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# **ASTi Telestra HLA User Guide**

**Document: DOC-01-TELS-UG-1  
Telestra v1.6**



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## Overview

Telestra comes with ASTi's federate software, the configuration utility, and various test, support, and debug tools pre-installed. The federate software is designed to be compatible with both the DMSO 1.3 NG RTI (versions 3 and later) and the MAK RTI (version 1.3.5a and later). Please consult Appendix B: Telestra Compatibility Table for a listing of which combinations of RTI versions, SOM versions, and Telestra versions have been tested by ASTi.

This guide assumes the user has a basic understanding of the High Level Architecture (HLA), and should be familiar with such terms as *federate*, *federation*, *RTI*, etc. It also assumes a basic familiarity with UNIX, such as accounts, passwords, basic commands, etc. If you are familiar with UNIX in general, but not Linux in particular, there are some useful commands and tools specific to Linux described at the end of this document. Telestra documentation is also available on ASTi's website at:

<http://www.asti-usa.com/support/document/index.html>.

## System Accounts

The Telestra system is shipped with two accounts. The administration/super user account name is "root" with a default password of "abcd1234". This account is used for system maintenance, and will be used to configure the system.

The second account is a normal user account. The account name is "hlauser" with a default password of "HLA!now!". This account is used to run the Telestra federate.

To change the password of either account, log into the account and type:

```
passwd
```

and follow the directions printed on the screen.

***DO NOT lose the passwords, particularly the root password. If the root password is lost, you will need to completely rebuild the system hard drive!***

## Preparing Telestra For Use

Standard networking hardware should be used when making connections to Telestra and the DACS units (hubs, bridges, etc.). There are three ethernet interfaces on each Telestra system (HLA, DACS, and Host) used for communicating with Telestra. The location of each interface varies with chassis type. **For new systems, check the back of your chassis for labels showing the location of each interface.**

Figure 1a. Ethernet locations on 1st gen. Telestra chassis, no built-in CD-ROM

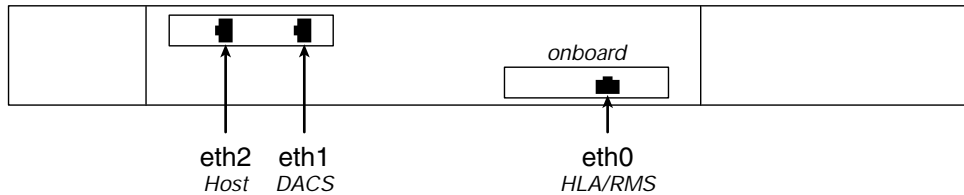


Figure 1b. Ethernet locations on 2nd gen. Telestra chassis, built-in CD-ROM

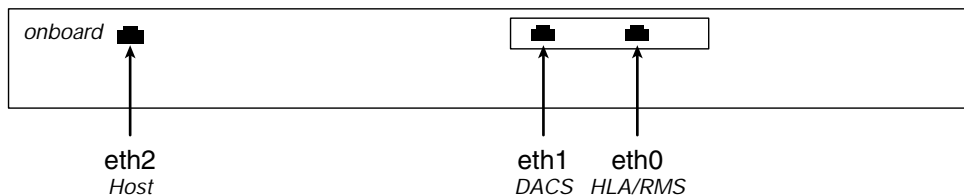


Figure 1c. Ethernet locations on 3rd gen. Telestra chassis, built-in CD-ROM

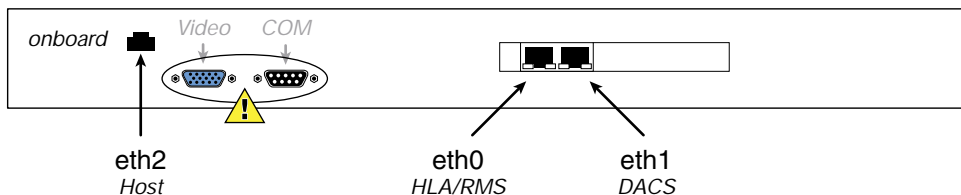
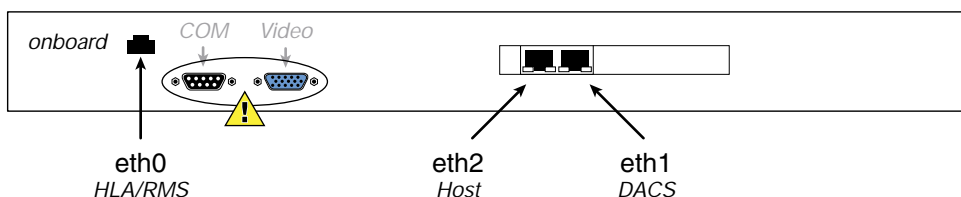
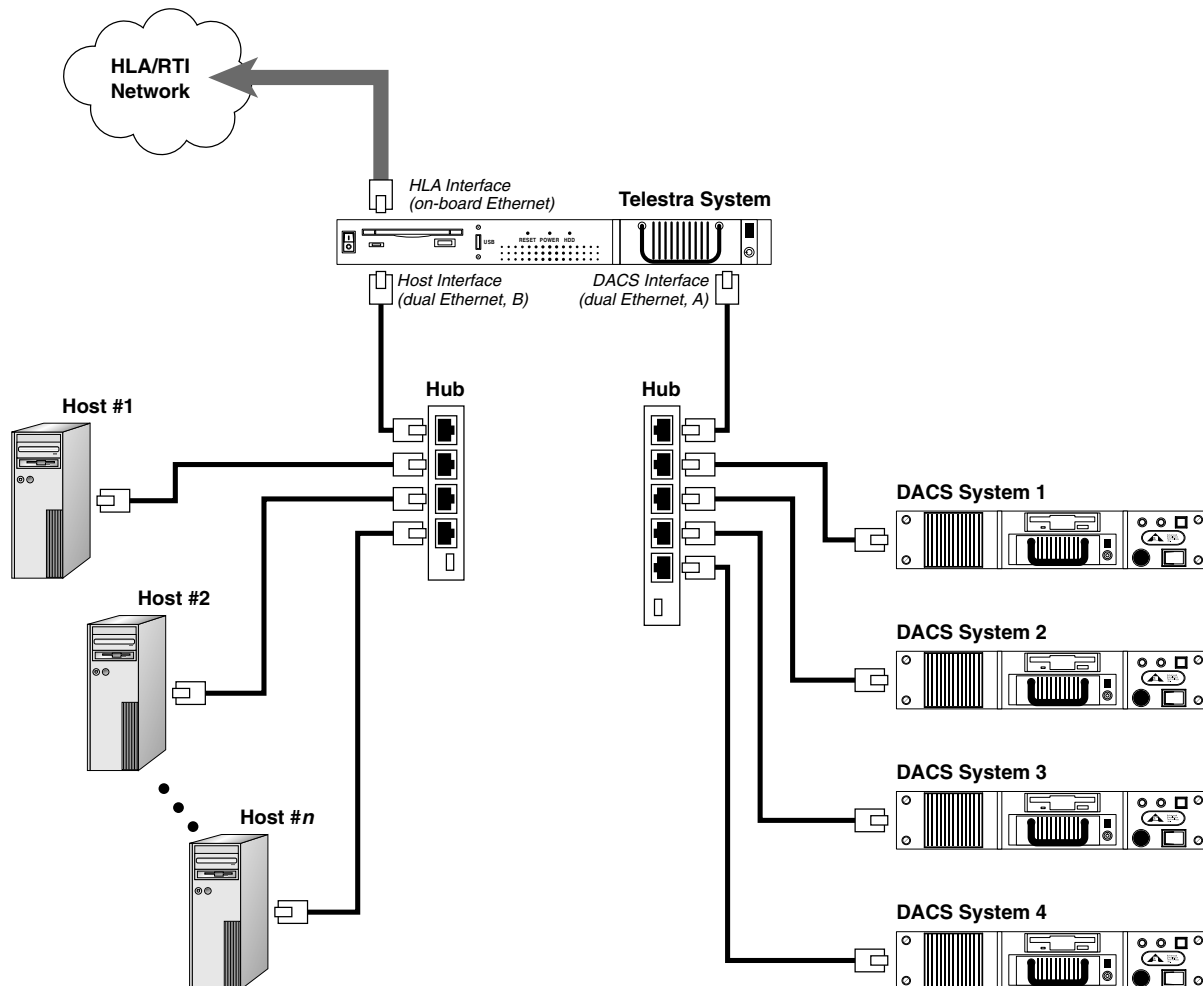


Figure 1d. Ethernet locations on 4th gen. Telestra chassis, built-in CD-ROM (Q2 2002)





*Figure 2. Example network topology for the Telestra system*

Figure 2 shows an example network topology for the Telestra system. Notice that an individual Telestra system contains support for a maximum of four DACS boxes. Please note that in order to integrate Telestra into your network, certain configuration set-up procedures are required to set the IP address of the HLA Ethernet adapter and Host Interface adapter. The second Ethernet adapter, used to connect to the DACS node, is pre-configured on shipment and should not be modified unless under ASTi instruction. Instructions for setting the IP address and hostname of the Telestra system are given in the “Network Settings” section.

Once the system is configured, it can be run and shutdown remotely. Instructions for this are described in the “Remote Control Interface” section.

## Starting and Stopping the Telestra System

Telestra runs the Linux operating system and therefore must be started and more importantly shut-down in the correct manner in order to maintain file system integrity. To start the unit, apply power via the front mounted on/off switch. The unit will boot-up and run the Telestra federate software as a background process. The user may log into the system and edit files from any of the six virtual consoles. To switch to a particular console, press the 'Alt' key and the corresponding function key. For example, the user may switch to the second console by pressing the 'Alt-F2' key combination. The Linux command "`shutdown -h now`" may be entered from a console screen to power down the system. (The user must log in as "root" in order to use this command.) Wait until the screen display reads "Power down" before turning the power switch off. It is also possible to shutdown and reboot the system via remote control over the network - see the section "Remote Control Interface" for more details.

In versions 1.6 and later, the Telestra federate software runs as a background process and may be accessed only through the remote control interface. The Telestra system comes with a host emulator utility to allow the user to test the remote interface on Telestra. The "Remote Control Interface" section provides detailed information on the remote control interface and the host emulator utility.



---

# Telestra Setup Procedure

## Telestra Configuration Utility

The Telestra system ships with a console GUI configuration tool that supports configuring all network interfaces, host access, terrain queries, tactical data link hosts, and federate software parameters. To start the configuration utility, login as 'root' and type the command:

```
configTelestra.pyc
```

Upon startup the welcome screen for the Telestra Configuration Utility, shown in Figure 3, appears. Press the ENTER key to go to the Main Menu, shown in Figure 4. The main menu of the Telestra Configuration Utility consists of four options: Network Settings, Install RTI, RTI Settings, and Federate Settings. Each option is described below. On-line help is also available throughout the Configuration Utility.

General rules for navigating through the utility are as follows:

- To select a menu option, highlight that option with the cursor using the up/down arrow keys, highlight "OK" using the TAB key and press ENTER. This will cause either another menu or a data entry screen to appear.
- To return to the previous menu, use the TAB key to highlight "Cancel" and press ENTER
- To modify the value of a given field on a data entry screen, use the up/down arrow keys to highlight that field and begin typing
- To save changes and exit a data entry screen, use the TAB key to highlight "OK" and press ENTER
- To exit from a data entry screen without saving changes, use the TAB button to highlight "Cancel" and press ENTER
- To save all changes and exit the utility, use the TAB key to highlight "Save" on the exit screen and press ENTER. This will save all changes made within the utility and restart the Telestra services
- To exit the utility without saving any changes, use the TAB key to highlight "Ignore" on the exit screen and press ENTER



Figure 3. Telestra Configuration Utility welcome screen

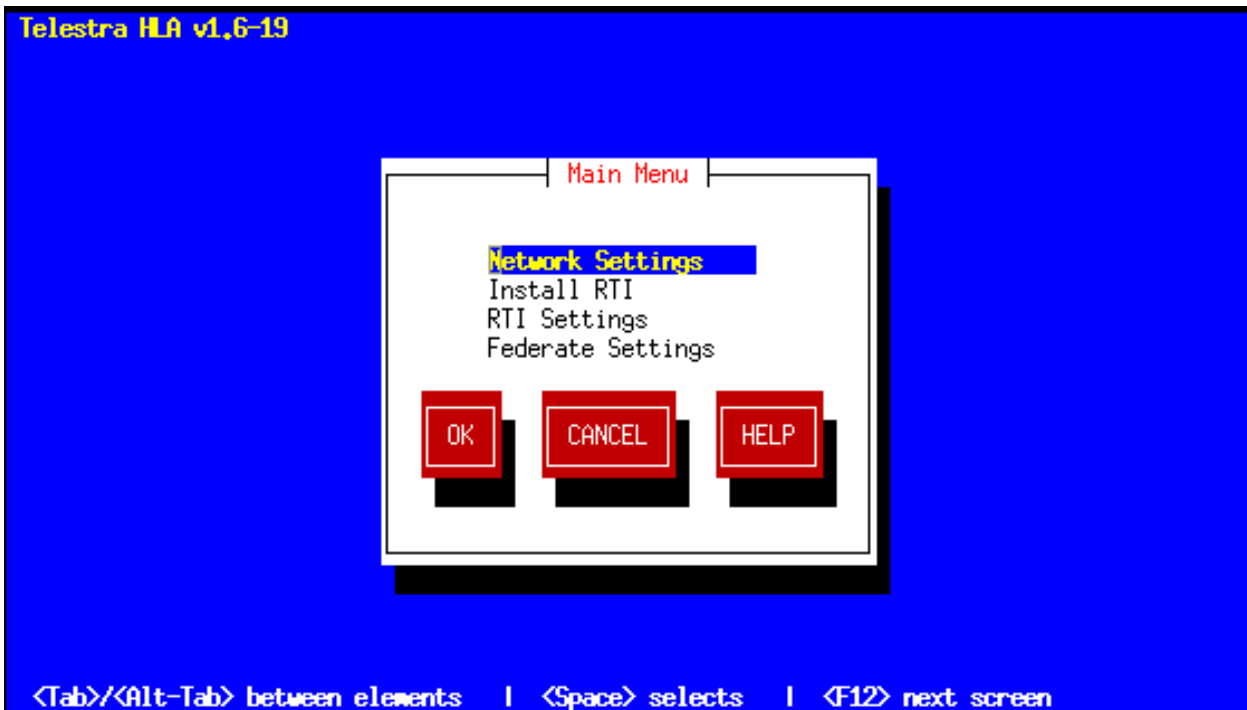


Figure 4. Telestra Configuration Utility Main Menu

## Network Settings

The Network Settings submenu consists of three options: Basic Settings, Ethernet Settings, and DACS Settings. Each option is described below.

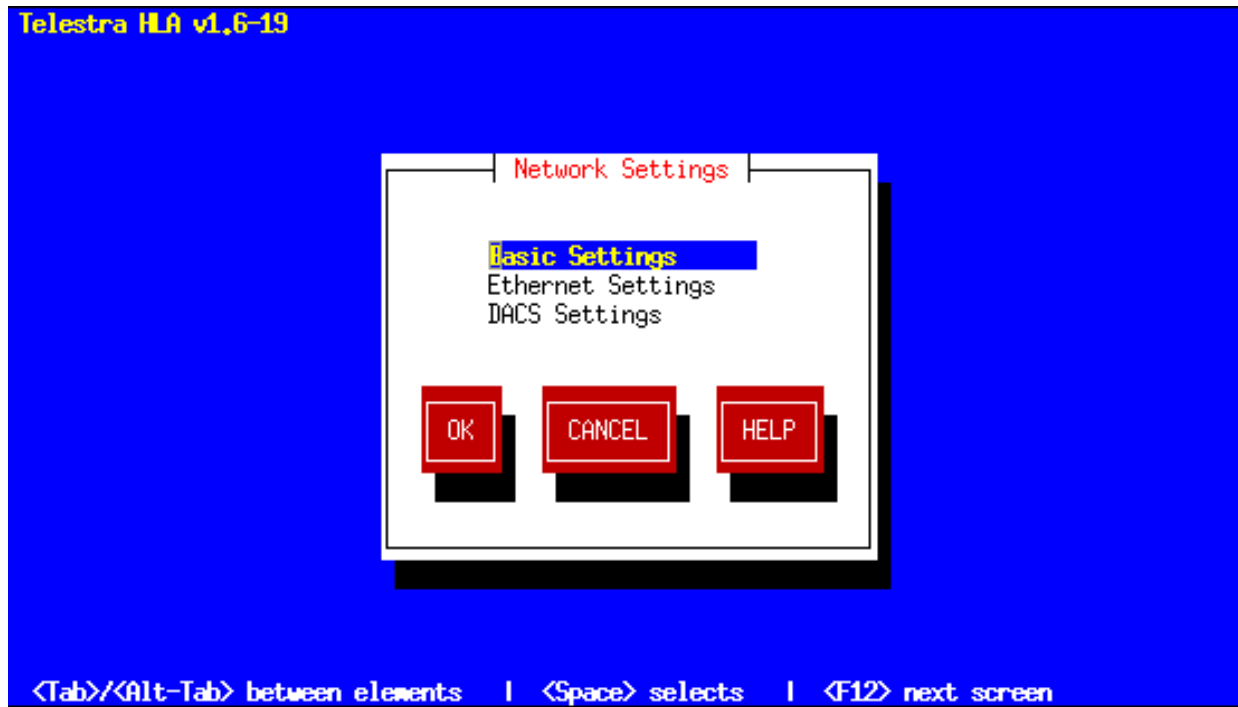


Figure 5. Network Settings Menu

## Basic Settings

By selecting this option, the user can set the hostname, domain name, nameserver, and gateway IP address of the Telestra system.

**Note:** For the DMSO RTI to function correctly, the gateway IP address must be set to some value (even if that value is just a non-existent address on the network). If used with the MAK RTI, this field may be empty.

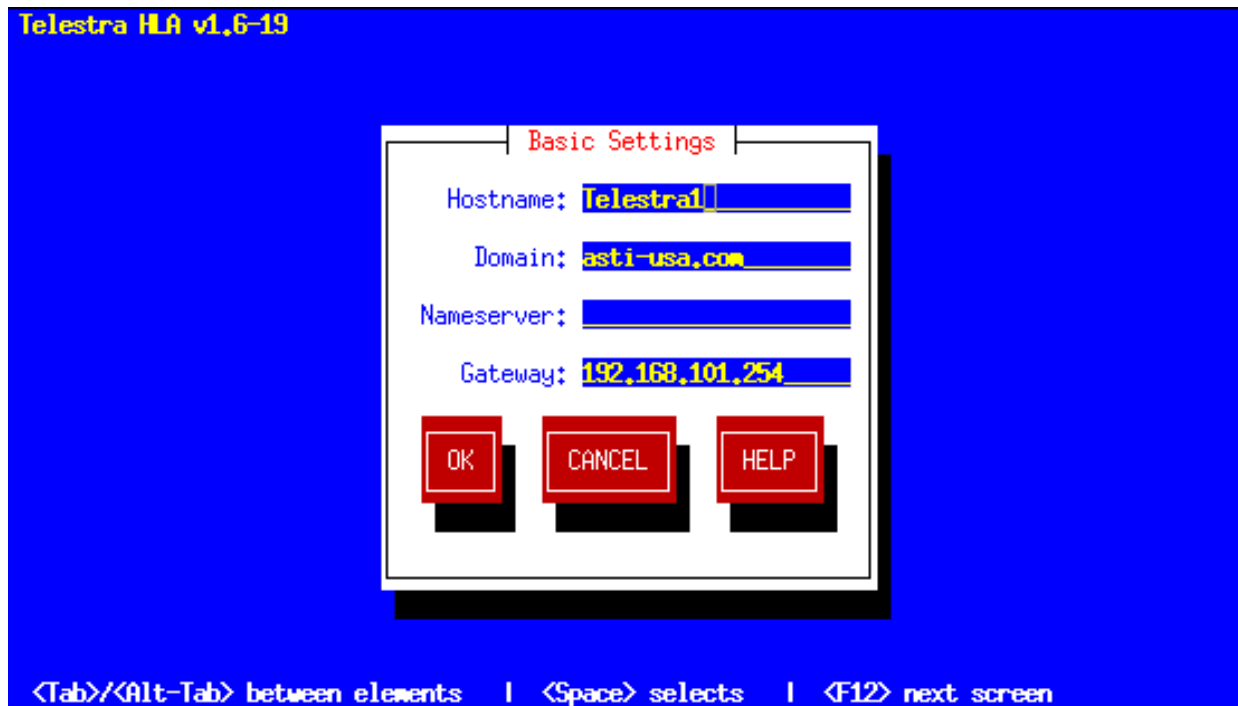


Figure 6: Basic Settings

## Ethernet Settings

By selecting this option, the user can set the IP address and network mask for each of the three interfaces (HLA, DACS, Host). By default, the remote control interface is enabled. The user may disable the remote control capability for any interface by selecting this option on the screen.

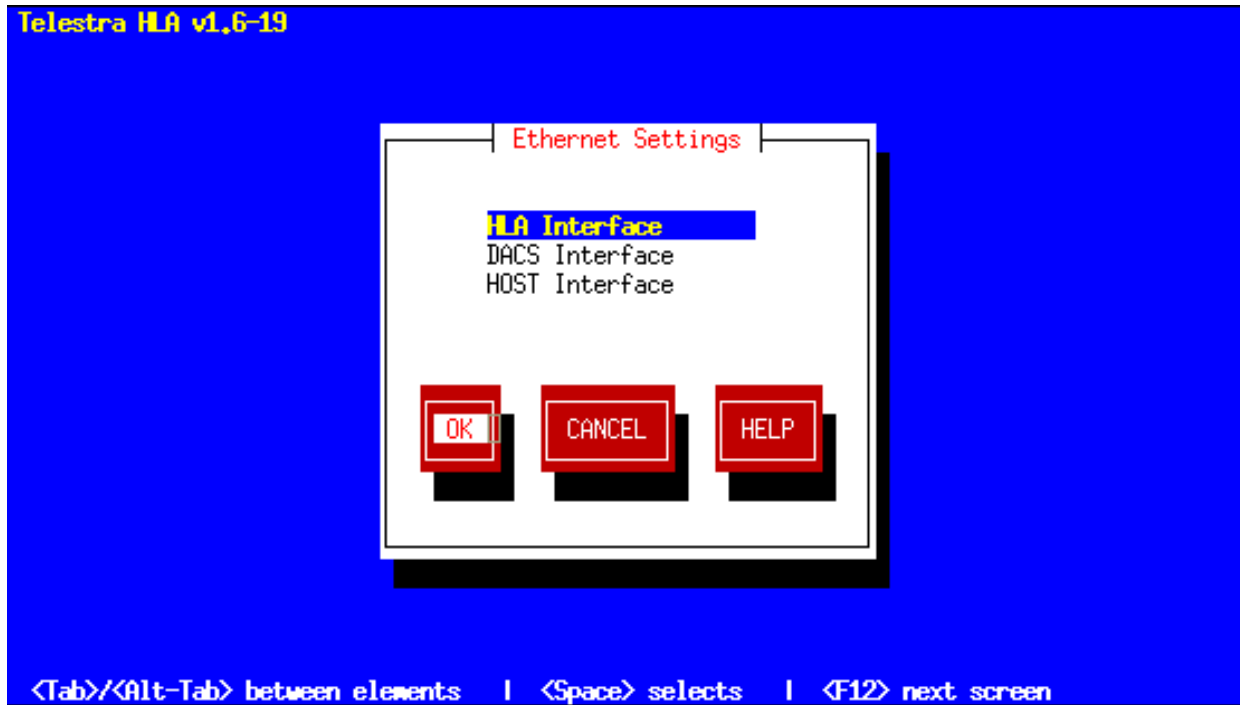


Figure 7: Ethernet Settings Menu

**Note:** The host portion of the DACS Interface IP address must be 254, which is the default setting. The user should change only the network portion of the address. The DACS Interface IP network mask must be 255.255.255.0.

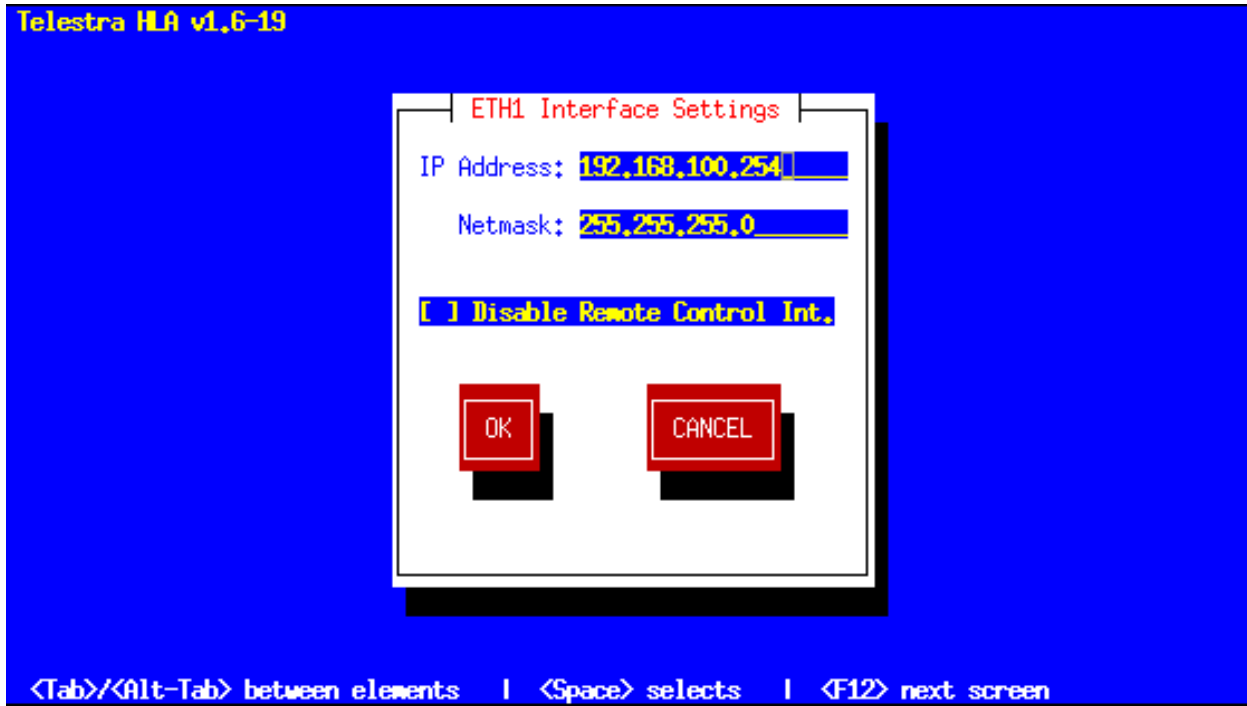


Figure 8: DACS Interface Ethernet Settings

## DACS Settings

The DACS Settings submenu has an entry for each of the four DACS. For each DACS, the user may assign an IP address and designate a host controller, a terrain server, and a TDL host. The DACS IP address is a required field and must be unique; however the DACS units may point to the same IP address for host control, terrain, and TDL.

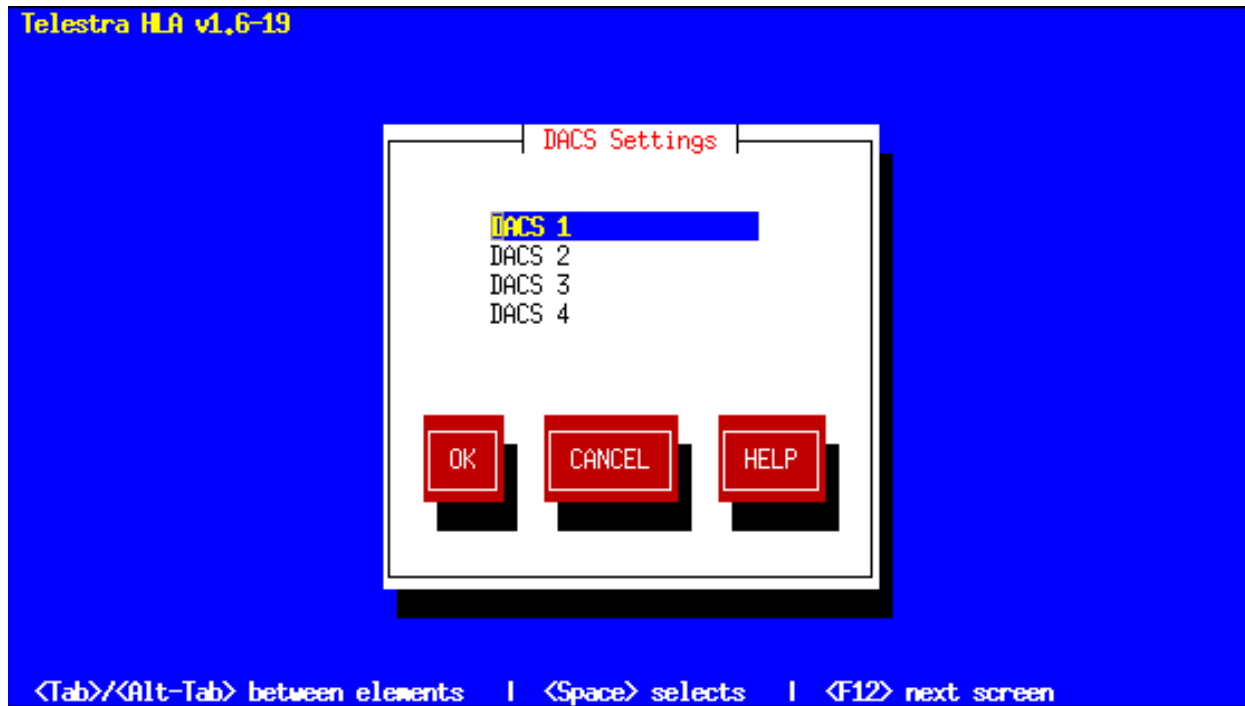


Figure 9: DACS Settings Menu

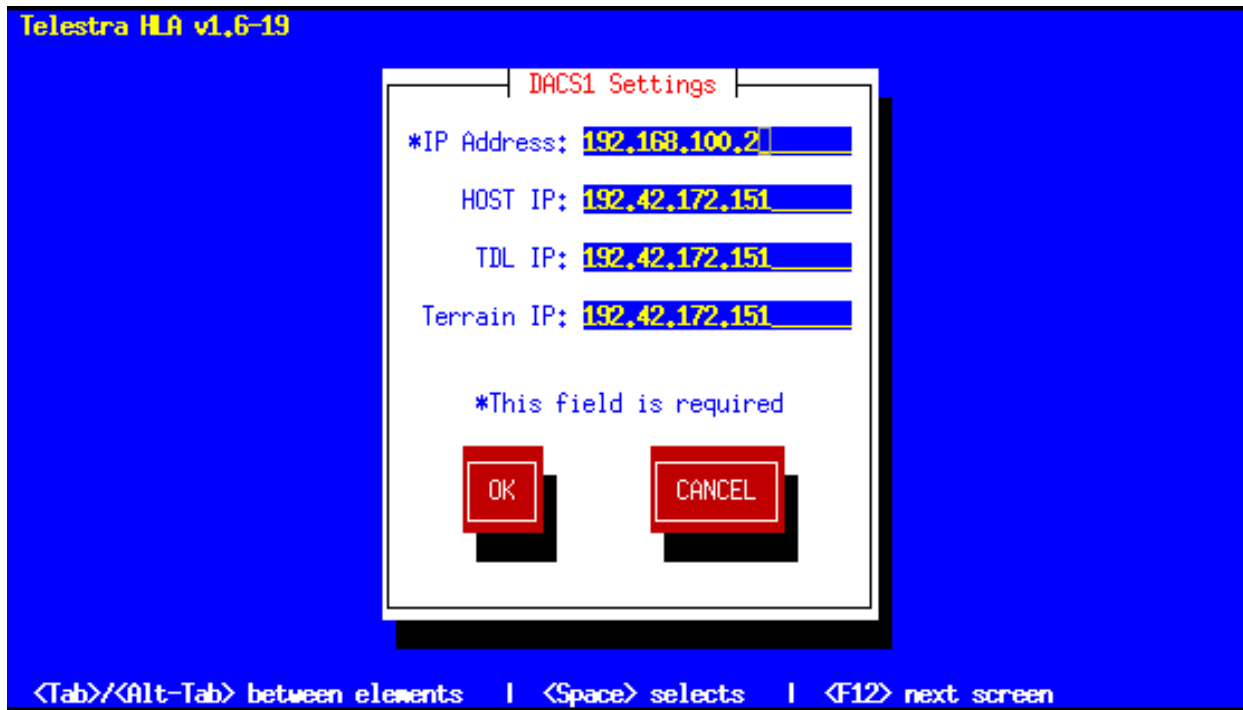


Figure 10: Example settings for DACS 1



## Install RTI

Users are responsible for acquiring and installing the RTI on Telestra. The configuration utility facilitates this process. The DMSO RTI is available through the software distribution center on the DMSO web site at:

<http://sdc.dms0.mil>

The MAK RTI is available through the MAK web site at:

[http://www.mak.com/rti\\_download.htm](http://www.mak.com/rti_download.htm)

In either case, the RTI implementation must be compatible with the Red Hat Linux 6.X operating system. DMSO distributes its RTI in the form of self extracting shell files, which have an extension “. sh”. MAK distributes its RTI as a compressed tar file, which has an extension “. gz”.

Once the RTI has been downloaded, perform the following steps:

1. Before starting the configuration utility, place the RTI archive file in the /home/hlauser directory, via ftp or the CD-ROM.
2. Select “Install RTI” from the main menu to display a list of available RTI archives.
3. Select the desired archive from the list and press Enter to install the RTI.

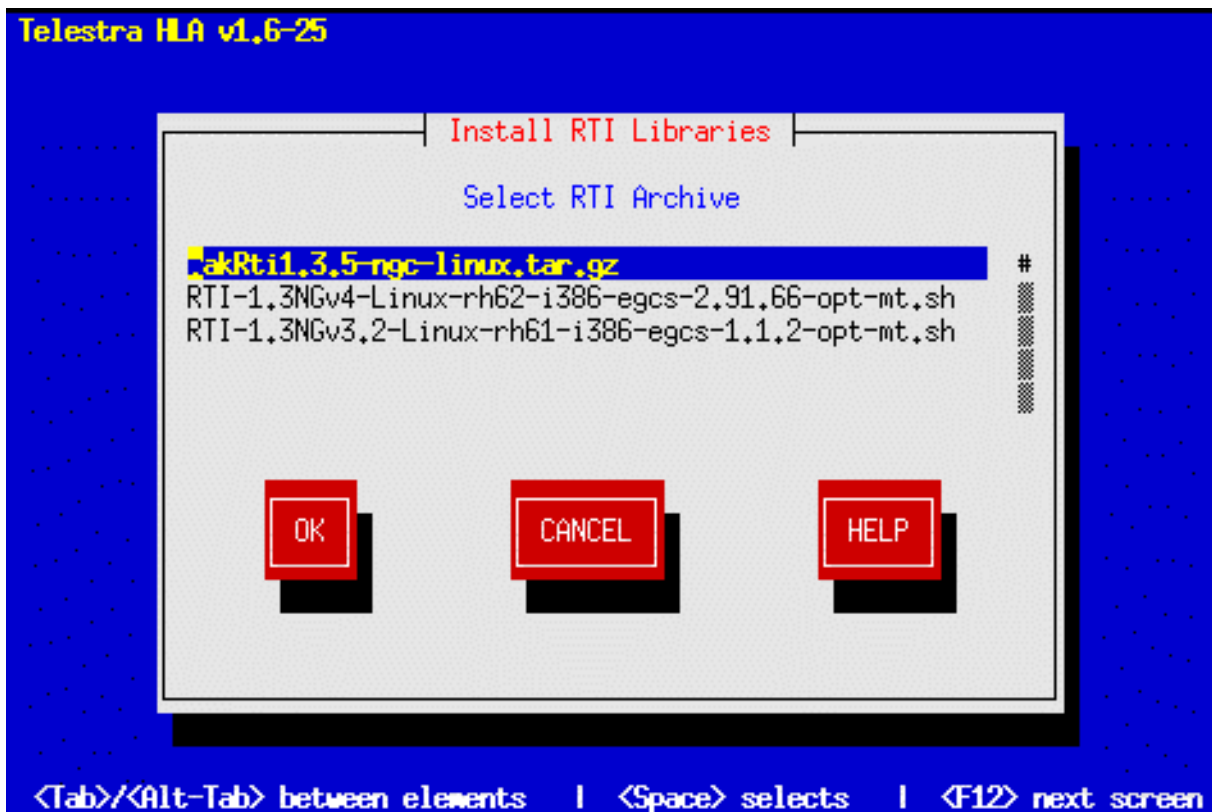


Figure 11: Installing the RTI

## RTI Settings

Only one RTI may be run at a time although more than one RTI may be installed on the same Telestra. The user specifies which RTI library to use by entering the library path under the RTI Settings screen. The library is located within the RTI directory which is in the “/opt/rti” directory. The full path must be specified in the configuration utility. The user should verify the path to the library directory before entering it into the configuration utility.

For the MAK RTI, the name and IP address of the license server must be specified. These parameters tell Telestra from which host it must check out a license to run the RTI.

The Default Debug Level field sets the default level of detail for debugging information that is printed to the HLA log file. Higher debug levels consume more processing time and may impact system performance. The debug level may be changed from the default value at any time from within the federate during a simulation exercise. The section “Debugging the Remote Control Interface” provides additional information about the debug levels.

The Manager Timeout field controls the frequency at which the management thread checks for missing federate processes. If a federate has crashed, the manager spawns another copy to take its place.

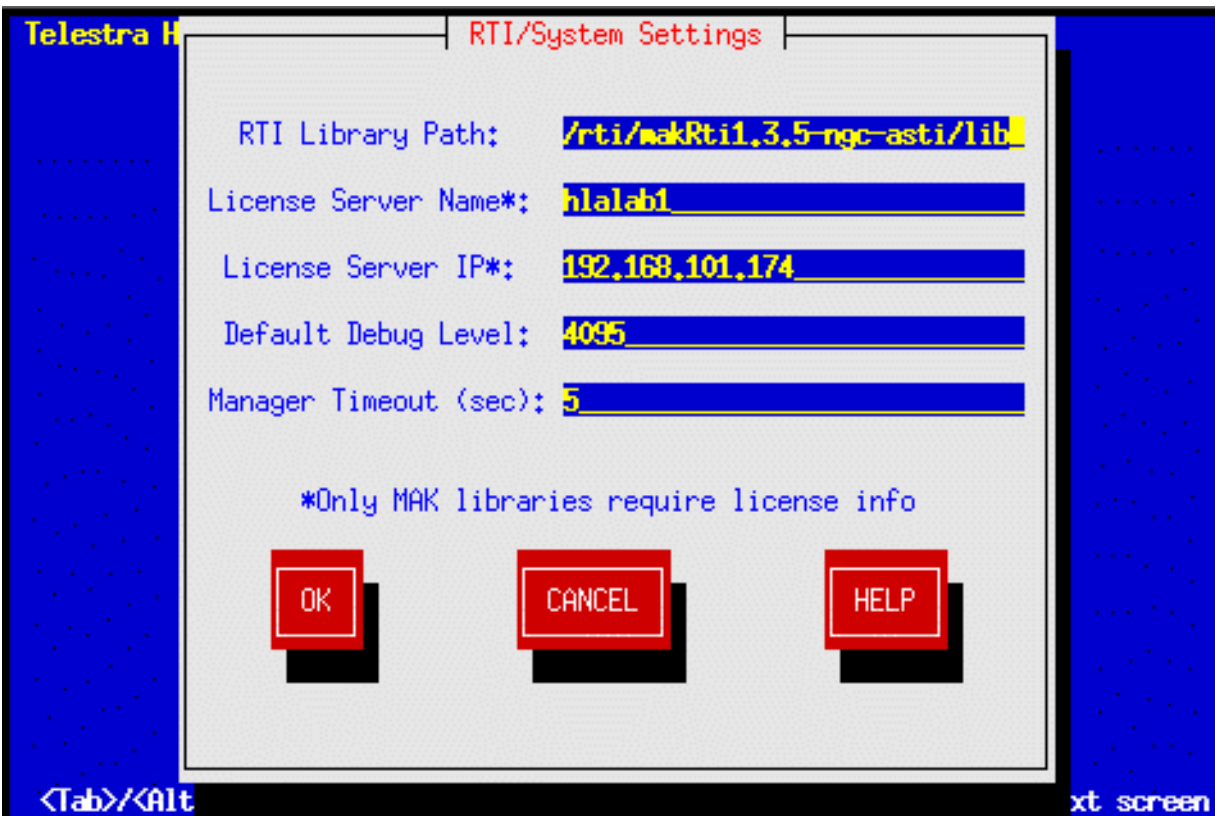


Figure 12: RTI/System Settings

## Federate Settings

Telestra includes support for up to eight federates (Federates 1-8). The federate numbers in Telestra correspond to the federation numbers in Model Builder. Through the “Federate Settings” option on the main menu of the configuration utility, the user may specify the following parameters for each of the eight federates: Rid File, Federation Name, Federate Name, Fed File, Convert File, Control Port, Join at Startup, and Audio Backchannel. The purpose of each field is described below:

### Rid File

The rid file provides control parameters for the RTI software. The specified rid file must be located in the “/home/hlauser/rid” directory. It is not necessary to enter the full path to the rid file in this field. If no rid file is specified, the RTI uses default values for its control parameters. This file is NOT supplied by ASTi.

### Federation

This field defines the federation that is joined, either automatically upon start-up (see `Join_at_startup`), or when a “`join`” command is used without an argument. Two federates must be joined to the same federation to exchange information.

### Federate

This field allows the user to specify the federate name. This name must be unique for a given federation. If this field is empty, each system will automatically select a unique name based upon the local IP address.

### Fed File

This field defines the fed file that the system will use. The Telestra system is shipped with multiple versions of the ASTi SOM pre-installed in the “/home/hlauser/fed” directory. The user may also copy a custom SOM or FOM (in the fed file format) to this directory. In either case, the user specifies which file to use by entering the appropriate fed file name in this field. It is not necessary to enter the full path to the fed file.

*Note:* Any custom fed file must incorporate an official version of the ASTi SOM.

### Convert File

This field contains the name of the file that defines the data representations used by the federate. It is not necessary to enter the full path. The Telestra system is shipped with multiple versions of the conversion files pre-installed in the “/home/hlauser/fed” directory. Each fed file has a corresponding convert file. The versions of the specified fed file and convert file must match. The matching SOM version is evident in the name of the conversion file. It may be necessary to modify the data representations file, dependent on the specific FOM being used. To use a non-standard data format please contact ASTi.

### Remote Control Port

This field specifies the TCP/IP port number for the Remote Control Interface for the Telestra federate software. All control of the federate occurs through this port.

## Join At Startup

This option determines whether the federate attempts to join the federation upon system start-up. The default value is *N* and therefore requires the user to perform a manual “join” through the remote control interface. If this is set to *Y*, the Telestra federate attempts to join after the Telestra unit is powered on. If using an rtiexec, the user must ensure the rtiexec is started prior to powering on the Telestra; otherwise, the federate will be unable to join.

## Audio Backchannel

If this is set, the Telestra Federate sends the audio over the HLA physical network, but bypasses the RTI. The Telestra federate will still create transmitter and receiver HLA objects. This is intended for cases when the RTI is unable to keep up with the amount of audio traffic being sent. In this mode the audio will not be seen on any of the standard HLA tools. The default value is OFF. For more information on the Audio Backchannel, please refer to the application note.

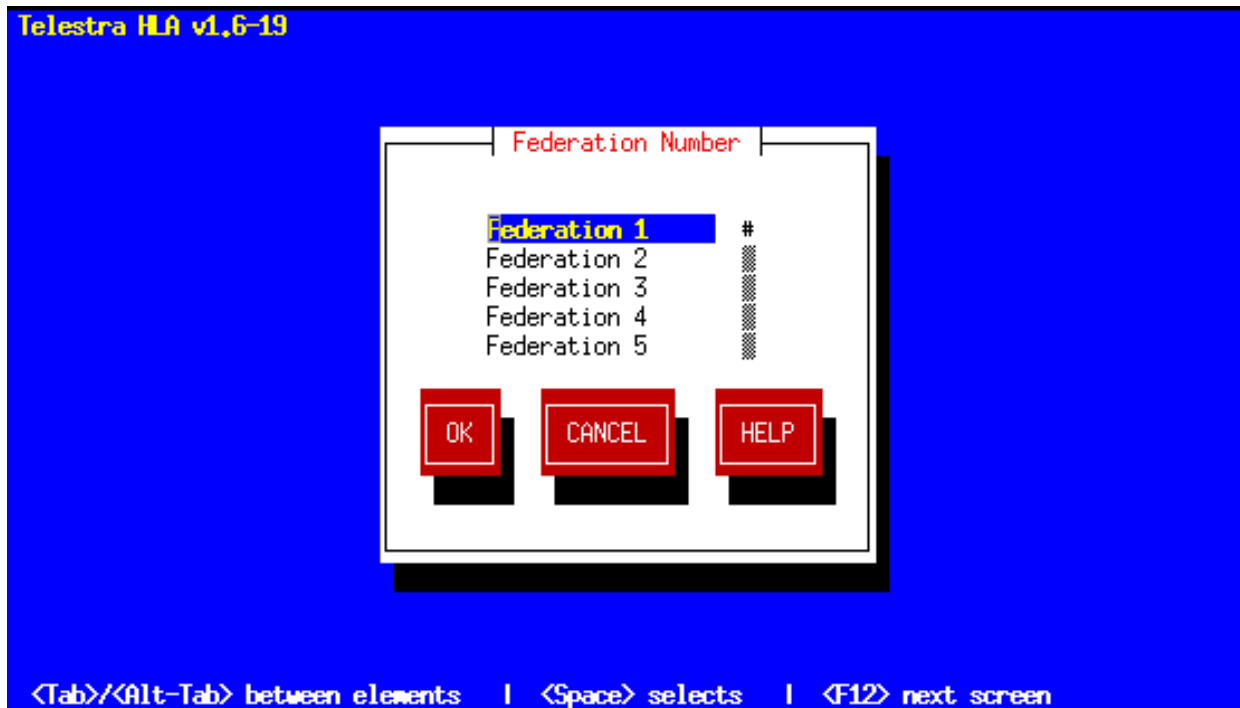


Figure 13: Federation Settings Menu

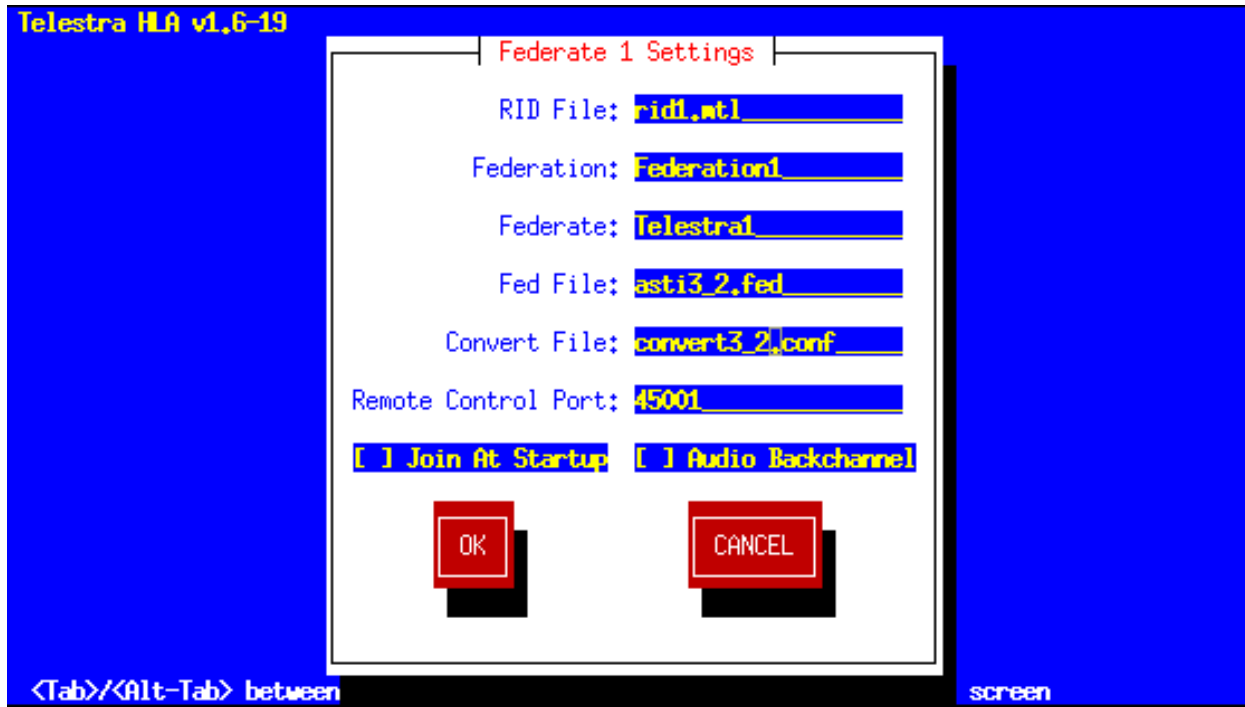


Figure 14: Example settings for Federate 1

## How To Use The Software

The software that is run on the Telestra box is an HLA federate. This federate software, when combined with the DACS audio routing and processing node, implements a full radio simulation environment, based upon the data structures defined in the ASTi Radio SOM.

From power on, the Telestra system will start the Telestra federate application as a background process. A particular federate may be accessed through the remote control interface, which is described in the section “Remote Control Interface”.

### The RTI Software

The DMSO RTI requires that the rtiexec application be running somewhere on the HLA network. In the normal mode of use, the rtiexec will be running on another computer system resident on the HLA network. However, to allow local only testing or stand-alone tests to be performed, it is possible to run the rtiexec on the Telestra box. This rtiexec will service every system on the network. Prior to starting the rtiexec, the DMSO RTI must be installed and the proper RTI library path must be specified in the Telestra Configuration Utility. Once Telestra has been configured to use the DMSO RTI, go to the DMSO RTI directory (in `/opt/rti`) and type the following commands:

```
cd config
. rtienv.sh
cd ../bin
./rtiexec
```

To stop the RTI, type “Ctrl-C”.

The MAK RTI may also use an rtiexec application although this is not necessary. To run the rtiexec application for the MAK RTI, go the MAK RTI directory (in `/opt/rti`) and type the following commands:

```
cd bin
./rtiexec
```

To stop the RTI, type “Ctrl-C”.

Please refer to the MAK RTI Reference Manual for more information on the rtiexec application.

## Remote Control Interface

The Telestra federate software runs in the background upon system startup and may be accessed only through the remote control interface. The Telestra federate no longer runs on the first console. The user accesses the remote control interface through a TCP/IP connection to the appropriate control port. Each federate has its own control port as specified in the Telestra Configuration Utility. A given control port can support only one TCP connection at a time. Once the remote control interface is in place, you can completely control the system from a remote computer. You can even shutdown the system through the remote control interface, eliminating the need for a keyboard and monitor on the Telestra System.

Through the remote control interface, a host computer can:

- Tell the Telestra federate to join or resign a federation
- Specify the federate name, federation name, fed file, rid file, and conversion file
- Direct the Telestra system to shutdown or reboot

The host can also get information from the Telestra federate:

- Joined/resigned status
- Current federate name, federation name, fed file name, rid file name, and conversion file name
- RTI network activity information
- Lists of known local objects and objects on the RTI

The host can only get this information if it is controlling the Telestra federate. The commands and responses through this interface are all text based, human readable messages. A host emulator program is supplied with the Telestra system that can act as a console attached to the Telestra federate, either on the local box or a remote one. The connection is designed to be robust - if the connection is unexpectedly closed or broken, the socket will automatically re-open and begin listening for a new connection after a timeout period.

## Host Emulation Utility

The host emulation program that is shipped with Telestra allows the user to test the remote interface and verify that it is working correctly. To run the host emulator on the local box, log in as 'hlauser' on any console and type the command:

```
hostemu.pyc <port number>
```

at the command prompt. The port number specifies which of the eight Telestra federates will be controlled via this connection. Control ports are assigned to each Telestra federate through the configuration utility under "Federate Settings". By default, the federates are assigned values 45001-45008 for Federates 1-8, respectively.

To connect to a port on a remote Telestra, type the command:

```
hostemu.pyc <port number> <ip address>
```

where the IP address parameter specifies the remote Telestra. This command allows a local Telestra to act as a remote host to a second Telestra.

Once attached, hostemu acts as a console. Text typed in is sent to the telestra remote control interface, and the replies are printed out on the console.



## Remote Interface Commands and Responses

The Telestra federate expects all command lines to be terminated with a newline character ('\n' to you C programmers). If two command lines come at once, they will be executed in order. ***A command will not be executed until the final newline (\n) is received.***

Commands are not case sensitive; however, some data for the commands may be case sensitive (for example, the fed file name must be in the correct case).

Telestra system replies that are of variable length (for example, when retrieving statistics or object lists) will end with the line "ENDLIST\n". This is an indication to the host computer that no more data is being sent.

If the interface receives a command it does not recognize, it will return "UNKNOWN COMMAND" followed by the unrecognized command. If it receives a line of whitespace (followed by a newline character), it will respond with a newline character.

HELP

This command returns a list of all the supported remote control interface commands. The response to this command is:

```
JOIN <FEDERATION NAME>
RESIGN
STATUS
OBJECTS <ENTITY, TRANSMITTER, RECEIVER, LOCAL>
QUIT
SHUTDOWN
NAME <FEDERATE, FEDERATION, FEDFILE, RIDFILE, CONVERT> <New Name>
REBOOT
STATS
HELP
ACTIVITY
```

JOIN <Federation Name>

This command directs the Telestra federate to join the federation with the name specified. If no name is given, it will use the federation name specified for that federate in the telestra configuration file. If the federate is already joined to a federation, it will resign and attempt to join again. It will do this even if the federation name is unchanged. If no federation name has been set (either through the remote control port or from the configuration file), then the JOIN command will fail and respond "JOIN <NONAMEGIVEN> FAIL". Two federates must use the same federation name to pass information between them.

The response to the JOIN command is either "JOIN FederationName OK", "JOIN FederationName FAIL", or "JOIN FederationName FAIL BAD\_FED\_FILE". The last response occurs if the federate could not get handles for all of the object class names and attribute names it requested from the RTI. The normal cause of this is that the object names and attribute names in the .fed file do not match the information in the conversion file.

If the system does not join successfully, the most likely causes are:

- No rtiexec was running
- No federation name was specified
- No license available to run the RTI (MAK RTI only)
- The .fed file did not contain the names in the ASTi Radio SOM or was not found.

If “JOIN <federation\_name> OK” is returned, the system is now running and can be interrogated to determine the federate status and activity.

#### RESIGN

This command can be entered at any time in order to leave the current federation. To join a different federation, it is not necessary to resign first: issuing a new join command will cause the Telestra federate to resign from its current federation before attempting to join the new one. If the Telestra federate is instructed to join a federation it is already joined to, it will resign and re-join that federation. The response is “RESIGN OK” or “RESIGN FAIL”. If the federate is not joined to a federation, no action is taken and the federate will respond “RESIGN OK”.

#### STATUS

Returns either “JOINED <FederationName>” or “RESIGNED”. The federation name returned is the one currently joined, even if the NAME command has been issued to change the FEDERATION variable.

#### OBJECT

When called with no arguments, the OBJECT command returns a list of objects that the Telestra federate has detected. The Telestra federate subscribes to Receiver, Transmitter, and entity objects. The name, RTI handle, and type of the object is returned. In addition, an object is designated as “local” if it is owned by the Telestra federate in question (for transmitters and receivers). A sample output looks like this:

Receiver		Radio1_EntityB.Radio1.rx	handle:	100002 0x186a2
Receiver	local	Radio1_EntityA.Radio1.rx	handle:	200004 0x30d44
Receiver	local	Radio2_EntityA.Radio2.rx	handle:	200002 0x30d42
Transmitter		Radio1_EntityB.Radio1.tx	handle:	100001 0x186a1
Transmitter	local	Radio1_EntityA.Radio1.tx	handle:	200003 0x30d43
Transmitter	local	Radio2_EntityA.Radio2.tx	handle:	200001 0x30d41

When issued with an argument, the OBJECT command will only return a subset of the objects - either transmitters, receivers, entities, or local objects. The valid arguments for the OBJECT command are:

```
OBJECT TRANSMITTER
OBJECT RECEIVER
OBJECT ENTITY
OBJECT LOCAL
```

RadioName is the name given to the radio object in the model, and .tx and .rx designate transmitters and receivers. This naming convention is used to make the output to debugging tools more “human readable”. Other radios that do not follow this naming convention will still interoperate with the ASTi system.

QUIT

This command can be entered at any time in order to terminate the HLA federate application. If joined, the Telestra federate will resign before exiting.

SHUTDOWN

This command instructs the Telestra system to do an orderly system shutdown. If the federate is currently joined to a federation, it will resign before shutting down. The response to this command is “GOODBYE”, followed by the connection being broken. The shutdown will not complete until some time after the “GOODBYE” response is received. It is a good practice to wait at least 60 seconds between receiving the “GOODBYE” and powering off the Telestra system. Otherwise, the file system may be corrupted.

NAME

When called with no parameters, the NAME command simply returns the names of the federate, the federation, the .fed file, the .rid file, and the conversion file. A typical response to this command would look like:

```
FEDERATION Federation1
FEDERATE Telestral
FEDFILE /usr/local/asti/fed/asti3_2.fed
RIDFILE /usr/local/asti/rid/rid1.mtl
CONVERT /usr/local/asti/fed/convert3_2.conf
```

These variables receive their values from either the configuration file or through passing parameters to the NAME command as shown below:

```
NAME FEDERATION <NewFederationName>
NAME FEDERATE <NewFederateName>
NAME FEDFILE <NewFedFileName>
NAME RIDFILE <NewRidFileName>
NAME CONVERT <NewConvertFileName>
```

**Note:** The file name parameters may specify the file name only. It is not necessary to enter the full path.

## REBOOT

This command triggers an orderly reboot of the system.

## STATS

This commands prints performance statistics. A sample out put would be:

```
ScanListTime : n = 94 Min = 0.000013 Max = 0.000122 Avg = 0.000051
TickTime : n = 6058 Min = 0.000008 Max = 0.001606 Avg = 0.000014
```

The `ScanListTime` statistics reflect the number of times the federate software scans the current list of transmitters and receivers, the minimum list scan time, the maximum list scan time, and the average list scan time. The `TickTime` statistics reflect the number of times the `RTI tick()` function is called, and the minimum, maximum, and average durations of time that are spent within a tick() call

## ACTIVITY

This command returns activity counters from the Telestra system. (If accessing the remote control interface through the host emulator utility on Telestra, this command may be initiated by simply pressing the ENTER key.) A sample output would be:

```
life count: 0x41
<Attribute Updates>
  rx: 0x6 | tx: 0xc | ignored: 0x0
<Interactions>
  Audio | rx : 0x0 | tx : 0x0
  TDL | rx : 0x0 | tx : 0x0
  Attach | rx 0x0
<Objects>
  Transmitters | local : 0x2 | rti : 0x1
  Entities | local : 0x0 | attached
: 0x0
<Backchannel (Telestra <=> DACS)>
  Tx/Rx | rx : 0x1e4 | tx : 0x0
  Audio | rx : 0x0 | tx : 0x0
<Backchannel (Telestra <=> WAN)>
  Tx/Rx | rx : 0x10 | tx : 0x4
  Audio | rx : 0x0 | tx : 0x0
ENDLIST
```

The “life count” increments once a second while the entity is joined to a federation. It is a general indicator of federate health.

“Attribute Updates” reports the cumulative number of attribute updates sent and received by the federate. “ignored” is the number of updates received but ignored. This happens when the federate receives an update for an entity object to which none of its radios are attached. The attributes, which are defined in the ASTi SOM, include radio object parameters such as power, world location, and frequency. An attribute update occurs whenever one of these fields changes.

“Interactions” is the number of interactions sent and received. The interaction counters are organized by interaction type. The “Audio” counters increment as the federate sends or receives audio packets. The “TDL” counter increments as the federate sends or receives data messages. (Versions 3.1 and higher of the ASTi SOM define a data message interaction to implement tactical data link simulations in HLA. Application Note #26, “Using ASTi’s Tactical Data Link”, describes how to configure Telestra and the DACS for TDL messages.)

“Objects” lists the number of transmitter and entity objects on the HLA network. For transmitters, the “local” counter reflects the number of local transmitter objects while the “rti” counter reflects the number of remote objects. For entities, the “local” counter reflects the number of entities the federate has detected on the HLA network. The “attached” counter reflects the number of local radios that are attached to existing entities.

“Backchannel (Telestra <=> DACS)” tracks the activity over the backchannel between the Telestra and the DACS. The “Tx/Rx” counters increment as the Telestra receives Tx and Rx PDUs from the DACS or sends Tx and Rx PDUs to the DACS on the backchannel. The “Audio” counters increment as the Telestra receives signal PDUs from the DACS or sends signal PDUs to the DACS on the backchannel.

“Backchannel (Telestra <=> WAN)” tracks the activity over the backchannel between the Telestra and the HLA network. The “Tx/Rx” counters increment as the Telestra receives Tx and Rx PDUs from the WAN or sends Tx and Rx PDUs to the WAN on the backchannel. The “Audio” counters increment as the Telestra receives signal PDUs from the WAN or sends signal PDUs to the WAN on the backchannel. In summary:

- When the Telestra system powers up, the software attempts to read parameters in the telestra.conf file, which is generated by the Telestra Configuration Utility. From this, it gets values for the federation name, the federate name, the fed file, the rid file, and the conversion file. These values can be overridden by user commands sent directly to the telestra software via the remote control interface.
- When the “join” command is issued, the fed file and the conversion file are read. The telestra federate joins the federation specified (either in the telestra.conf file or from a command-line input). It reads in the conversion file, and attempts to get handles for all of the attribute names and object names for the RTI.
- If it fails to get any of the handles, it will resign from the federation and return a “JOIN <FEDERATION NAME> FAIL BAD\_FED\_FILE” message. If not, it will return a “JOIN <Federation Name> OK” message, and begins sending and receiving information to and from the RTI.
- At any time, it can receive a command to join another federation, resign, quit, shutdown, or reboot.

## Debugging the Remote Control Interface

Debug messages are printed to the file `/var/log/hla.messages`. The level of detail within these messages may be set by typing the following command:

```
debug <debug level>
```

from within the federate. The debug level parameter determines which combination of debug messages are printed to the file. Its value is derived from a debug mask described in the following table.

Debug Mask Position	Description
0	Off
1	General (required to print any debug messages)
2	RTI Object Activity
4	New Ethernet Object Info
8	Name Info
16	Ethernet Activity
32	RTI Activity
64	Handle
128	Translate
256	Timeouts
512	Convert
1024	Context

---

## System File Structure

When the user logs onto the Telestra system as `hlauser`, they are in the `hlauser` home directory (`/home/hlauser`). The following list describes the contents of the sub-directories in the latest version of Telestra.

`~/etc`

This sub-directory contains the Telestra configuration file, `telestra.conf`. This file, which is generated by the Telestra Configuration Utility, contains all of the configuration information for the Telestra system.

`~/fed`

This sub-directory contains the ASTi SOM files (e.g. `asti3_1.fed`) as well as the associated convert files (e.g. `convert3_1.conf`). Telestra comes with several versions of the ASTi SOM installed. The convert file supports an agile FOM interface by defining data format representations. Each SOM must be used with its corresponding convert file (as indicated by the file names). The version of the SOM and corresponding convert file to be used is specified for each federate through the Telestra Configuration Utility.

`~/rid`

This sub-directory contains the `rid` file which specifies the configuration parameters that control the operation of the RTI software. The format of and specific parameters in the `RID` file differ between the DMSO and MAK RTIs. It is important that the specified `RID` file is compliant with the RTI being used. Please consult DMSO and MAK RTI documentation for more detailed information about the `RID` file. A sample DMSO RTI `rid` file may be found in the `doc` sub-directory in the DMSO RTI directory. A sample MAK RTI `rid` file may be found in the MAK RTI directory. Both RTI directories are located under the `/opt/rti` directory.

`~/run`

This sub-directory contains up to eight debug files that are generated upon execution of the “`join`” command for a given federation. The debug files list the handles (numeric identifiers) that are assigned to each class and attribute defined in the `.fed` file. Each federate has its own debug file associated with it. The file names follow the convention: `handle_X.val`, where `X` is the federate number (1-8).

## DACS Operational Differences Running HLA

**Note:** This guide is written with the assumption that the user is familiar with DACS operation, and DIS Radios in the DACS. The changes to the DACS Model Builder application are relatively straight forward in order to allow it to function in HLA mode. Note that all previous functionality in non-networked and DIS operational modes are retained and are available in HLA mode.

For HLA operation the DACS system must be configured to run in HLA mode. This is done via a command in the DACS configuration (“`.cfg`”) file.

The required command line is:

```
hla = on
```

When Model Builder is started with the “`hla = on`” command, you will notice that the main menu now includes an selection titled “`hla network`”. The configuration file command that sets the local IP address of the DACS system must also be converted to HLA. The new command line is:

```
hla:local_ip=xxx.xxx.xxx.xxx
```

The IP address must match the address specified for that DACS in the Telestra Configuration Utility.

***IMPORTANT: Any configuration file commands that begin with “DIS” should be commented out or removed.***

Changes at the object level in Model Builder are restricted to the “Radio”, “Receiver” and “Transmitter” objects in the “Signals” list and to “World Position” objects in the “Controls” list.

The changes to the “Radio”, “Receiver” and “Transmitter” objects are all common to each other. The most obvious and fundamental change is that these objects are no longer identified using the “Site/Host/Entity/Radio ID” numbers of DIS. The identification is now via a concatenation of the World Position name used by the object to define its location, and the Radio object name. These names are the user created names entered as part of the Model development (note that if the user does not enter a name, the system will chose a default name for each object). Therefore assuming we have a world position control object identified “Aircraft\_Posn” and a radio object identified “Cockpit\_UHF1”, then the object name displayed (and created on the RTI) will be “Aircraft\_Posn.Cockpit\_UHF1.rx”. (A radio object actually consists of two separate objects which are created on the RTI. These are Transmitter objects, whose names the ASTi System ends in ‘.tx’, and receiver objects, whose names will end in ‘.rx’).

***IMPORTANT: Radio object names must be unique across the HLA network. This means that either the radio object name or the world position object name must be different between DACS systems.***

Note that it is no longer necessary to manually set the Radio ID number to anything other than the Model Builder supplied default, since this is not published or utilized outside of the DACS/Telestra pair.

World Position objects have been changed to include the option of setting the Entity ID type to “HLA”. This is achieved using the “Entity ID” field and incrementing through the options. On



selecting the “HLA” type, the line above changes from “Exercise No” to become “Federation No”. Federation numbers 1-8 are reserved for RTI communication. Please see the application note “Using Telestra Backchannels” for more information on assigning Federation numbers. The other numbers displayed for the site, host and entity fields should be left at the default values, since Model Builder defaults these to be unique, and they are not reported as part of the HLA data.

The “Entity” object used for entity attach now functions in a different way. It is now only necessary to enter the HLA name of the required attach entity in the name field of the Entity object in Model Builder. The system then interrogates the RTI and extracts the required position information. It is no longer required to set-up site/host/entity numbers.

A method of dynamically attaching radios to an entity across the network is available in Telestra v1.6 and higher. ASTi SOM version 3.2 supports dynamic entity attach. Please refer to ASTi Application Note 52: “Entity Attachment over HLA” for more information on this feature.

The network intercom object is currently represented as a Radio object on the HLA network.

## System Utilities

### Accessing a floppy disk

One issue when using the Linux operating system is the difficulty in accessing peripherals. Traditionally peripherals must be mounted and unmounted in the correct fashion. Red Hat Linux (and hence the Telestra System) includes a set of utilities that greatly simplifies access to the 3.5" floppy drive fitted to the unit. These tools are known as "mtools" and allow DOS-like commands to be used for all normal floppy operation, without the need to mount/unmount the drive.

Useful commands are:

```
mdir a:
```

Provides a directory listing of the floppy disk contents.

```
mcopy <filename> a:
```

Copies a named file to the floppy.

```
mcopy a:<filename>
```

Copies a named file from the floppy into the current directory

```
mdel a:/<filename>
```

Deletes a specified file from the floppy disk. Note the use of the "/" slash in place of the DOS standard "\".

For a fully synopsis of the utility enter "man mtools" from the console.

### Editing text files

There are several text editors available on Red Hat Linux. A very quick and simple text editor to use is `pico`. To run it simply enter

```
pico <filename>
```

from the command line. For the Unix pro, `vi` is available, as well as `emacs` and `jed`. If you are in X-windows, `kedit` provides an intuitive, simple to use interface. For more information about these tools or any other Linux commands type "man <command name>" for a full description.

## Appendix A: Joining a Federation

This section assumes that the RTI and Telestra federate software are properly installed on both Telestra systems. This example will use the DMSO RTI (1.3NGv4) and, for the purposes of this scenario, the rtiexec process will run on one of the two Telestra systems. Only one rtiexec process should exist on the network. For performance reasons, ASTi recommends running this process on a separate machine during an actual exercise and NOT on one of the Telestra systems. Figure 1 shows a picture of the network topology for this example. A hub connects the two Telestra systems together to form an isolated network. For the purposes of this example, we will ignore the host interface and DACS interface on both Telestra systems.

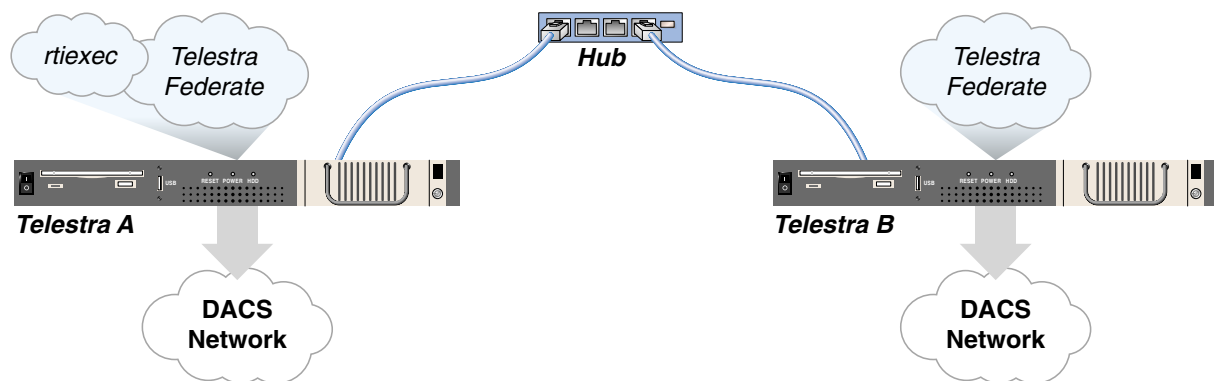


Figure A1: Network Topology for example scenario

The table below displays the network settings for both Telestra systems. Following this table are step-by-step instructions on using the Telestra Configuration Utility to setup both Telestra systems.

**NOTE:** Users will need to change the network settings below to match their own network configuration.

Hostname	Telestra_A	Telestra_B
Domain	asti-usa.com	asti-usa.com
IP Address	192.168.1.100	192.168.1.200
Netmask	255.255.255.0	255.255.255.0
Gateway	192.168.1.254	192.168.1.254

These instructions walk through using the configuration utility to setup the Telestra\_A system. To setup another system, follow these instructions on that system, using the network settings for that system.

## System Configuration

**Step 1.** Make sure the Telestra system is powered ON.

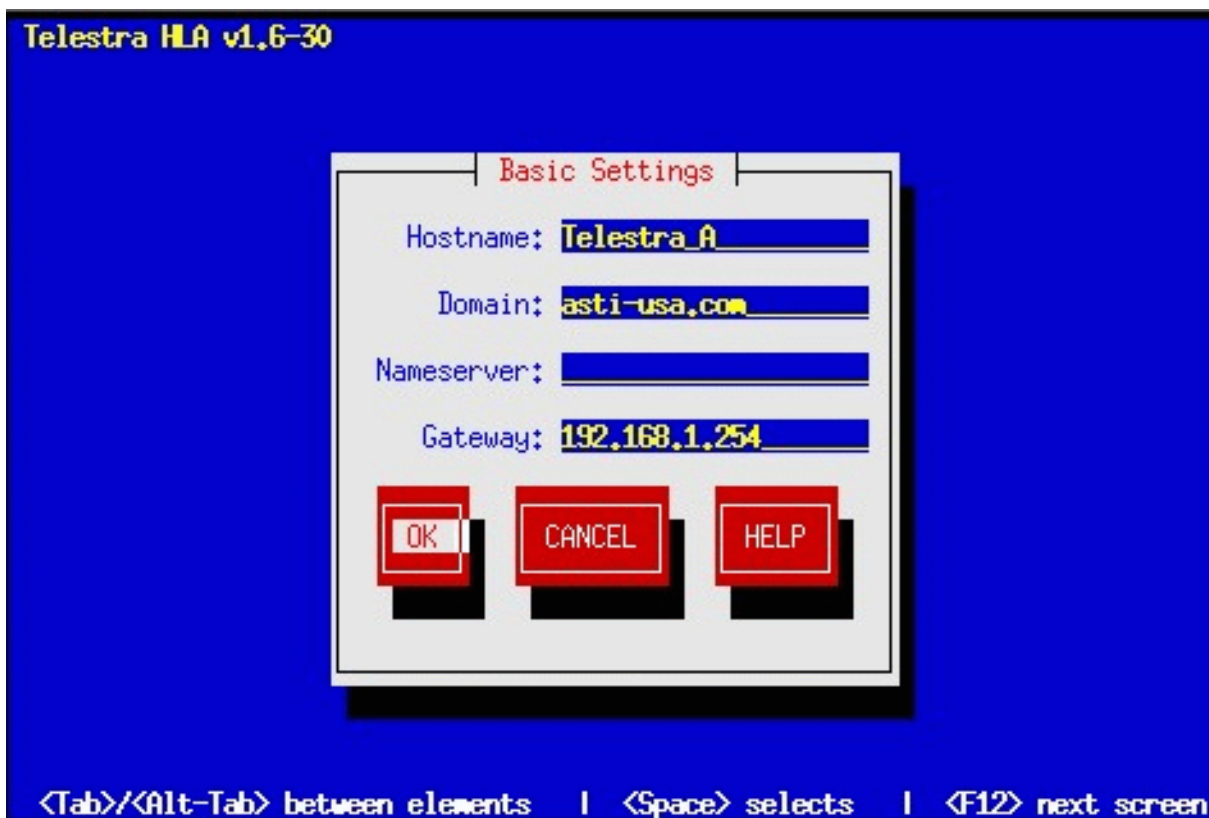
**Step 2.** Login as root on any of the six consoles.

**Step 3.** Start the Telestra Configuration Utility using “configTelestra.pyc”.

```
[root@telestra /root]#  
[root@telestra /root]#  
[root@telestra /root]#  
[root@telestra /root]#  
[root@telestra /root]# configTelestra.pyc
```

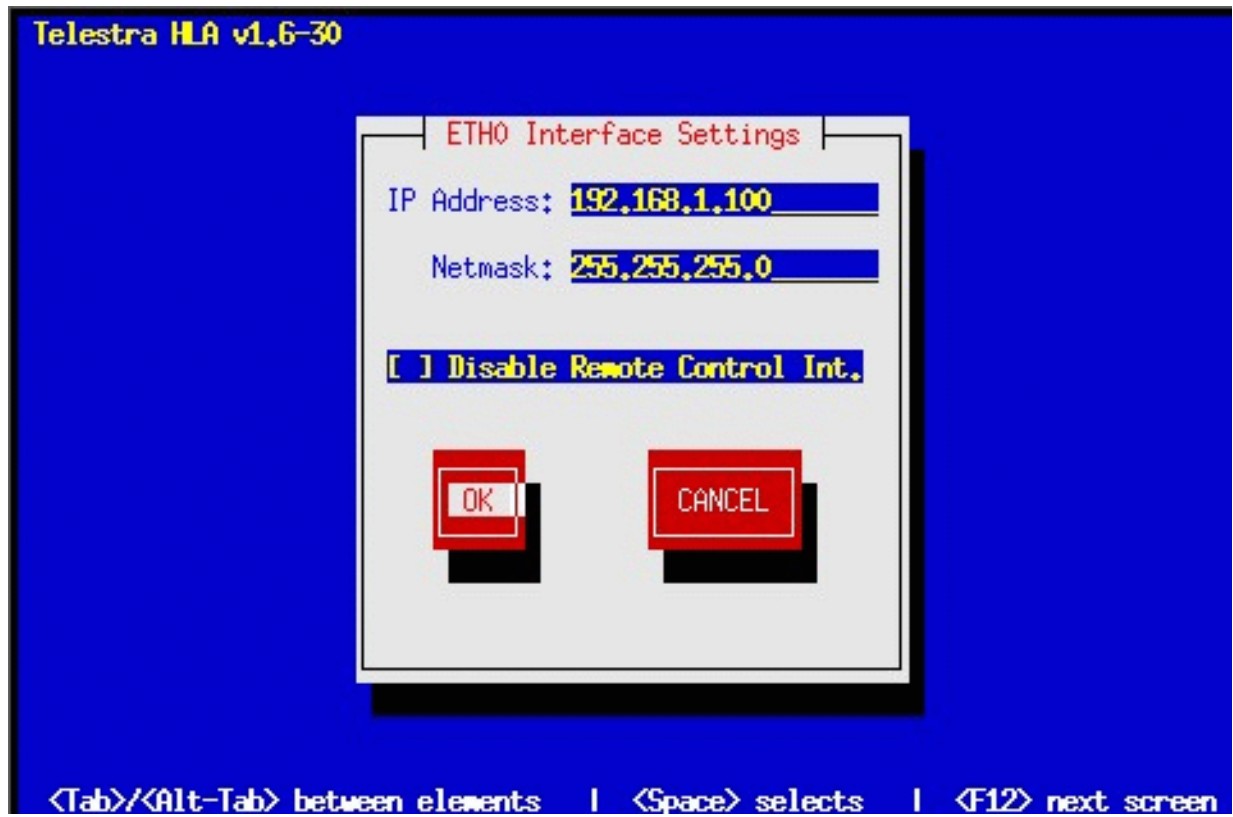
*Step 3 Figure: Starting the configuration utility*

**Step 4.** Under the Network Settings -> Basic Settings menu, change the default hostname and gateway IP address.



*Step 4 Figure: Modified basic network settings*

**Step 5.** Under Network Settings -> Ethernet Settings -> HLA Interface, change the IP address and netmask.



Step 5 Figure: Modified HLA Interface settings

**Step 6.** Under RTI Settings, change the RTI library path to point to the DMSO RTI.



*Step 6 Figure: Modified RTI settings*

**Step 7.** Save changes upon exiting the configuration utility.

**Step 8.** Repeat steps 1 through 6 for additional machines, using the specific settings for each machine.

After configuring all machines participating in the exercise (two in this example), you are ready to start setting up the Federation.

## Setting Up the Federation

**Step 1.** On Telestra\_A, login as hlauser on any of the six consoles. Change to the DMSO RTI directory (/opt/rti/RTI-1.3NGv4/Linux-rh62-i386-egcs-2.91.66-opt-mt). Then change to the subdirectory “config” and type “. rtienv.sh”.

```
[hlauser@Telestra_A config]$ . rtienv.sh
RTI_HOME           : /opt/rti/RTI-1.3NGv4
RTI_BUILD_TYPE     : Linux-rh62-i386-egcs-2.91.66-opt-mt
System Libraries   : /opt/rti/RTI-1.3NGv4/Linux-rh62-i386-egcs-2.91.66-opt-mt/lib:
[hlauser@Telestra_A config]$ █
```

*Step 1 Figure: Setting rtiexec environment on Telestra\_A*

**Step 2.** Change to the DMSO RTI “bin” subdirectory and type “. /rtiexec”.

```
[hlauser@Telestra_A config]$ . rtienv.sh
RTI_HOME           : /opt/rti/RTI-1.3NGv4
RTI_BUILD_TYPE     : Linux-rh62-i386-egcs-2.91.66-opt-mt
System Libraries   : /opt/rti/RTI-1.3NGv4/Linux-rh62-i386-egcs-2.91.66-opt-mt/lib:

[hlauser@Telestra_A config]$ cd ../bin
[hlauser@Telestra_A bin]$ ./rtiexec

The RTI Executive process no longer accepts input to interrogate
or control the federation executions. Instead a separate RTI
Console application provides this functionality. The RTI Console
was designed to improve usability and add the ability to be run
at multiple locations. Please consult the RTI Installation Guide
for further information concerning the RTI Console application.

Hit Ctrl-C to make rtiexec exit

Multicast Discovery Endpoint: 224,9,9,2:22605
Advertising launching service as Launcher/192,168,101,2

rtiexec (process = 2324) initialization complete.
█
```

*Step 2 Figure Running rtiexec on Telestra\_A*

**Step 3.** On each machine, run the host emulator utility from any console and enter the command “join”.

```
[hlauser@Telestra_A hlauser]$ hostemu.py 45001
Trying port 45001 on host 127.0.0.1
Connected to port 45001
Hit ctrl-c<enter> to quit

life count: 0x0
<Attribute Updates>
  rx: 0x0 | tx: 0x0 | ignored: 0x0
<Interactions>
  Audio | rx : 0x0 | tx : 0x0
  TDL   | rx : 0x0 | tx : 0x0
  Attach | rx 0x0
<Objects>
  Transmitters | local : 0x0 | rti : 0x0
  Entities     | local : 0x0 | attached : 0x0
<Backchannel (Telestra <=> DACS)>
  Tx/Rx | rx : 0x280 | tx : 0x0
  Audio | rx : 0x0 | tx : 0x0
<Backchannel (Telestra <=> WAN)>
  Tx/Rx | rx : 0x10 | tx : 0x4
  Audio | rx : 0x0 | tx : 0x0
ENDLIST
```

*Step 3 Figure: Telestra federate before the join command*



**Step 4.** Wait for the federate software to return “JOIN OK” to indicate a successful join operation. If the software returns “JOIN FAIL”, double check the network configuration on each machine.

```
join
JOIN Federation1 OK

life count: 0xbc
<Attribute Updates>
  rx: 0x0 | tx: 0x0 | ignored: 0x0
<Interactions>
  Audio | rx : 0x0 | tx : 0x0
  TDL   | rx : 0x0 | tx : 0x0
  Attach | rx 0x0
<Objects>
  Transmitters | local : 0x0 | rti : 0x0
  Entities     | local : 0x0 | attached : 0x0
<Backchannel (Telestra <=> DACS)>
  Tx/Rx | rx : 0x2d0 | tx : 0x0
  Audio | rx : 0x0 | tx : 0x0
<Backchannel (Telestra <=> WAN)>
  Tx/Rx | rx : 0x14 | tx : 0x34
  Audio | rx : 0x0 | tx : 0x0
ENDLIST
```

*Step 4 Figure: Telestra federate after the join command*

```

The RTI Executive process no longer accepts input to interrogate
or control the federation executions. Instead a separate RTI
Console application provides this functionality. The RTI Console
was designed to improve usability and add the ability to be run
at multiple locations. Please consult the RTI Installation Guide
for further information concerning the RTI Console application.

Hit Ctrl-C to make rtiexec exit
Multicast Discovery Endpoint: 224.9.9.2:22605
Advertising launching service as Launcher/192.168.1.100
rtiexec (process = 752) initialization complete.
Federation asti finished initialization with process ID 753 and Endpoint 192.168.1.100:1045
█

```

*Step 4 Figure: The rtiexec indicating successful federate initialization*

At this point, there is an “asti” Federation with two Federates joined. Note that the Federate name for each Telestra system was generated based on the Hostname and IP address of the individual machine. In order to properly destroy the federation, you must:

1. Resign each Federate by typing resign at the Telestra > prompt on both Telestra systems.
2. Stop the rtiexec process using CTRL-C.

## Appendix B: Telestra Compatibility Table

	<b>RTI*</b>	<b>SOM</b>	<b>Model Builder</b>
<b>Telestra HLA v1.6</b>	DMSO 1.3NGv4 DMSO 1.3NGv3.X MAK 1.3.5a	3.0 3.1 3.2	4.06d or higher
<b>Telestra HLA v1.4</b>	DMSO 1.3NGv3.X	3.0	4.06d or higher
<b>Telestra HLA v1.2</b>	DMSO 1.3NGv3.X	3.0	4.04e or higher
<b>Telestra HLA v1.1</b>	DMSO 1.3NGv2	3.0	4.04e or higher

\* All RTIs must be compatible with the Linux Red Hat 6.X operating system.