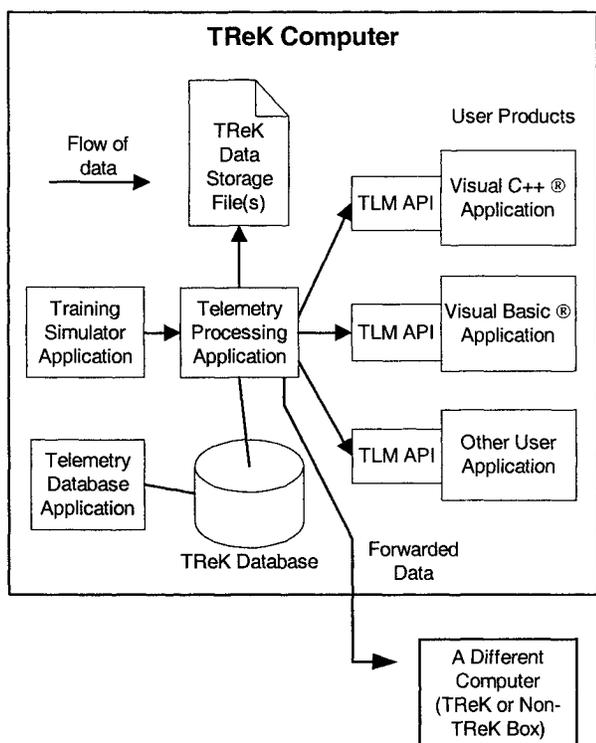


Figure 5 TReK Telemetry Software

TRAINING SIMULATOR

The Training Simulator application is a training tool. It is used to simulate telemetry data for training purposes. This application can generate various types of telemetry packets such as PDSS Payload packets, GSE packets, and Suitcase Simulator packets. This application can be useful when learning how to use the TReK software. It can simulate a data source when the real data source is unavailable. In some cases it can also be used to simulate a particular payload's data stream.

TELEMETRY PROCESSING

The Telemetry Processing application is used to configure and control all TReK telemetry services. It is used to identify incoming data streams and to specify what should be done with the data when it arrives. There are a variety of services available such as data processing, data recording, data display, data monitoring, and data forwarding.

DATA RECEIPT

The Telemetry Processing application can be configured to receive different types of data from the same data source simultaneously. For example, it is likely that most payload teams will

receive PDSS Payload packets and GSE packets from the POIC at the same time. Additionally, the same data stream can also arrive in different data modes at the same time. When the ISS cannot transmit data to the ground, data is recorded on-board. Later, when transmission becomes possible, the recorded data is transmitted simultaneously with real-time data. The recorded data is labeled "dump data". The Telemetry Processing application can be configured to receive both the real-time data and dump data streams simultaneously.

As mentioned earlier, it is also possible to receive data from different data sources simultaneously. For example, the Telemetry Processing application can be configured to receive data from the POIC, Suitcase Simulator, and the TReK Training Simulator application simultaneously.

Data can be received via the User Datagram Protocol (UDP) or the Transmission Control Protocol (TCP). Multicast data is supported and data can be received on multiple network cards simultaneously.

DATA PROCESSING

The Telemetry Processing application provides several different data processing options: Off, Pass Thru, and Process Entire Packet. Data processing can be turned off. This can be useful if a computer needs to be configured for a purpose other than processing. For example, some payload teams set up a computer to receive data and record it but nothing more. The Pass-Thru data processing option specifies that incoming packets should be retrieved from the network and stored in memory, but no further processing should be performed. This option provides a way to take advantage of network and real-time data storage services without using the processing service. The TReK software can be used to retrieve the data from the network, store the data in memory, and then hand-off the data to a user-developed program. The Process Entire Packet option provides full data processing services. If this option is selected, incoming packets will be retrieved from the network and the packet will be decomposed into individual parameters. For example, suppose an incoming packet contains 4 parameters (2 temperatures and 2 pressures). When the packet is processed, the entire packet and each of the 4 parameters will be stored in memory. These values can then be retrieved using the TReK User Application Programming Interface library.

PARAMETER PROCESSING

Once an unprocessed parameter (i.e., raw binary data) has been extracted from an incoming telemetry packet it can be converted, calibrated, and/or limit/expected state sensed. Conversion refers to the translation of a binary pattern to a native PC data type such as an integer or a string. Calibration is the transformation of a parameter to a desired physical unit or text state code. For example, a converted value can be input into a polynomial equation thereby producing a "calibrated" value. These calibrated parameters can then be "sensed" for limit, delta, or expected state violations. For example, limit sensing checks to see if a value is within a particular range of values.

PARAMETER RECORDING (RELEASE 2)

As parameters are extracted from an incoming packet, they can be recorded in an unprocessed, converted, calibrated, or limit/expected state sensed format. The data is stored in a comma (or other) delimited ASCII file. This file can then be used in conjunction with a commercial software product such as Microsoft Excel[®] to analyze the data.

DATA RECORDING

As telemetry packets arrive they can be recorded. This recording feature stores the entire unprocessed packet (binary data) as soon as it arrives. The location of the "data recording files" is user specified. The unprocessed packets stored in these files can be "played back" at a later time (as soon as the file is closed). When the data is played back, it is given a special playback data mode to differentiate it from other incoming data such as real-time data or dump data. The data recording feature is useful for storing all incoming data for analysis and troubleshooting purposes.

DATA FORWARDING

As telemetry packets arrive they can be forwarded to one or more computers using UDP or TCP (TCP will be supported in Release 2). The unprocessed packets can be forwarded to one or more unicast or multicast addresses. When the machine has multiple network cards, the user can specify what network card to use when forwarding data.

DATA MONITORING

As incoming telemetry packets are processed, the individual parameters in the packet can be

monitored for limit/expected state violations. Monitoring can be performed for one or more parameters. (This feature can be used only if TReK is processing the packet). If monitoring has been turned on for a parameter and the parameter arrives out of range or not in an expected state, a user-defined text message is generated and displayed in a window. Monitoring services can be turned on and off on a parameter basis.

DATA DISPLAY

As incoming telemetry packets are processed, the processed parameters can be displayed. A parameter's unprocessed, converted, or calibrated value can be displayed (or any combination thereof). The information displayed can also indicate limit/expected state sensing information. The parameter values are arranged in a text format in a user-defined order. The display can be customized using font and color properties. While this is a simplistic data display tool, it can be useful when it is necessary to generate a display very quickly and can be helpful with data analysis and troubleshooting.

DATA PLAYBACK

Once incoming data has been recorded using the data recording feature, the data can be played back. Data recording files are named according to content. For example, each file has a base filename (a meaningful name to identify what data resides in the file) and a start time and a stop time to indicate the time associated with the data stored in the file. The timestamp used can be a TReK Receipt Time (the GMT corresponding to the time the data arrived at the TReK system) or a Spacecraft Time (the time the data was generated on-board the ISS). When configuring the Telemetry Processing application to perform a playback, the user indicates what segment of data should be played back using the start time and stop time. All the data can be played back, or just a segment of the data can be played back. Additionally, all other services are available. The data can be processed, recorded (again), or forwarded to other computers. The playback feature is useful for analyzing data or troubleshooting.

Since most data arrives via the user datagram protocol, it is possible for data to arrive out of order. When data is played back, the user can specify to re-order the data so it is played back in the correct order based on the data's timestamp. (Release 2)

As mentioned earlier, it is possible to receive real-time data and dump data simultaneously. The data playback service provides a way to play this data back at the same time and merge the two data streams. This provides a way to re-create the data stream as it was output by the payload on-board the ISS. When this merge is performed, there may be duplicate packets. For example, when data is recorded on-board the ISS, recording often starts while real-time data is still being transmitted. Therefore the same packet may be downlinked twice, once in a real-time stream and once in a dump stream. If TReK is recording the real-time stream and the dump stream this means the same packet will appear in the real-time data recording files and the dump data recording files. The data playback service provides a way to handle this situation. When specifying a playback that contains both real-time data and dump data the user can specify to remove duplicates. This provides a way to merge the real-time stream and the dump stream and to avoid playing back a duplicate packet that was stored in both sets of recording files.

PARAMETER EXTRACTION (RELEASE 2)

While the playback service provides a way to play back the entire packet, parameter extraction provides a way to retrieve individual parameters from one or more data recording files. When specifying which parameters to retrieve, the user can also specify whether the values should be unprocessed, converted, or calibrated values. Limit/expected state sensed information can also be requested. Once the parameters are retrieved from the data recording files, they are placed in a comma (or other) delimited ASCII file. This file can then be used with a commercial software product such as Microsoft Excel[®] to analyze the data.

TELEMETRY PACKET VIEWING (RELEASE 2)

Telemetry Packet viewing is available for all types of telemetry packets. This capability provides a way to view the contents of an incoming packet in a text/hexadecimal format

TELEMETRY PROCESSING STATISTICS

Telemetry Statistics are collected and made available for viewing. The statistics cover a variety of information including the number of packets received, the number of packets recorded, the maximum packet rate, and the number of

sequence errors that occurred.

TELEMETRY DATABASE APPLICATION

The Telemetry Database application is a front-end for the TReK Telemetry Database. The TReK Telemetry Database is a Microsoft Access[®] database that contains packet definitions and other information about how to process incoming data. Packet definitions can be downloaded from the POIC and imported into the Telemetry Database. This includes PDSS Payload packet definitions and GSE Packet definitions. Database information can be viewed and modified using the Telemetry Database application or Microsoft Access[®].

TELEMETRY APPLICATION PROGRAMMING INTERFACE

The Telemetry Application Programming Interface (API) is a dynamic link library that contains over 70 ANSI C functions. This library can be linked into a commercial software product and used to retrieve telemetry data in a variety of ways. For example, there are functions to retrieve an entire packet and functions to retrieve individual parameters extracted from a packet. When retrieving an individual parameter, the value can be retrieved unprocessed, converted, or calibrated. Limit/expected state sensing information can also be retrieved. The API provides two types of retrieval mechanisms: polling and signaling. Users can retrieve data by polling at a user-defined rate or can request to be signaled when data arrives.

The API is important because it provides flexibility. Since it can be linked into any commercial software product that supports an ANSI C interface, it is possible to use the API with a variety of commercial software products such as Microsoft Visual C++[®], Microsoft Visual Basic[®], Borland C++[®], and Labview[®]. By using this library it is possible to create user-developed software programs that access telemetry data being processed by TReK. This provides an easy way to create custom telemetry displays and other programs that perform data manipulation.

COMMAND SOFTWARE (RELEASE 2)

The TReK command software (shown in Figure 6) is a mirror image of the telemetry software. It is comprised of three applications and one library: Command Trainer, Command Processing,

Command Database, and the Command API.

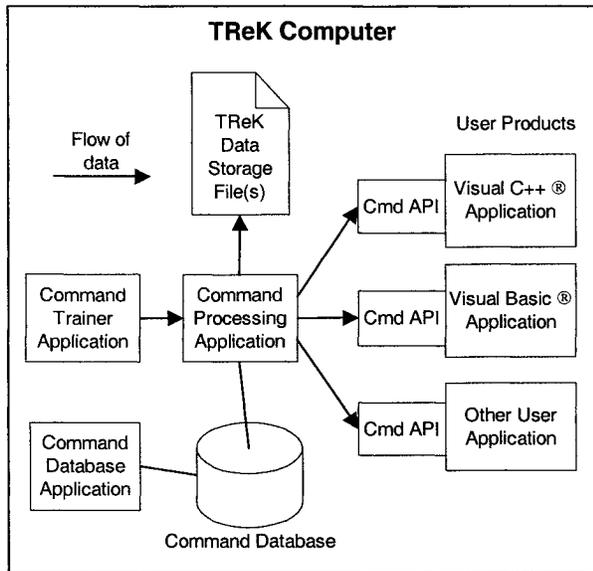


Figure 6 TReK Command Software

COMMAND TRAINER

The Command Trainer application is a training tool. It is used to simulate command services provided by the POIC or a Suitcase Simulator. This is useful when you are learning how to use the TReK software.

COMMAND PROCESSING

The Command Processing application is used to configure and control all TReK command services. This application can be used to create a command session with a particular destination such as the POIC or a Suitcase Simulator. A user can establish multiple command sessions to be used simultaneously. Once a command session is established, any of the services available for that specific type of command session (destination) can be used. Services will differ based on the destination. For example, when a command is sent to the POIC one or more command responses will be returned. When a command is sent to the Suitcase Simulator no command responses will be returned since the Suitcase Simulator does not generate command responses. Each of the capabilities described below will provide more information about the differences between the POIC and the Suitcase Simulator.

STATUS AND CONFIGURATION INFORMATION

When a command connection is established with

the POIC, the POIC returns three types of information: status information (e.g. POIC command system enabled/disabled status), configuration information (e.g. number of command retries), and a list of the commands that correspond to the POIC user ID that was used to establish the connection. This information is available through the Command Processing application and the Command API. The Suitcase Simulator does not provide any type of status or configuration information.

REMOTELY INITIATED COMMANDS

Remotely Initiated Commands can be sent from the Command Processing application or through the Command API. This capability is only available for POIC command sessions. When a remotely initiated command is sent, the POIC uses information in the POIC command database to generate a binary uplink pattern for the command. Therefore, it is important to ensure that the command data stored in the POIC database is correct. Once the command uplink pattern is generated it is sent to the Space Station Control Center for uplink.

COMMAND UPDATES

The TReK command software supports two types of command updates: local updates and POIC updates. If a command definition resides in the local TReK command database, a command update can be performed to update the contents of the command. Additionally, the POIC provides a remote service to update the contents of a command that resides in the POIC command database. Both types of updates can be made from the Command Processing application or the Command API.

COMMAND RESPONSES

The POIC generates six types of command responses. When the POIC receives a command from a remote site, one or more of these responses are generated and sent back to the remote site. The TReK command software processes these responses as they are received. Each individual response is available through the Command Processing application and the Command API.

COMMAND TRACKING

The TReK command software tracks all commands that it sends (regardless of destination). Command track information includes the name of the command, the time the command

was sent, and information about the number and type of command responses received for that command. Command track information can be sorted and filtered based on any of the criteria just described.

COMMAND SESSION VIEWING

Command Session viewing is available for both POIC and Suitcase Simulator destinations. This capability provides a way to view all communication that occurs between TReK and a specific destination. The output provides a transcript of the command data (commands, responses, etc.) that is exchanged during a command session.

COMMAND SESSION RECORDING

Command Session recording is available for both POIC and Suitcase Simulator destinations. This capability provides a way to record all communication that occurs between TReK and the destination. This data is stored in one or more files in a binary format. Each filename is composed of a base name, a start time, and a stop time. These files can be searched based on a specific time segment and the data can then be viewed in a text/hexadecimal format. This output provides a transcript of the command data (commands, responses, etc.) that was exchanged during a particular timeframe.

COMMAND STATISTICS

Command processing statistics are collected and made available for viewing. These statistics provide information about the number of commands sent and the number of responses received.

COMMAND DATABASE APPLICATION

The Command Database application is a front-end to the TReK Command Database. The TReK Command Database is a Microsoft Access® database that contains command definitions and other information needed to support commanding. Command data can be downloaded from the POIC and imported into the TReK Command Database. It can also be entered using the Command Database application or Microsoft Access®.

COMMAND APPLICATION PROGRAMMING INTERFACE

The Command API is a dynamic linked library that contains ANSI C functions for performing command functions. The Command API provides a software interface to perform many of the

functions provided through the Command Processing application. For example, the Command API can be used to retrieve status and configuration information for a POIC command session, send a remotely initiated command request to the POIC, update a command that resides in the local TReK database, or update a command that resides in the POIC command database. In addition to these functions, the API can also be used to send remotely generated commands. Unlike remotely initiated commands, remotely generated commands are commands that are built by the remote site and then sent to a destination. This type of command request is supported by the POIC and is the only type of command request supported by the Suitcase Simulator. The TReK command software provides three different ways to work with remotely generated commands: (1) TReK generates the complete bit-pattern for the command, (2) TReK generates the header portion of the command and the data zone is provided by a user-developed software program, (3) A user developed software program generates the complete bit-pattern for the command (header and data zone). In option 1, the TReK software uses the command data that resides in the local TReK command database to generate the bit-pattern for the command. This will include the header and the data zone. This bit-pattern will then be sent to the POIC. In option 2, the TReK software uses local command data that resides in the local TReK database to generate the command header, but the data zone portion of the command is passed in from a user-developed software program. In option 3, the user-developed software program generates the command's complete bit-pattern (header and data zone) and the TReK software just passes this on to the POIC without any further processing. If option 3 is used, it is not necessary to store any information about the command in the local TReK command database.

COMBINING THE TELEMETRY AND COMMAND API LIBRARIES

The Telemetry API and the Command API can be combined and used in a single user-developed program to perform both telemetry and command functions.

PERFORMANCE AND DATA RATES

TReK performance is based on many different factors including processor speed, the amount of memory available, the number of data packets ingested simultaneously, whether the packets

ingested are also processed, the number of other processes running on the machine, etc. The data rates that can be supported by a TReK system must be quantified with respect to these variables. It is not sufficient to state that a TReK System can support a 5Mbit/sec data rate. This value is meaningless unless it is qualified with information about the other variables listed above. Therefore, a suite of tests have been developed that take these considerations into account. These tests have been run using various hardware and software configurations. The configurations and corresponding performance data are available on the TReK Web Site.

CUSTOMER SUPPORT

The TReK development team provides customer support in a variety of ways: TReK Web Site, Beta Software Testing Program, Training Classes, TReK Help Desk, and TReK E-Mail Support.

TREK WEB SITE

The TReK Web Site is an important resource for TReK users. It contains information about the TReK schedule, the content of each TReK release, frequently asked questions, hardware and software requirements, and performance data. The web site is also used to distribute the TReK software (beta releases, operational releases, and patches). All TReK customers, both potential and existing customers, are highly encouraged to visit the TReK Web Site (<http://trek.msfc.nasa.gov>) for more detailed information about TReK.

BETA SOFTWARE TESTING PROGRAM

The Beta Software Testing Program was established to provide a way for potential and existing TReK customers to test drive the TReK software. This is the best way for customers located anywhere in the world to review and provide inputs on the software. Although this is called "beta" software, it is tested quite extensively before it is made available and is always accompanied by a complete set of documentation. One or more beta releases are made available in the time period leading up to an operational release. The beta program provides an opportunity for customers to interact directly with TReK developers, and to help guide the direction of the TReK product.

TRAINING CLASSES

The TReK development team provides TReK training classes on an as-needed basis. These classes are tailored to the need of the payload

team requesting the training. The classes can be organized as a one hour overview or an in-depth all day training class.

TREK HELP DESK

The TReK Help Desk is available during normal business hours and provides technical support for the TReK software. During flight, payload teams are requested to contact the HOSC Help Desk for assistance since many operational issues are best fielded by the HOSC.

TREK E-MAIL SUPPORT

The TReK E-Mail Support Line provides a way for customers to e-mail in questions, requests for enhancements, comments, or problem reports about the TReK software. When an e-mail message is sent to the TReK e-mail support address, the message is sent to all developers on the TReK development team. This ensures a timely response by a knowledgeable team member.

CONCLUSION

The POIC provides command and telemetry capabilities that enable the remote user to perform their payload operations at their home site. In addition, the TReK software makes it even easier for the remote user as it provides freely available software to perform both the command and telemetry functions. For further information or questions regarding the POIC interfaces, please contact Catherine C. Lapenta (Cathy.Lapenta@msfc.nasa.gov). For further information or questions regarding the TReK software, please contact Michelle Schneider (Michelle.Schneider@msfc.nasa.gov).