

TREK

HOSC Payload Ethernet Gateway (HPEG)

TUTORIAL



February 2015

Approved for Public Release; Distribution is Unlimited.

TABLE OF CONTENTS

| <u>PARAGRAPH</u> | <u>PAGE</u> |
|--|-------------|
| 1 Welcome..... | 1 |
| 1.1 System Requirements..... | 1 |
| 2 Technical Support..... | 1 |
| 3 Introduction..... | 2 |
| 4 Overview of the User Interface..... | 3 |
| 4.1 Main Window | 3 |
| 4.2 Toolbars | 4 |
| 4.2.1 <i>Configuration Toolbar</i> | 5 |
| 4.2.2 <i>HPEG Toolbar</i> | 5 |
| 4.2.3 <i>Ground Node ID Toolbar</i> | 6 |
| 5 TReK HPEG Tour | 6 |
| 5.1 How to Activate the HPEG Service and Obtain a Proxy IP Address | 8 |

FIGURES

| <u>FIGURE</u> | <u>PAGE</u> |
|---|-------------|
| Figure 1 TReK/POIC Communication | 2 |
| Figure 2 Standard IP Communication | 3 |
| Figure 3 Main Window | 3 |
| Figure 4 Configuration Toolbar..... | 5 |
| Figure 5 HPEG Toolbar..... | 5 |
| Figure 6 HPEG Toolbar Populated..... | 6 |
| Figure 7 Ground Node ID Toolbar | 6 |
| Figure 8 Ground Node ID Toolbar with DTN Configuration Information..... | 6 |
| Figure 9 Tutorial Configuration | 8 |
| Figure 10 trek_eris_sim_console missing config file | 9 |
| Figure 11 trek_eris_sim_console ready message..... | 10 |
| Figure 12 HPEG Main Window | 10 |
| Figure 13 ERIS Configuration Dialog..... | 11 |
| Figure 14 Configuration Status..... | 12 |
| Figure 15 HPEG Active..... | 13 |
| Figure 16 Active Destination..... | 14 |
| Figure 17 Inactive Destination after Stop Session..... | 15 |
| Figure 18 HPEG Deactivated | 15 |

1 Welcome

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. The TReK HPEG application provides the capability to access the Huntsville Operations Support Center (HOSC) Payload Ethernet Gateway (HPEG) service.

This tutorial provides step-by-step instructions describing how to perform common application functions.

This tutorial uses screen dumps taken on a Windows computer. However, the steps are the same regardless of whether you are running on Windows or Linux.

1.1 System Requirements

Windows 7, Red Hat Enterprise Linux 6.x.

2 Technical Support

If you are having trouble installing the TReK software or using any of the TReK software applications, please try the following suggestions:

Read the corresponding material in the manual and/or on-line help.

Ensure that you are correctly following all instructions.

Checkout the TReK Web site at <http://trek.msfc.nasa.gov/> for Frequently Asked Questions.

If you are still unable to resolve your difficulty, please contact us for technical assistance:

TReK Help Desk E-Mail, Phone & Fax:

| | |
|------------|--|
| E-Mail: | trek.help@nasa.gov |
| Telephone: | 256-544-3521 (7:00 a.m. - 3:30 p.m. Central Time) |
| Fax: | 256-544-9353 |

TReK Help Desk hours are 7:00 a.m. – 3:30 p.m. Central Time Monday through Friday. If you call the TReK Help Desk and you get a recording please leave a message and someone will return your call. E-mail is the preferred contact method for help. The e-mail message is automatically forwarded to the TReK developers and helps cut the response time.

3 Introduction

The TReK HPEG application provides the capability to access the Huntsville Operations Support Center (HOSC) Payload Ethernet Gateway (HPEG) service. The HPEG service provides access to payloads onboard the International Space Station (ISS) using standard network protocols and services. Services supported include:

- Ping over ICMP
- Hypertext Transfer Protocol Secure (https) over TCP on port 443
- Remote Desktop (rdp) over TCP on port 3389
- Secure Shell (ssh) over TCP on port 22
- CCSDS File Delivery Protocol (CFDP) over UDP on port 4560
- Delay Tolerant Network (dtn) over TCP on a configured port

Note: In the event this list does not match the Payload to Generic User Interface Definition Document (PGUIDD) SSP 50305, the information in the PGUIDD takes precedent.

Access to these services is based on HOSC account privileges.

The general sequence of events when using HPEG is as follows:

- Establish VPN session with HOSC.
- Start the TReK HPEG application.
- Push the Configure button to configure the application.
- Push the Activate button to activate the HPEG service.
- During activation you will be prompted to log into your HOSC account.
- Once the HPEG service is active, start a session with your destination (payload). A Proxy IP Address will be returned.
- Use the Proxy IP address returned to communicate with your payload using other products such as the TReK CFDP application, Remote Desktop, a console command line to ssh, etc.
- When finished Deactivate and Exit.

Interfaces between TReK and the HOSC are shown in Figure 1. An initial interface is established to login and a second interface is established for HPEG communication (starting and stopping sessions, etc.).

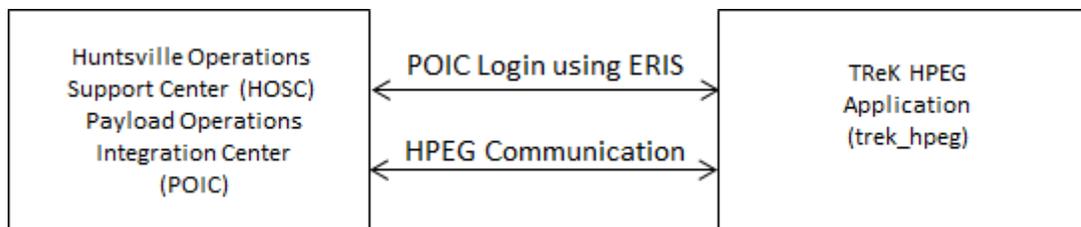


Figure 1 TReK/POIC Communication

Figure 2 shows the standard IP communication that is possible between ground applications and flight applications once HPEG services have been started.



Figure 2 Standard IP Communication

4 Overview of the User Interface

4.1 Main Window

The main window is shown in Figure 3. The Message area is a dock window that you can float or dock. To float a dock window, use your left mouse button to click and hold the title area while dragging the window to another area of the screen. To dock, use the title bar to drag the dock window over the main window and drop.

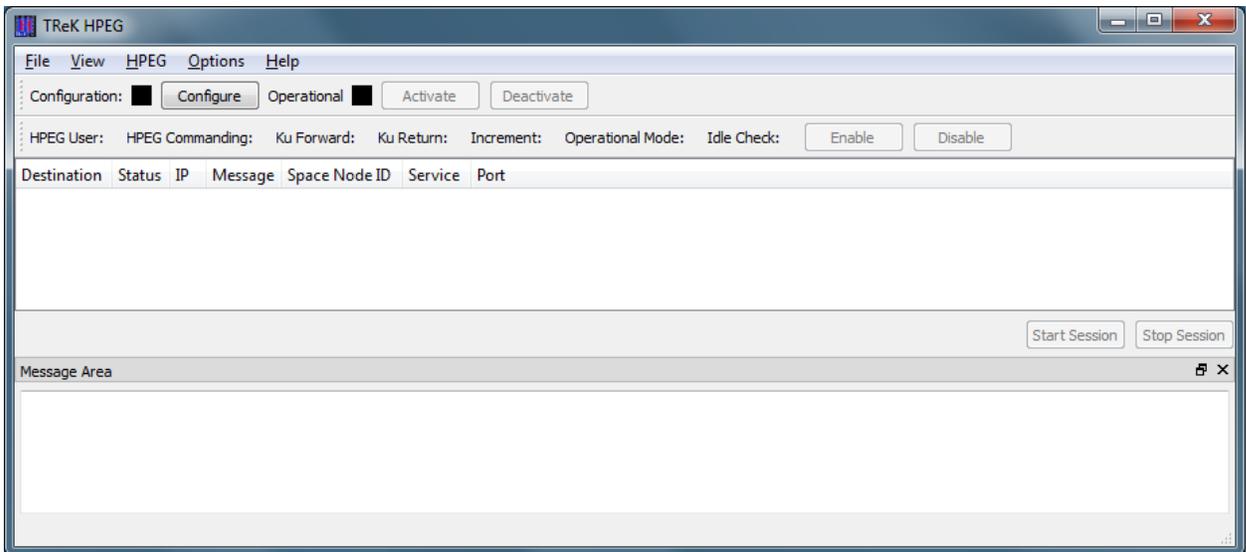


Figure 3 Main Window

Configuration Toolbar

The Configuration toolbar at the top of the window provides quick access to configure the application, activate, and deactivate the HPEG service.

HPEG Toolbar

The HPEG toolbar (located under the Configuration toolbar) provides quick access to HPEG Status and Configuration information. It also provides the capability to Enable and Disable the HPEG Idle Check capability.

Ground Node ID Toolbar

The Ground Node ID Toolbar (located under the HPEG toolbar when displayed) provides quick access to the Ground Node ID. If you do not have a Ground Node ID assigned, this toolbar will not be displayed. The Ground Node ID toolbar is only displayed when the HPEG service is active and a Ground Node ID is in use. This toolbar will also display Delay Tolerant Network information if you have access to this service.

HPEG

The HPEG area provides a list of “Destinations” onboard ISS you are authorized to access through the HPEG. Typically you will have one destination in the list – your payload. The HPEG area also provides “Start Session” and “Stop Session” buttons to start and stop an HPEG session for a selected destination. Once you activate the HPEG service, and you have a destination in your list, you will be able to see the specific services authorized for use with that destination (e.g. ping, ssh, cfdp). If you are authorized to use the CFDP service or the DTN service, you will be assigned a Ground Node ID, and your payload onboard will be assigned a Space Node ID. These IDs correspond to CFDP Entity IDs (EIDs) needed by the CFDP protocol and the DTN node number when using DTN. If you are authorized to use the CFDP service or DTN service, you will be prompted to select your Ground Node ID during HPEG activation. It is possible to have more than one Ground Node ID assigned. In this case you will be prompted with a list and can select the Ground Node ID you would like to use for the session. If you are not authorized to use the CFDP service or the DTN service, you will not be prompted for a Ground Node ID and the Space Node ID field will always be empty.

If you are authorized to use the CFDP service or DTN service, you must select a Ground Node ID when prompted. If you select a Ground Node ID that is in use, you will be prompted again. If all Ground Node IDs are in use, you will need to free one of the Ground Node IDs so you can select one that is available or cancel the activation.

Message Area

The Message Area displays important information, warning and error messages. The message area can be cleared using the View menu.

4.2 Toolbars

There are three toolbars: Configuration, HPEG and Ground Node ID. The Configuration toolbar provides visual information about the state of the application and provides access to common application functions. The HPEG toolbar provides HPEG Configuration and Status information. The Ground Node ID toolbar provides access to the Ground Node ID

selected during activation and DTN configuration information if you are authorized to use the DTN service.

4.2.1 Configuration Toolbar

The Configuration toolbar is shown in Figure 4. It can be used to configure the application, activate the HPEG service, and deactivate the HPEG service.



Figure 4 Configuration Toolbar

Configuration Status

When the Configuration status is black, this indicates the application has not been configured. When the Configuration status is green, this indicates the application has been configured and the HPEG service can be activated.

Use the Configure button to access the Configuration dialog to configure the application.

Operational Status

When the Operational status is black, this indicates the HPEG service is inactive. When the Operational status is purple, activation is in progress. When the Operational status is green, this indicates the HPEG service is active. The application must be properly configured before the Activate button will be available. The HPEG service must be active before the Deactivate button will be available.

Use the Activate button to activate the HPEG service. This will initiate all internal activities needed to prepare the application to support the HPEG service. If you need to reconfigure the HPEG application, deactivate the HPEG service, and then push the Configure button to reconfigure.

4.2.2 HPEG Toolbar

The HPEG toolbar is shown in Figure 5 and Figure 6. When the HPEG service is Inactive, the HPEG Toolbar will not contain any HPEG Status and Configuration information. When the HPEG service is activated, the HPEG Toolbar will display HPEG Status and Configuration information. The HPEG Toolbar also provides the capability to Enable and Disable the HPEG Idle Check. This feature is only available when the HPEG service is active.



Figure 5 HPEG Toolbar

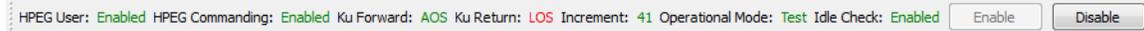


Figure 6 HPEG Toolbar Populated

4.2.3 Ground Node ID Toolbar

The Ground Node ID Toolbar is shown in Figure 7. This toolbar provides quick access to the Ground Node ID. If you do not have a Ground Node ID assigned, this toolbar will not be displayed. The Ground Node ID toolbar is only displayed when the HPEG service is active and a Ground Node ID is in use. If you are authorized to use the DTN service, the Ground Node ID Toolbar will also display DTN configuration information as shown in Figure 8.

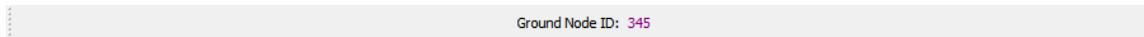


Figure 7 Ground Node ID Toolbar



Figure 8 Ground Node ID Toolbar with DTN Configuration Information

5 TReK HPEG Tour

Sometimes it's easier to learn how to use an application by example. This section describes how to activate the HPEG service and obtain a proxy IP address.

This section was written assuming that you have read the Introduction section and the Main Window section. If you have not read these sections, please go back and read them. They contain important information that is not repeated in this section.

If you have a firewall enabled on your computer, you may need to turn it off or allow traffic through for the ports and protocols used in this example.

Please go through the tour in order. Some sections depend on data from previous sections.

How to Activate the HPEG Service and Obtain a Proxy IP Address

5.1 How to Activate the HPEG Service and Obtain a Proxy IP Address

The following steps describe the minimum necessary to activate the HPEG service and obtain a proxy IP address. These steps require launching the TReK ERIS Simulation Console application and the TReK HPEG application. Normally the TReK HPEG application communicates with the Huntsville Operations Support Center. But for training purposes, the TReK ERIS Simulation Console application has been provided to play the part of the HOSC. The configuration that will be used is shown in Figure 9.

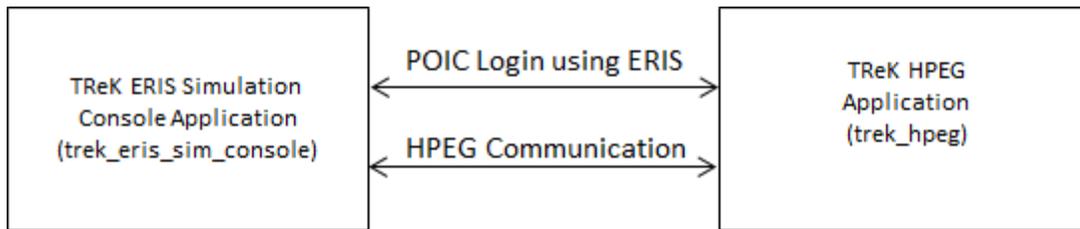


Figure 9 Tutorial Configuration

Note: VPN is required when logging into the HOSC. It is not required for the TReK ERIS Simulation console application.

Step-By-Step

1. First start the `trek_eris_sim_console.exe` application. To do this, open a command prompt (console window) and navigate to the TReK installation bin directory (normally located under `C:\Program Files (x86)\TReK x.x.x\bin`) on Windows and `/usr/trek-x.x.x/bin` on Linux). In the command prompt (console window) type the following:

```
> trek_eris_sim_console (Windows)
```

```
>start_trek_eris_sim_console.sh (Linux)
```

Note: On Linux, always start a trek executable using the `start_trek_<name>` script. The script sets environment variables needed for the executable to run correctly.

If this is the first time you have run `trek_eris_sim_console` you will see the following message:

```

ca. Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\kirk>cd %TREKROOT%
C:\Program Files (x86)\TReK 4.0.0>cd bin
C:\Program Files (x86)\TReK 4.0.0\bin>trek_eris_sim_console.exe
*****
Could not find the eris_sim_properties.xml file in your home directory:
C:\Users\kirk
Please copy the eris_sim_properties.xml file from the TReK installation
config directory:
C:\Program Files (x86)\TReK 4.0.0\config
* You will need to edit the copied file to change the "Local IP Address"
* value from 127.0.0.1 to the IP address you want to use for the simulator.
*****
C:\Program Files (x86)\TReK 4.0.0\bin>_

```

Figure 10 trek_eris_sim_console missing config file

The trek_eris_sim_console application reads a configuration file (eris_sim_properties.xml) during application initialization. This configuration file must be located in your home directory. Follow the instructions and copy the eris_sim_properties.xml file to your home directory (normally C:\Users\

2. Start the trek_eris_sim_console application and you should see a window similar to the one shown in Figure 11 with the message: “ERIS Simulator is ready to use. Type in command below (help is a good place to start)...”. This indicates the simulator is ready. This is all you need to do with this application. You can minimize this window if you would like.

```

ca. Command Prompt - trek_eris_sim_console.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\kirk>cd %TREKROOT%
C:\Program Files (x86)\TReK 4.0.0>cd bin
C:\Program Files (x86)\TReK 4.0.0\bin>trek_eris_sim_console.exe
ERIS Simulator is ready to use. Type in command below (help is a good place to
start)...
> _

```

Figure 11 trek_eris_sim_console ready message

3. If you haven't started the HPEG Application, use the operating system's menu to start the application. You should see the HPEG main window shown in Figure 12.

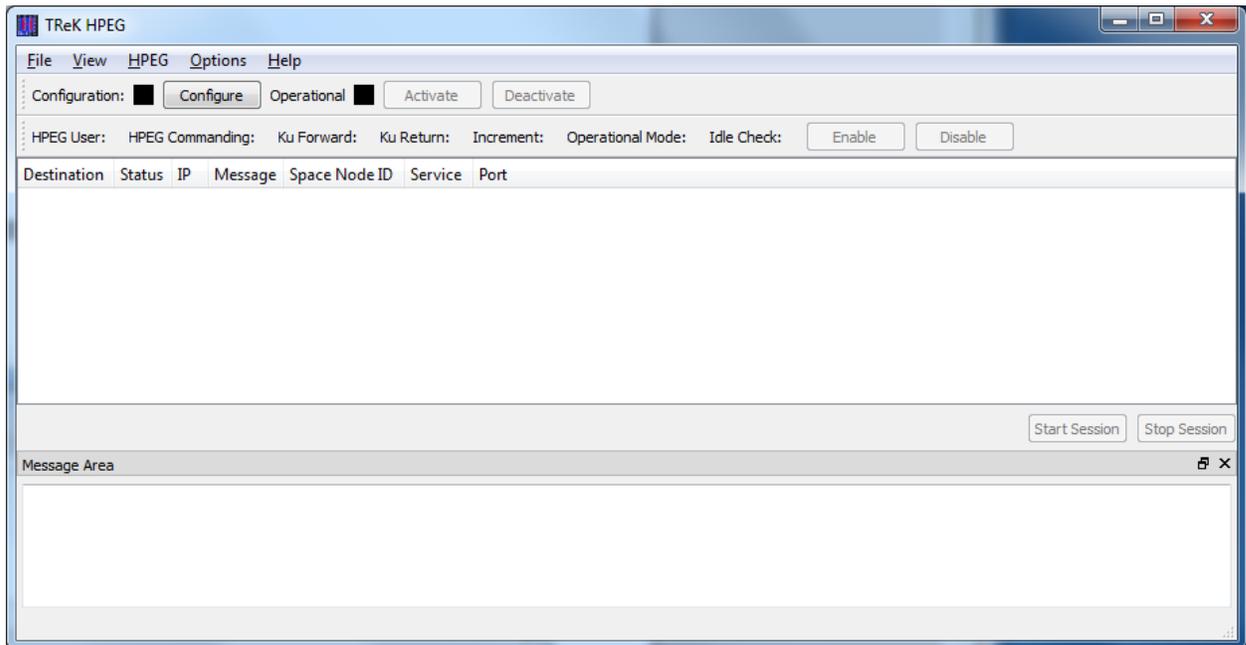


Figure 12 HPEG Main Window

4. In the main window configuration toolbar, push the Configure button. You should see the ERIS Configuration dialog shown in Figure 13.

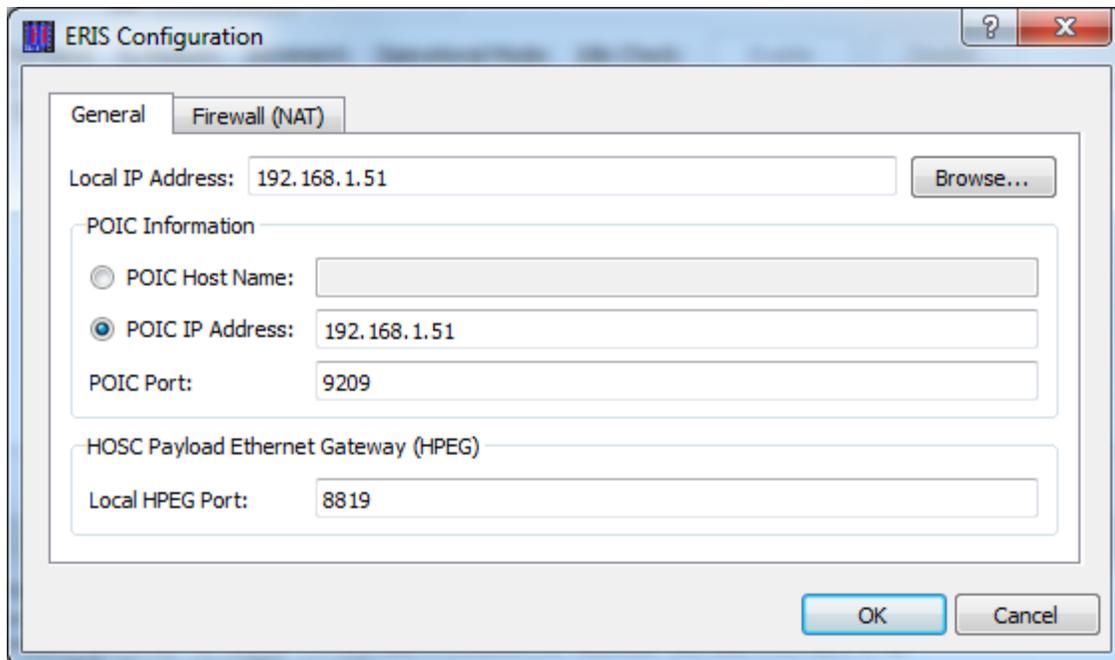


Figure 13 ERIS Configuration Dialog

5. In the ERIS Configuration dialog verify the Local IP Address is correct. Make sure the POIC IP Address is also set to your local IP address. The POIC is being simulated by the TReK ERIS Simulation console application which is running on your computer and using the local IP address. Push the OK button to save the settings and close the dialog.
6. If the application is configured correctly, the Configuration status in the main window will be green as shown in Figure 14. If you do not see green, the most likely problem is the local IP address. Verify that you have entered a valid local IP address for your computer.

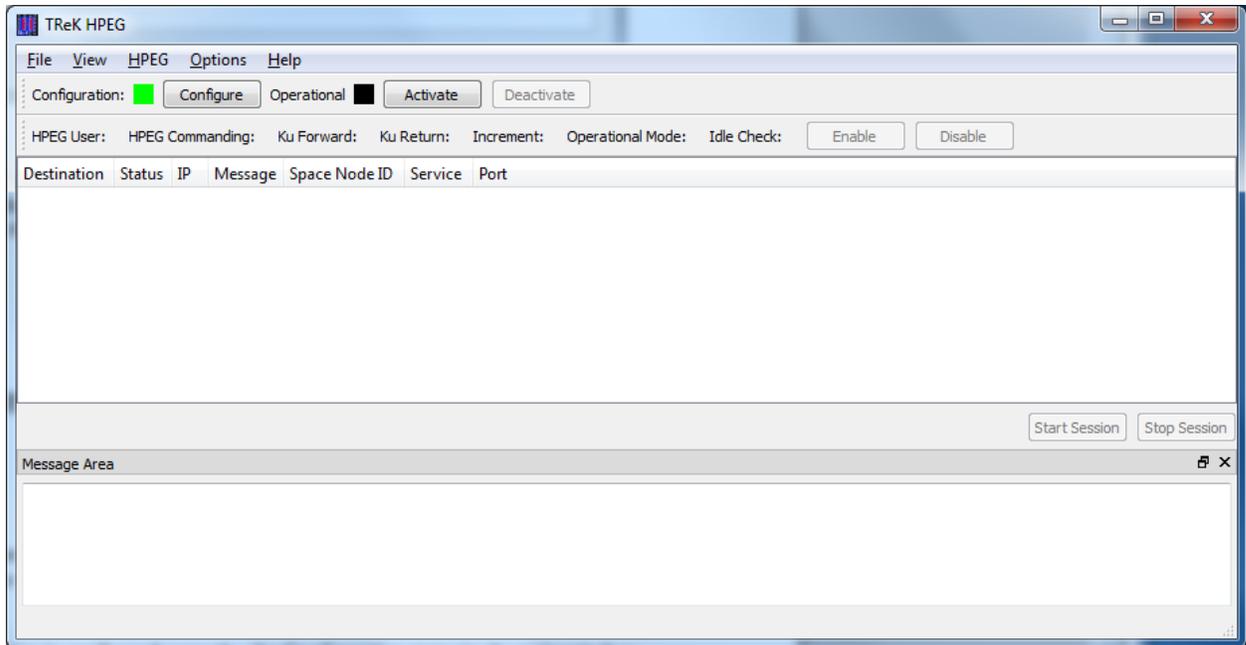


Figure 14 Configuration Status

- Next you will push the Activate button in the main window configuration toolbar. **Please finish reading step 7 before you push the button.** When you activate you will be prompted with a series of dialogs requesting POIC login information. Enter (select) the following information:

| | |
|-----------------|------------------------------|
| Warning Banner: | Push the OK Button to Accept |
| Username: | a |
| Password: | b |
| Passcode: | 12345678 |
| Role: | Dinner |
| MOP: | ISS:7A1:Flight |
| Ground Node ID: | 345 |

Ground Node ID Note

The Ground Node ID is a unique ID assigned to a ground node. If you requested to use the CFDP service or the DTN service in your Payload Integration Agreement, you will be prompted to select a Ground Node ID during the activation sequence. If you did not request the CFDP service or the DTN service you will not have a ground node ID and you will not be prompted.

Important Note: If the login fails (due to a typing mistake, cancelling out of a dialog, etc.) you must restart the `trek_eris_sim_console` program. If this happens: no worries. Just restart the `trek_eris_sim_console` program and then push the 'Activate' button in the TReK HPEG application to try again. You must restart the console application each time you 'Activate' the HPEG service in the TReK HPEG application.

If activation is successful, your main window should look like the one shown in Figure 15. The Operational Status will be green and there will be two destinations listed in the Destination list. Note the HPEG toolbar. It is now populated with Configuration and Status information such as HPEG Commanding status, Ku Forward status, and Ku Return status. The Space Node ID column for the ‘SomewhereOverTheRainbow’ destination contains 2001. The Space Node ID is a unique ID assigned to the payload onboard. It is used with the CFDP service and the DTN service. If you requested to use CFDP or DTN in your Payload Integration Agreement, you will see a Space Node ID. If you did not request CFDP or DTN, the Space Node ID field will be empty. If you selected a Ground Node ID, you will see the Ground Node ID toolbar with your selection. If you were authorized to use the DTN service, the Ground Node ID toolbar would also show DTN configuration information.

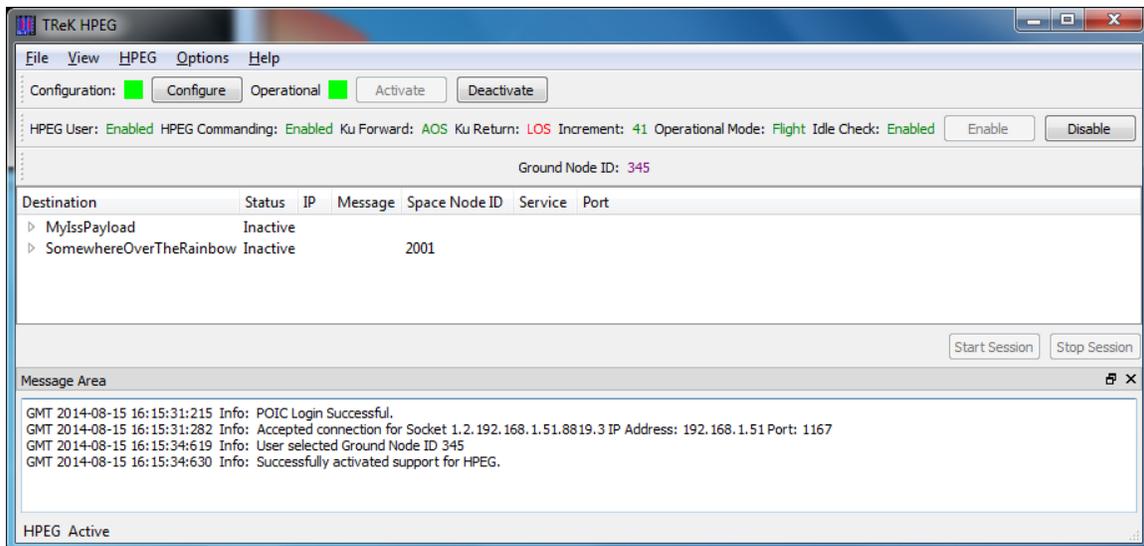


Figure 15 HPEG Active

8. All the destinations show a status of Inactive. It’s time to start a session with a destination. Select the ‘MyIssPayload’ destination. The ‘Start Session’ button will be available. Push the ‘Start Session’ button. The main window should look like the one shown in Figure 16. The ‘MyIssPayload’ status will show ‘Active’, you will see an IP address in the IP column, and the Message column will indicate the session was successfully initialized.

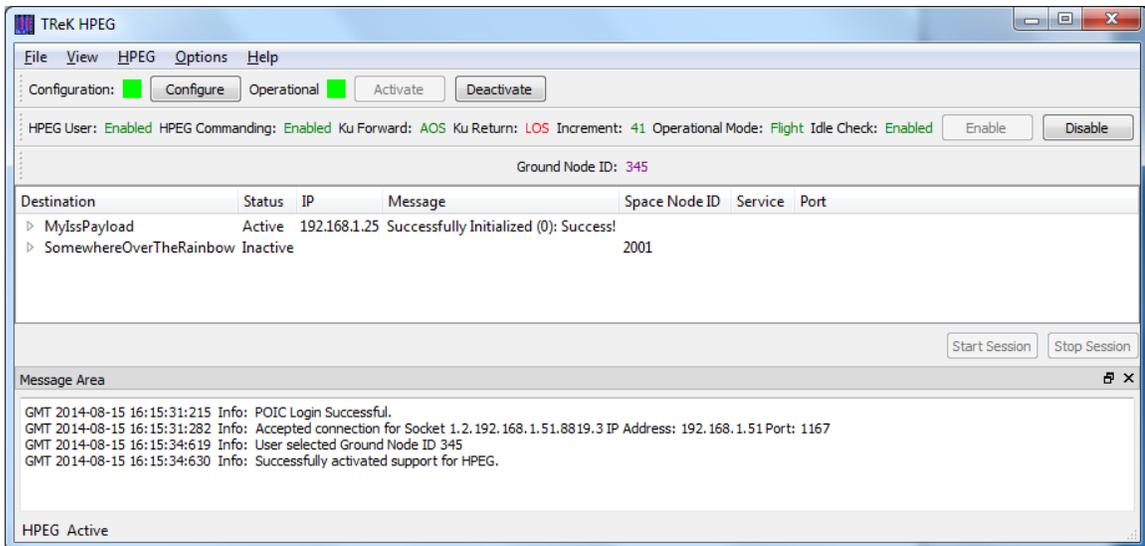


Figure 16 Active Destination

The address shown in the IP column is the Proxy IP address. This is the IP address you will use to communicate with the 'MyIssPayload' destination onboard ISS. It is called a Proxy IP address because it is a substitute address for the real IP address of the 'MyIssPayload' payload onboard the ISS. Real IP addresses are hidden for security purposes.

9. Next open a Command Prompt (console window). Type in the following:

```
>ping 192.168.1.25
```

Note: This will not work. The ping will fail. However, if you had a real HPEG session and the 'MyIssPayload' destination was onboard ISS, this would work. The ping would result in several successful replies. The purpose of this step was to describe one of the typical steps that one could take next when using the HPEG service. At this point you could also use other services such as ssh, CFDP, remote desktop, etc.

10. Next select the 'MyIssPayload' destination and push the 'Stop Session' button. This will deactivate the session with the 'MyIssPayload' destination. The main window should look like the one in Figure 17.

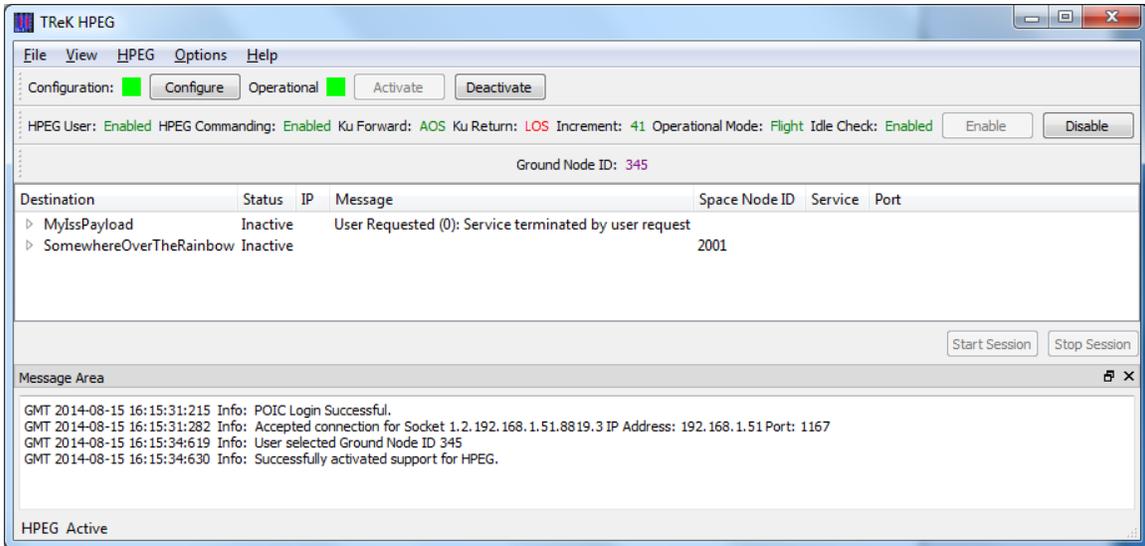


Figure 17 Inactive Destination after Stop Session

- Next select 'Deactivate' in the main window configuration toolbar. This will deactivate the HPEG service. The main window should look like the one shown in Figure 18. You may notice the Ground Node ID toolbar is gone. This is because the Ground Node ID toolbar is only displayed when the HPEG service is active and a Ground Node ID is in use.

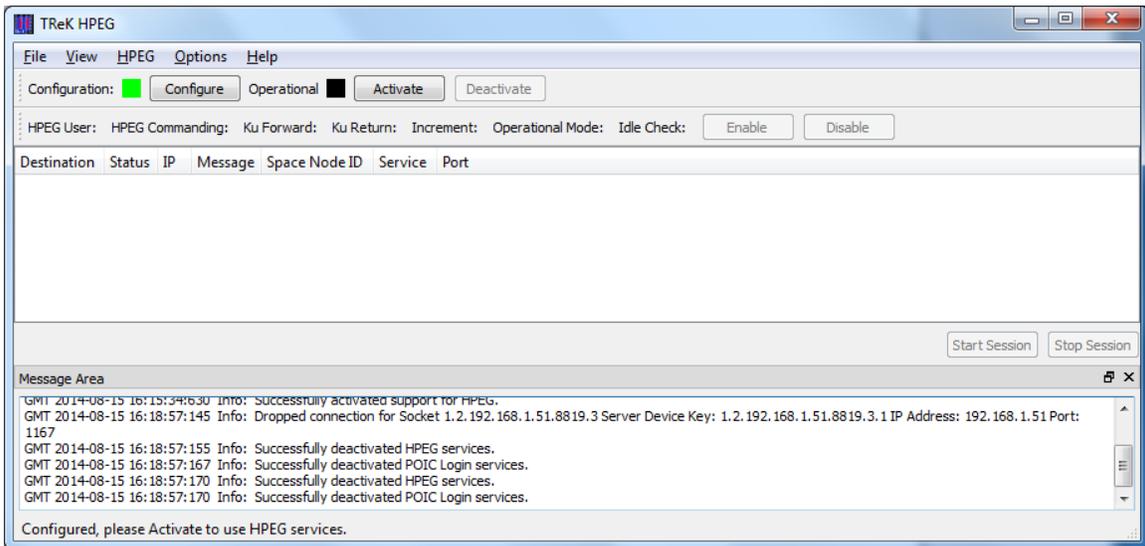


Figure 18 HPEG Deactivated

Note: Remember if you want to activate again, don't forget to restart the `trek_eris_sim_console` application before you push the 'Activate' button.

That's it! Now you know how to use the HPEG service. For more information please see the TReK HPEG User Guide.