Telescience Resource Kit (TReK)

TReK Review Package

April 30, 2014

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Background

Between 1997 and 2002, several versions of TReK software (TReK Release 1 – TReK Release 3) were developed and released into operation in support of the International Space Station program. This software was developed to run on Windows. In 2013, an Engineering Change Request was approved to provide TReK on Linux. The new cross platform version of TReK software is currently in work and will be deployed in phases during the 2014-2016 timeframe. This will include multiple beta releases that precede each incremental operational release. The TReK Beta Software Testing Program provides an opportunity for you to test drive the TReK software and provide feedback to improve the product, an opportunity to review TReK requirements and design, and early access to the TReK software.

The new TReK cross-platform software is composed of the TReK Toolkit, the TReK Desktop, and TReK Mobile.

TReK Toolkit

The TReK Toolkit is a suite of lightweight libraries and utility applications. It will include capabilities to access International Space Station payloads using standard network protocols and services, support for delay tolerant networking, and support for EXPRESS Payload to ISS C&DH System Ethernet interfaces. The TReK Toolkit is suitable for use on the ground and onboard ISS. The TReK Toolkit is a subset of the TReK Desktop.

TReK Desktop

TReK Desktop provides the complete set of TReK capabilities in a Windows and Linux environment. This includes existing capabilities and enhancements based on user requests and lessons learned.

TReK Mobile

TReK capabilities available in a mobile environment (Android & IOS). This is a new area that is expected to evolve over time. Work is in progress to evaluate possible architectures and gather an initial set of requirements.

Information About This Review

- Review Purpose
  - Provide an opportunity to review the TReK 4.0.0 Toolkit requirements and software.
  - Provide an opportunity to test drive a beta version of the TReK Toolkit software.

- Review Package Contents
  - TReK Requirements included at the end of this package.
  - TReK Software included in TReK 0.1.0 Beta Software Package.

- Review Time Period
  - RID Process: RIDs will be accepted between 04/30/14 and 05/16/2014.
  - TReK 0.1.0 Beta Software Review: 04/30/14 – 07/16/14.

For more information about TReK please visit the TReK Web Site: http://trek.msfc.nasa.gov.

TReK 4.0.0 (TReK Toolkit) Content

Software	Description
CFDP Application	Provides capabilities to perform file transfer functions using the CCSDS File Delivery Protocol (CFDP). This application has a graphical user interface.
CFDP Console Application	Provides capabilities to perform file transfer functions using the CCSDS File Delivery Protocol (CFDP). This application is a console application and is targeted for use onboard ISS. It was provided to serve two purposes: (1) a CFDP console application for customers to use right out of the box, and (2) an example program showing customers how to use the CFDP Library to perform common CFDP functions.
CFDP Library	Provides an application programming interface to perform file transfer functions using the CCSDS File Delivery Protocol (CFDP).
Device Services Library	Provides an application programming interface to perform functions such as creating sockets, sending data, receiving data, etc.. Includes support for Unicast, Multicast, TCP Listener, TCP Server, and TCP Client.
Data Library	Provides an application programming interface to create, populate, build, and decompose packets. Includes support for pre-defined and custom headers and packets.
HPEG Application	Provides access to HOSC Payload Ethernet Gateway (HPEG) services. This application has a graphical user interface. It provides the capability to log into the HOSC and request HPEG services. This includes selecting a ground node ID (if applicable), starting and stopping services, and enabling and disabling the HPEG Idle Check.
TReK Help Application	Provides integrated help for all TReK applications and libraries.

This is the first release of the TReK Toolkit. There will be additional releases that add more capabilities.

TReK Beta Software Testing Program

- The TReK Beta Software Testing Program:
  - Provides an opportunity for you to test drive the TReK software and provide feedback to improve the product.
    - Feedback is accepted throughout the entire Beta Software Testing time period.
    - You can send input via an e-mail to trek.help@nasa.gov.
    - All input is entered, assigned a number, and tracked to resolution.
    - TReK Development Team will correspond with you on any input received via trek.help@nasa.gov.
  - Provides an opportunity for you to review TReK requirements and design.
    - This includes the opportunity to input RIDs.
    - See RID process on the following chart.
    - RID Review Period is shorter than the TReK beta software testing period due to schedule constraints.
  - Provides early access to the TReK software.

Note: Due to ITAR requirements, a HOSC Portal Account with access to the TReK Software Download area is required to participate in the TReK Beta Software Testing Program.

RID Process

- RIDs will be accepted from all participants
- RIDs can be submitted to trek.help@nasa.gov
- RIDs will be accepted between 04/30/14 and 05/16/2014.
- RIDable Material
  - TReK Requirements included at the end of this package.
  - TReK Software Design included in TReK 0.1.0 Beta Software Package.
- RIDs will be accepted for:
  - Missing Requirement
  - Design Does Not Meet Requirement
  - Anything else – please send a comment to trek.help@nasa.gov.

Step	Description
1.	All RIDs will be entered, assigned a number, and tracked to resolution.
2.	Within approximately 3 weeks following the RID closure date, all RIDs are brought to a Review Board meeting in a RID disposition package.
3.	TReK Team coordinates closure of RID(s) with NASA Review Board Chair (as applicable).
4.	TReK Team will coordinate RID responses with RID originators.
5.	Signed off RIDs will be posted to the TReK Web Site (http://trek.msfc.nasa.gov).

TReK ERIS/HPEG Simulator

Background

- An ERIS/HPEG Simulator console application has been included in the package.
- This console application is intended as a simple utility application to assist in your review of the TReK HPEG application.
- It is not intended to be a true “simulation” of the POIC.
- It is not part of the TReK 4.0.0 review package.
- The TReK Desktop will contain one or more simulators to assist in learning how to use the TReK software.
- The TReK/ERIS Simulator is an interim solution.

How to Run the TREK ERIS/HPEG Simulator

- This program is not on the TReK menu. It is located in the installation in the “bin” directory.
- The TReK/ERIS Simulator is started using the following command line:
  - Windows> trek_eris_sim_console
  - Linux> start_trek_eris_sim_console.sh
- The TReK/ERIS Simulator should be started before “Activating” in the TReK HPEG application.
- The TReK/ERIS Simulator should be re-started prior to selecting “Activate” in the TReK HPEG application.

Device Requirements

- Core requirements
  - TReK shall provide the capability to create the following devices:
    - User Datagram Protocol (UDP) socket device.
    - Transmission Control Protocol (TCP) listener socket device.
    - TCP client socket device.
    - Multicast socket device.
    - Unix local client socket device (Linux Only).
  - TReK shall provide the capability to receive packets from a device.
  - TReK shall provide the capability to send packets to a device.
  - TReK shall provide the capability to delete a device.
  - TReK shall provide the capability to assemble packets from packet segments.
  - TReK shall provide the capability to receive messages from a device.
  - TReK shall provide the capability to record device messages to a log file.

Device Requirements

  - TReK shall provide the capability to identify the Internet Protocol (IP) addresses associated with the host platform.
  - TReK shall provide the capability to release all allocated device resources.

- Application Programming Interface Requirements
  - TReK shall provide an application programming interface to execute the TReK device core requirements.

Data Requirements

- Core requirements
  - TReK shall provide the capability to extract data from a packet.
  - TReK shall provide the capability to decode the following data types:
    - ASCII Strings of any length.
    - Two's complement integers from 2 to 64 bits inclusive.
    - Binary coded decimal from 1 to 4 digits inclusive.
    - Unsigned integers from 1 to 64 bits inclusive.
    - Sign and magnitude integers from 2 to 32 bits inclusive.
    - Boolean data of exactly one bit.
    - Distended signed integers of 16 or 32 bits.
    - IEEE floating point of 32 or 64 bits.
    - GPS Epoch Time (32-bit seconds since midnight 1980-01-06).
    - Enhanced HOSC System (EHS) time.
    - ISS Time (GPS epoch time with 8-bit fractional time).
    - FASTSAT Time (GPS epoch Time with 16-bit millisecond field).
    - DEM Time (GPS epoch Time with 10-bit millisecond field).
    - Unix system time (seconds since midnight 1970-01-01)

Data Requirements

- Core Requirements Continued
  - TReK shall provide the capability retrieve a parameter value as it appeared in the source data.
  - TReK shall provide the capability to retrieve a parameter's value.
  - TReK shall provide the capability to monitor a parameter's value for:
    - Values more than user defined limits
    - Values less than user defined limits
    - Values changing over user defines limits
  - TReK shall provide the capability to calibrate a parameter using:
    - Polynomial equation of any degree.
    - Linear interpolation.
  - TReK shall provide the capability to specify unique calibration code for parameter processing.
  - TReK shall provide the capability to enumerate unsigned integer values for data that is 1 to 32 bits inclusive.
  - TReK shall provide status about a parameter's value including:
    - Limit errors
    - Processing errors
    - Calibration errors

Data Requirements

- Core Requirements Continued
  - TReK shall provide the capability build a packet.
  - TReK shall provide the capability to encode the following data types:
    - ASCII Strings of any length.
    - Two's complement integers from 2 to 64 bits inclusive.
    - Binary coded decimal from 1 to 4 digits inclusive.
    - Unsigned integers from 1 to 64 bits inclusive.
    - Sign and magnitude integers from 2 to 32 bits inclusive.
    - Boolean data of exactly one bit.
    - Distended signed integers of 16 or 32 bits.
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    - ISS Time (GPS epoch time with 8-bit fractional time).
    - FASTSAT Time (GPS epoch Time with 16-bit millisecond field).
    - DEM Time (GPS epoch Time with 10-bit millisecond field).
    - Unix system time (seconds since midnight 1970-01-01)
  - TReK shall provide the capability to set a parameter's value.
  - TReK shall provide the capability to limit a parameter's allowed value range.
- Application Programming Interface Requirements
  - TReK shall provide an application programming interface to execute the TReK data core requirements.

File Transfer Requirements

- Core Requirements
  - TReK shall provide the capability to initiate a file put.
  - TReK shall provide the capability to initiate a file proxy put.
  - TReK shall provide the capability to receive a file from a remote CFDP node
  - TReK shall provide status for all in-progress file transfers.
  - TReK shall provide the capability to manage in-progress file transfers.
  - TReK shall provide the capability to retrieve all in-progress file transfers.
  - TReK shall provide the capability to define one or more remote entities.
  - TReK shall provide the capability to configure CFDP properties.
  - TReK shall provide the capability to retrieve CFDP properties.
  - TReK shall provide the capability to save file transfer configuration information.

- User Interface Requirements
  - TReK shall provide a graphical user interface to execute TReK core file transfer requirements.
  - TReK shall provide a console application to execute TReK core file transfer requirements.

- Application Programming Interface Requirements
  - TReK shall provide an application programming interface to execute the TReK file transfer core requirements.

HOSC Interface Requirements

- Core Requirements
  - TReK shall provide the capability to interface with the HOSC ERIS service as defined in the Payload to Generic Interface Definition Document SSP 50305 Volume 1 Section 7 Programmatic Environment Setup.
  - TReK shall provide the capability to interface with the HOSC HPEG service as defined in the Payload to Generic Interface Definition Document SSP 50305 Volume 2 Section 5 HOSC Payload Ethernet Gateway (HPEG) Services.

- User Interface Requirements
  - TReK shall provide a graphical user interface to interface with the HOSC ERIS service.
  - TReK shall provide a graphical user interface to interface with the HOSC HPEG service.