Telescience Resource Kit (TReK) Demonstration Payload

Science Symposium

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Background

- The Telescience Resource Kit (TReK) is a suite of software applications and libraries that can be used to monitor and control assets in space or on the ground.
    - It has been used as a ground system to monitor and control payloads on the International Space Station (ISS) since 2000.
    - It is now available for use onboard ISS as a generic flight software capability provided as a standard service.

- The latest version of TReK software is available for Windows and Linux.
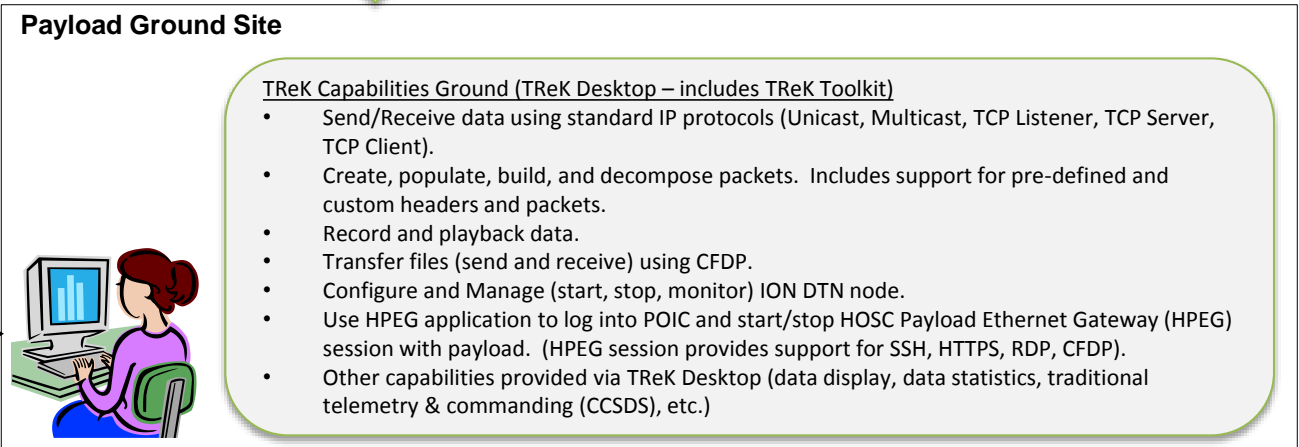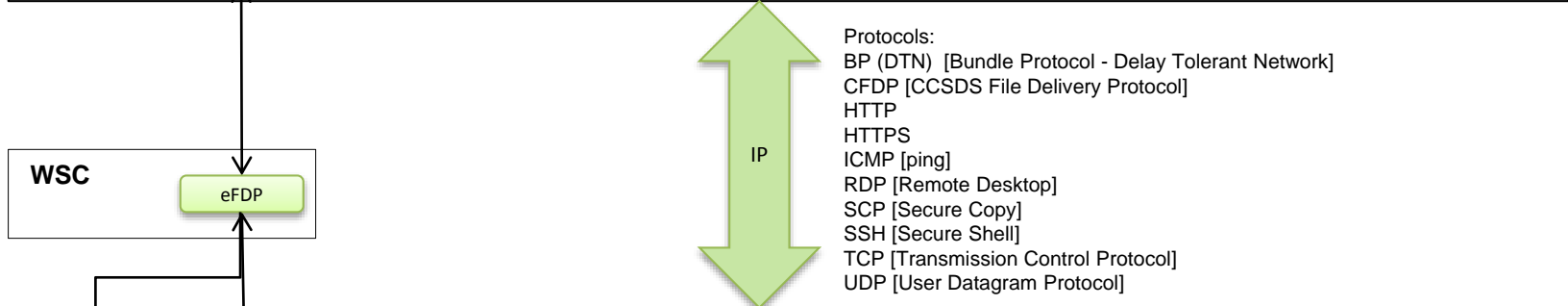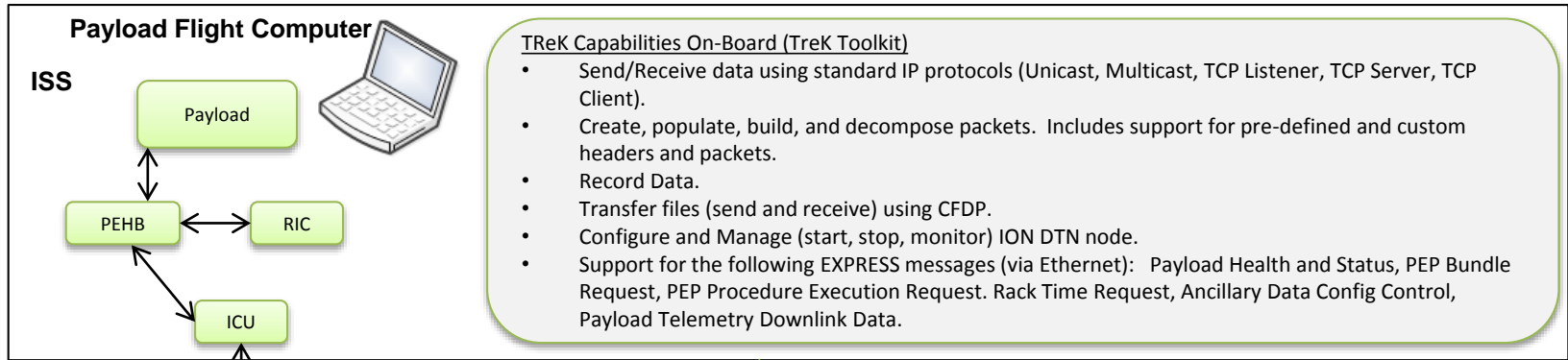
Flight Demonstration Purpose

- Demonstrate the TReK software running on-orbit on an ISS provided T61p laptop.

- Collect metrics for the IP protocols described in SSP 52050, and provide the capability to support live demonstrations during ISS Payload Conferences.

- Complete on-board verification for the TReK software so payloads using the software can leverage the verification.

- Provide the TReK Demonstration Payload as a training tool in the Huntsville Operations Support Center (HOSC) On Demand Test Environment for payloads seeking to experience operating with IP protocols.

Sponsor: Research Integration Office/Mary Beth Edeen

TReK Information

Payload Flight Computer

ISS

Payload

PEHB ↔ RIC

ICU

TReK Capabilities On-Board (TreK Toolkit)
- Send/Receive data using standard IP protocols (Unicast, Multicast, TCP Listener, TCP Server, TCP Client).
- Create, populate, build, and decompose packets. Includes support for pre-defined and custom headers and packets.
- Record Data.
- Transfer files (send and receive) using CFDP.
- Configure and Manage (start, stop, monitor) ION DTN node.
- Support for the following EXPRESS messages (via Ethernet): Payload Health and Status, PEP Bundle Request, PEP Procedure Execution Request. Rack Time Request, Ancillary Data Config Control, Payload Telemetry Downlink Data.

WSC

eFDP

IP

Protocols:
BP (DTN) [Bundle Protocol - Delay Tolerant Network]
CFDP [CCSDS File Delivery Protocol]
HTTP
HTTPS
ICMP [ping]
RDP [Remote Desktop]
SCP [Secure Copy]
SSH [Secure Shell]
TCP [Transmission Control Protocol]
UDP [User Datagram Protocol]

MCC

CDP

POIC

HPEG

PDSS

ePVT

Payload Ground Site

TReK Capabilities Ground (TReK Desktop – includes TReK Toolkit)
- Send/Receive data using standard IP protocols (Unicast, Multicast, TCP Listener, TCP Server, TCP Client).
- Create, populate, build, and decompose packets. Includes support for pre-defined and custom headers and packets.
- Record and playback data.
- Transfer files (send and receive) using CFDP.
- Configure and Manage (start, stop, monitor) ION DTN node.
- Use HPEG application to log into POIC and start/stop HOSC Payload Ethernet Gateway (HPEG) session with payload. (HPEG session provides support for SSH, HTTPS, RDP, CFDP).
- Other capabilities provided via TReK Desktop (data display, data statistics, traditional telemetry & commanding (CCSDS), etc.)

Operations Concept

- Operate for two 2 week periods during Inc 45/46 – separated by 1 month of calendar time
  - First week will focus on collecting IP Protocol metrics.
  - Second week will focus on exercising the TReK EXPRESS library*.
- Dependent on the Casablanca 2 (CB2) server being configured to support DTN, so estimating operations sometime early in 2016, pending CB2. Avionics community is aware of this dependency.
- Current Uplink Plan
  - Uplink the TReK Software to a SSC via Ops LAN
  - Crew transfers software to assigned laptop via USB and installs (Crew time for the T61p Laptop set up and software transfer is currently reserve time).
- Alternate Plan Under Consideration
  - Uplink the TReK Software to the Payloads Network Address Storage (NAS).
  - Install to assigned laptop using PXE Boot.
- After hardware configuration and software load, ops are via ground.
- *Keep Hard Drive assignment to avoid crew time for software load to support 2nd benchmark testing and future demonstrations.*

Activity	Target Timeframe	Description
Benchmark Metrics	On-Orbit + 2 Weeks	Benchmark Metrics (Round 1)
Benchmark Metrics	On-Orbit + 6 Weeks	Benchmark Metrics (Round 2)
Live Demonstrations	As Needed	Driven by ISS Payload Conferences

* Note: A CEF to expand the testing to include the EXPRESS Rack interfaces submitted the week of July 13.

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