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ASTi
Telestra v3.0 User Guide

Model Builder Visual

Remote Management System

Document: DOC-01-TELS-UG-3

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Product Name: Telestra 3

ASTi ASTi Telestra 3 User Guide

ASTi

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Chapter 1: Introduction

ASTi's Telestra product line consists of a network scalable, high performance, Linux-based hardware platform, USB-based digital audio and I/O distribution equipment, and ASTi's powerful and comprehensive Model Builder Visual communications and audio development/runtime environment.

In addition, Telestra supports a variety of additional software services and packages to meet even the highest of communications simulation requirements including:

- HLA Communications
- High-Fidelity (HF) Radio Environment
- Automatic Link Establishment (ALE) for HF Radios
- Satellite Communications
- Terrain Interface and Database
- Link-16 Tactical Data Link
- Remote Management System (RMS)
- Network Time Protocol (NTP)
- Multicast Router

ASTi documentation is also available for download from ASTi's website at:

`http://www.asti-usa.com/support/document`

Remote Management System

The Telestra Remote Management System (RMS) is a specialized web server that provides complete sight and control of all ASTi devices on the simulation network, ranging from stand-alone to multi-site, exercise-wide network configurations. Users can configure the HLA Communications Environment, multicast routing capability, and other services using a standard web browser from anywhere on the network. Further, RMS offers a familiar point-and-click "web page" interface for controlling ASTi resources, status checking, and file and network management.

Additional software packages will be documented as they are added into RMS version 3.x.

HF Radio Propagation Server

The ASTi HF Server provides real-time, high-fidelity modeling of HF radios using the Model Builder Virtual radio environment. The HF Server computes propagation effects between virtual radios, taking into account such things as transmitter-receiver global position, season, time of day (day-night terminator), and solar activity.

Automatic Link Establishment (ALE) Server

The ASTi ALE Server is used in conjunction with the ASTi HF Radio Propagation Server to realistically simulate the functionality of modern HF Automatic Link Establishment radios. The ALE Server allows a host computer to initiate the server with lists of radios and scan frequencies, and perform basic simulated ALE functions, such as soundings and calls. The ALE Server will typically perform a propagation analysis, and return a list of radio IDs (or callsigns) and realistic Link Quality Assessment (LQA) numbers, which depend on radio and environmental factors.

HLA Communications Environment

For High Level Architecture (HLA) applications, Telestra comes with ASTi's federate software and various test, support, and debug tools pre-installed. The federate software is designed to be compatible with various RTIs. Please consult Appendix A: Telestra Software Compatibility for a listing of which combinations of RTI versions, SOM versions, and Telestra versions have been tested by ASTi.

The HLA sections of this guide assume the user has a basic understanding of the HLA, and should be familiar with such terms as *federate*, *federation*, *RTI*, etc.

Chapter 2: System Installation

After unpacking the ASTi Telestra unit, connect power, network, keyboard and monitor to the system as described in Figure 1.

Remove all plastic packaging from the ASTi Telestra unit before proceeding with the system installation.

Note: As technology evolves, the Telestra chassis will continue to change.
Look for these objects on the **rear** of the chassis, and connect as appropriate.

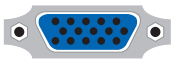
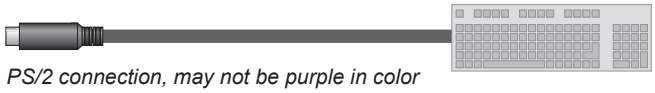
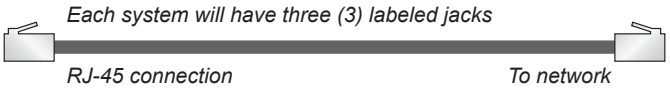
	**Power Cord In**	
	**Main Power Switch**	*May not be present on all systems*
	**Video Output**	
	**Keyboard**	
 **x3**	**Ethernet Jack**	

Figure 1: Telestra Connections Diagram

Remember to make sure the main power switch on the rear of the Telestra chassis is switched on.

Telestra Compatibility

The user should be aware of possible hardware compatibility issues when running Telestra MBV. When using a mouse and keyboard with Telestra (primarily during development mode) the mouse and keyboard ***must*** have a PS/2 type connector ***not*** a USB connector.

ASTi recommends Microsoft and Logitech wheel mice year 2003 or later. Although this is not required, ASTi recommends, more specifically, the Logitech Mx310 mouse using the USB-to-PS/2 adapter which comes with the mouse. ASTi does ***not*** recommend using off-brand and trackball mice.

When using a mouse, the user may experience problems if it is running through a KVM (keyboard, video, and mouse) switch, and it is not directly attached to the Telestra system. ASTi recommends the 8-port Raritan MasterConsole II (part #MCC8), this KVM has been tested to work with all combinations of mice and host systems (Windows XP and Telestra). Other recommendations include the 4-port and 16-port MasterConsole II KVM switches; however, ASTi has not tested them.

A minimum 17” monitor is required, and a 19” monitor is recommended with a resolution of 1280 x 1024 or higher. The minimum requirements are a horizontal sync of 30-68 hz or greater and a vertical refresh of 50-85 Khz or greater.

Note: Telestra MBV cannot operate properly when using any USB items outside of the recommended ASTi peripherals.

Identifying your System

Depending on the system requirements there are various hard drive options installed in the Telestra. To identify your hard drive look for a part number on your system on the bottom of the carrier.

For Telestras with the **Parallel IDE** hard drive the part number on the bottom of the carrier is **DE75i-CA100/B**. The ASTi part number on top is **HD3-TL-A-R**. This part number will only appear on the drive if it is ordered as a spare drive, i.e. This label is not installed on full systems when they are initially shipped.

For Telestras with the **SATA (Serial ATA)** hard drive the part number on the bottom of the carrier is **S20J102**. The ASTi part number installed on the top of the carrier is **HD3-TL3-A-R**.

Network Interfaces

Each Telestra platform has three Ethernet connections. The physical location and function of each of these connections varies, based on the hardware installed by ASTi prior to shipment. The connections will vary over time and from system to system. ***Please read the labels on your system to verify Ethernet locations.***

ASTi recommends using the Telestra system's ***eth0*** interface to access RMS over the network. Check ASTi Application Note 48, "Telestra Networking Concepts" for complete details.

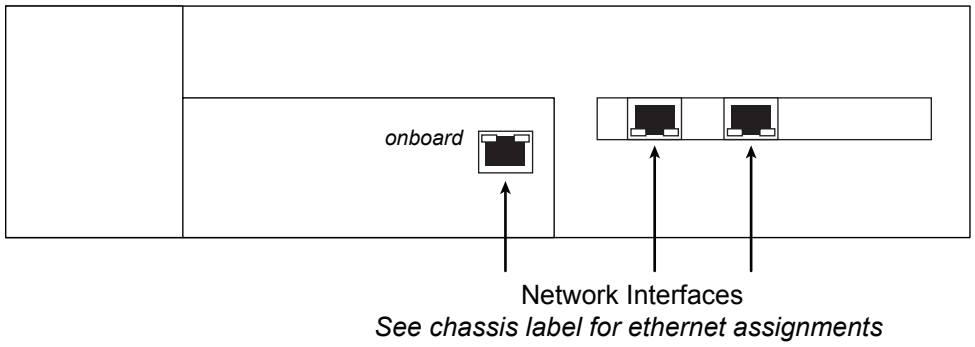


Figure 2: 2U Telestra Chassis Ethernet Port Physical Locations

Telestra systems are shipped with all necessary software pre-installed. To rebuild the system's hard disk, please see the Telestra Cold Start Procedure (DOC-01-TELS-CS-3). Turn on the Telestra system via the power switch on the front of the chassis. The system will then boot into the Linux operating system.

Connecting Telestra USB Devices

All Telestra USB devices are connected with high-quality USB cables--with the exception of Prism-to-Spectrum connections, which use standard Cat5, unshielded, twisted-pair (UTP) network cables. The high-quality USB cables have two different types of connectors: a standard “A” type connector, and a miniature “B” type connector.

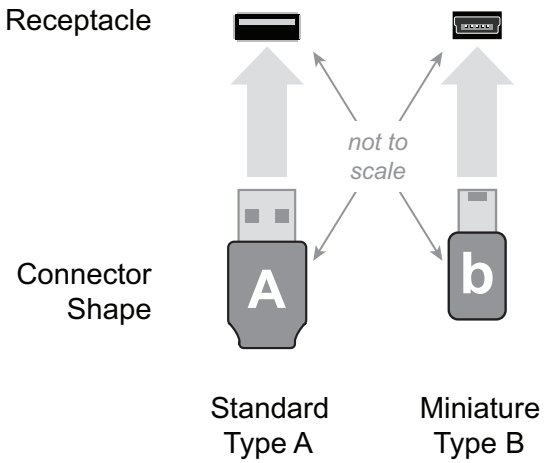


Figure 3: USB Cable Connector Identification

Connections made with this type of USB cable will always be type “A” connector upstream (closest to the Telestra unit), and miniature type “B” connector downstream (further from the Telestra).

There are four (4) USB ports on the rear of the 2U Telestra chassis:

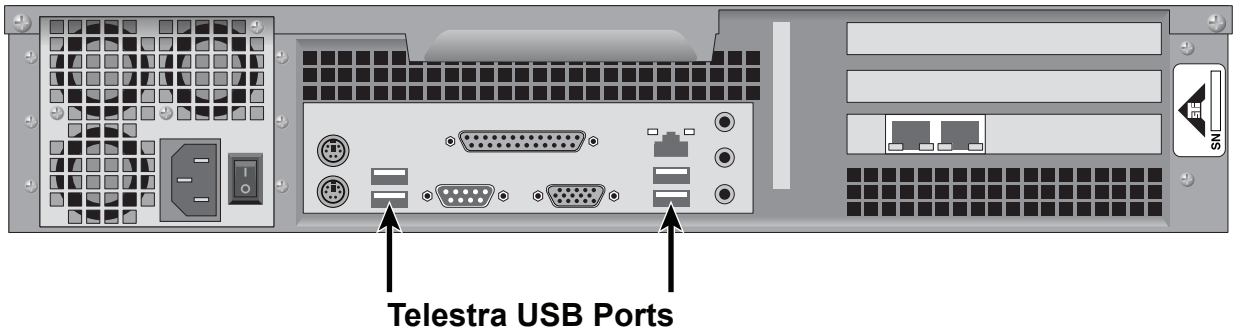


Figure 4: Telestra Chassis USB Port Locations

Only two types of devices can be connected directly to the Telestra system: the Axis (Local Distribution) module, or the Prism (Remote Distribution) unit.

When using the Axis, only Iris audio and I/O devices can be connected further downstream.

When using the 4-channel Prism unit, only Spectrum devices can be connected downstream (using Cat5 UTP cable), followed by Iris audio and I/O devices.

When using the 2-channel Prism unit, Iris audio and I/O devices can be connected locally downstream, as well as Spectrum modules for remote distribution (again, followed by Iris units).

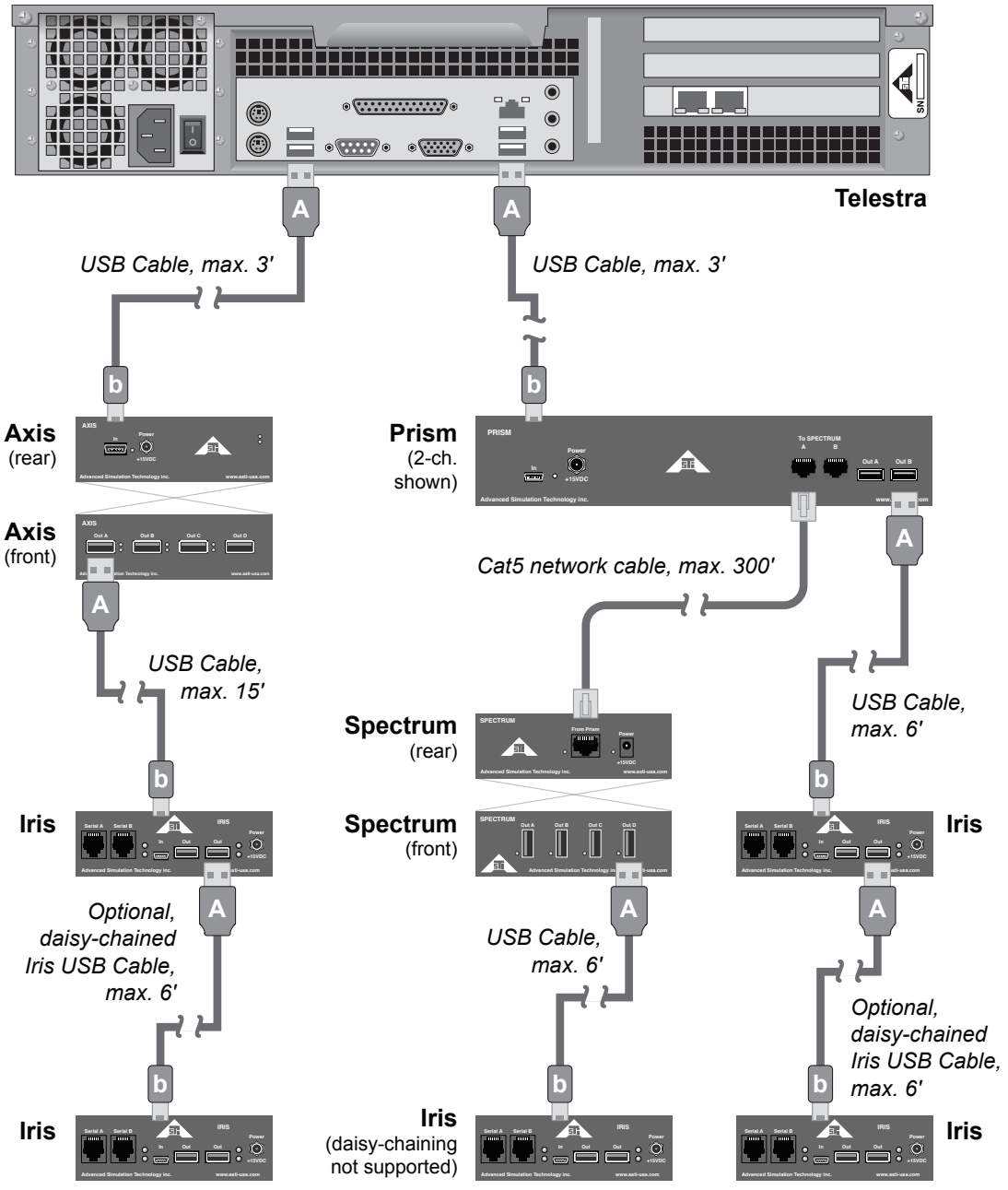


Figure 5: Master USB Connection Diagram

As shown in Figure 5 above, connection cable types and maximum lengths vary slightly, depending on the types of devices being connected. Table 1 below collects this information.

From Device	To	Cable Type	Max. Length (ft.)
Telestra	Axis	USB A to mini-B	3
Axis	Iris	USB A to mini-B	15
Iris (connected to Axis)	Iris	USB A to mini-B	6
Telestra	Prism	USB A to mini-B	3
Prism	Spectrum	Category 5 or better, Unshielded Twisted Pair (UTP)	300
Prism (2 channel version)	Iris	USB A to mini-B	6
Spectrum	Iris	USB A to mini-B	6
Iris (connected to Spectrum)	Iris	not supported	n/a

Table 1: Connection Cable Types & Maximum Lengths

Please note that a maximum of two (2) Iris audio and I/O devices may be attached to any single Spectrum module.

Power-On Ordering Requirements and Lost USB Devices

The USB audio distribution architecture has specific requirements regarding the power on sequencing of devices in order to achieve a working system. The Telestra processor system must perform a discovery process in order to find all the devices that are connected, and hence this system is started last in the sequence of elements. The discovery process runs as part of the system framework boot process, or it is manually initiated from RMS, by clicking the “Hardware” tab, and then the “Reset USB network” link. Prior to this all other elements of the USB sub-system must be connected, and powered on. **Note** that the Prism/Spectrum extender architecture should be powered on before or simultaneously with the Iris audio interface units.

If any element of the USB sub-system is powered off and then back on again without rebooting the Telestra processor, or initiating a manual USB discovery, then the result will be that those devices are “lost” to the system, and will no longer process audio. The most effective way to check for this condition is to look at the RMS system, select the “Hardware” tab, and then the “Layout” tab. Any Iris units that were connected at the time of system boot and have been subsequently powered off will show up with a red ‘X’ through the device. If profiling is turned on (see Chapter 6: Telestra RMS Web Interface for details), then any device that is not active on the USB sub-system will be reported with a red ‘X’. To recover from this situation, power on the required USB devices (Prism devices first, Iris devices last), and then either reboot the Telestra, or initiate a manual USB re-discovery using RMS. If using RMS, once the re-discovery process has completed, it will be necessary to reload the model.

For more information about individual USB devices, their power requirements, connections, etc. please see:

- Iris Technical & User Guide (ASSY-01-UMAU-UG-1)
- Axis Technical & User Guide (ASSY-01-UMLD-UG-1)
- Prism/Spectrum Technical & User Guide (ASSY-01-UMRXRD-UG-1)
- Telestra USB Device Connections Matrix (ASSY-01-UMCX-IN-1)

Chapter 3: Starting and Stopping the Telestra System

Telestra runs the Linux operating system, and must be started—and more importantly shut down—in the correct manner.

Starting Telestra

To start the unit, apply power via the on/off switch on the front of the chassis. The system will begin to boot. Once the loader is ready, the following screen will be displayed, providing your boot options:

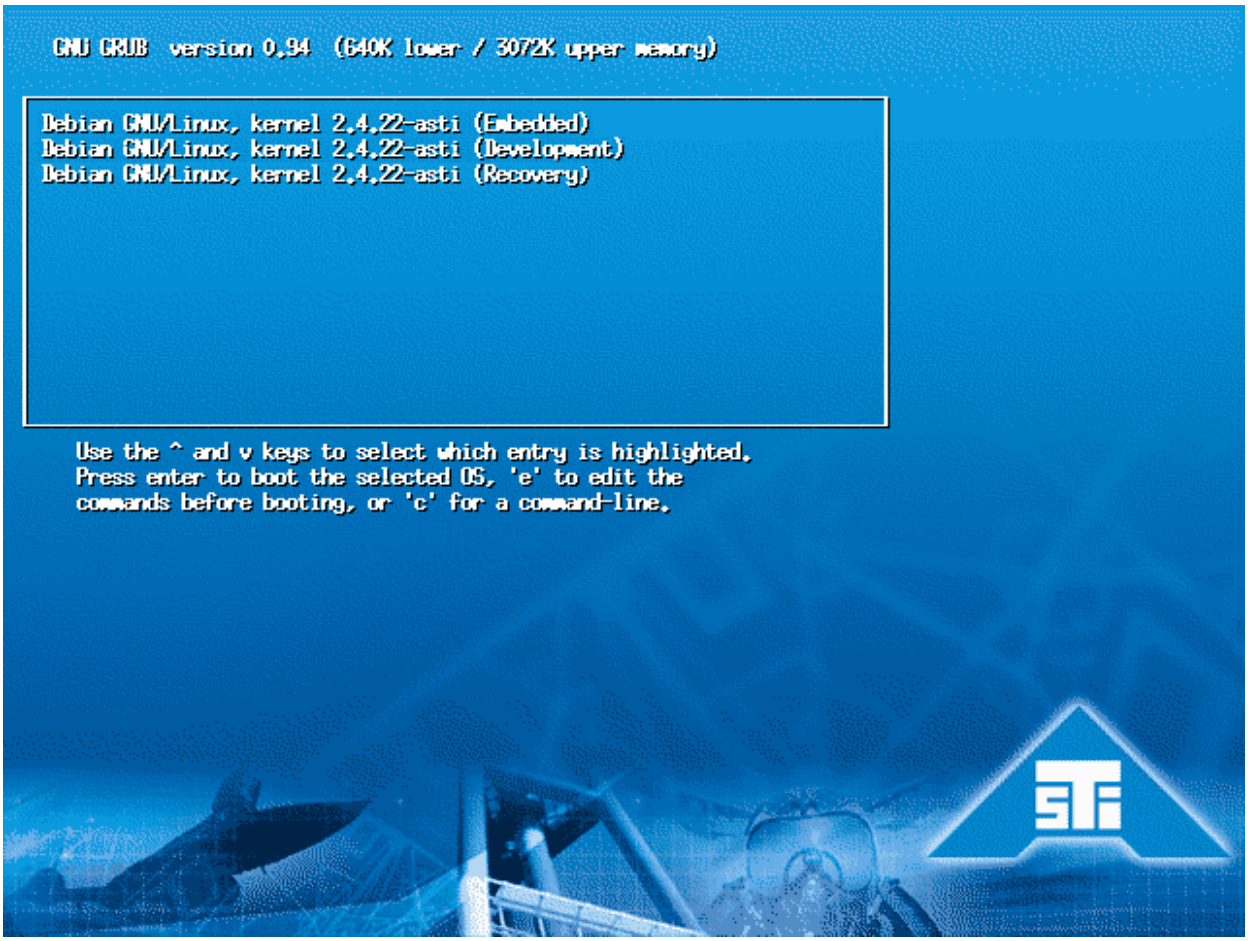


Figure 6: Telestra Boot Options

"Embedded" mode is the default runlevel, unless the runlevel is changed in RMS. In this mode, the system will boot, load and run the default MBV model. This is the recommended boot mode. Press the Enter key, or simply wait a few seconds, to have Telestra start in Embedded mode.

After bootup is complete, the user may log into the system from virtual consoles 2 through 6; console 1 is used for the Telestra Configuration Utility (see Chapter 5: Initial Network Configuration).

To switch to a particular console, press and hold the ALT key, and then press the corresponding function key (F1 through F6). For example, the user may switch to the second console by pressing ALT+F2.

System Shutdown

Local

The system can be rebooted and shutdown by selecting the “Reboot” or “Shutdown” button in the Telestra Configuration Utility (see Chapter 5).

Alternately, 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.

Remote

The system can be rebooted and shutdown via the RMS web interface, through links in the “Telestra Actions” section.

Chapter 4: Initial Network Configuration

Default Network Settings

After initial software installation or system cold start, Telestra Ethernet interface ***eth0*** tries to obtain a network IP address and subnet mask using DHCP. In order to obtain these network settings, a DHCP server must exist on the network intended for use by ***eth0***. If Telestra cannot contact a DHCP server using ***eth0***, it will assign a meaningless IP address of 0.0.0.0 to that interface.

Telestra's other two Ethernet interfaces are assigned default IP addresses and subnet masks. Refer to Figure 2 for the physical locations of the Ethernet ports.

Interface	Default IP Address	Default Subnet Mask
eth0	via DHCP or 0.0.0.0	via DHCP or none
eth1	192.168.100.254	255.255.255.0
eth2	20.1.1.1	255.0.0.0

Table 3: Default Network Settings

If you do not wish to use DHCP to configure ***eth0*** (or if the network does not have a DHCP server), use the Telestra Configuration Utility to manually specify its IP address, subnet mask and gateway IP. This will change ***eth0***'s operational mode from "DHCP" to "fixed."

After initial software installation or cold start, any Ethernet interface can be configured manually ("fixed" mode), or toggled to use DHCP to obtain its proper network configuration at any time. This is done through the "Telestra Networking" section of RMS.

Ask your network administrator for valid IP addresses and subnet masks for the network(s) where Telestra will be integrated.

The procedure outlined in the "Telestra Configuration Utility" section is only required after initial system installation or system cold start, and requires a keyboard and monitor be connected directly to the Telestra chassis.

After initial configuration of interface ***eth0*** (if not using DHCP), users must use the RMS web interface to change settings for Telestra's Ethernet ports.

See ASTi Application Note 48: "Telestra Networking Concepts" (http://www.asti-usa.com/) for detailed information regarding integrating Telestra with your IP network.

Telestra Configuration Utility

Following the system boot, the monitor will display the Telestra Configuration Utility screen, as shown in the figure below.

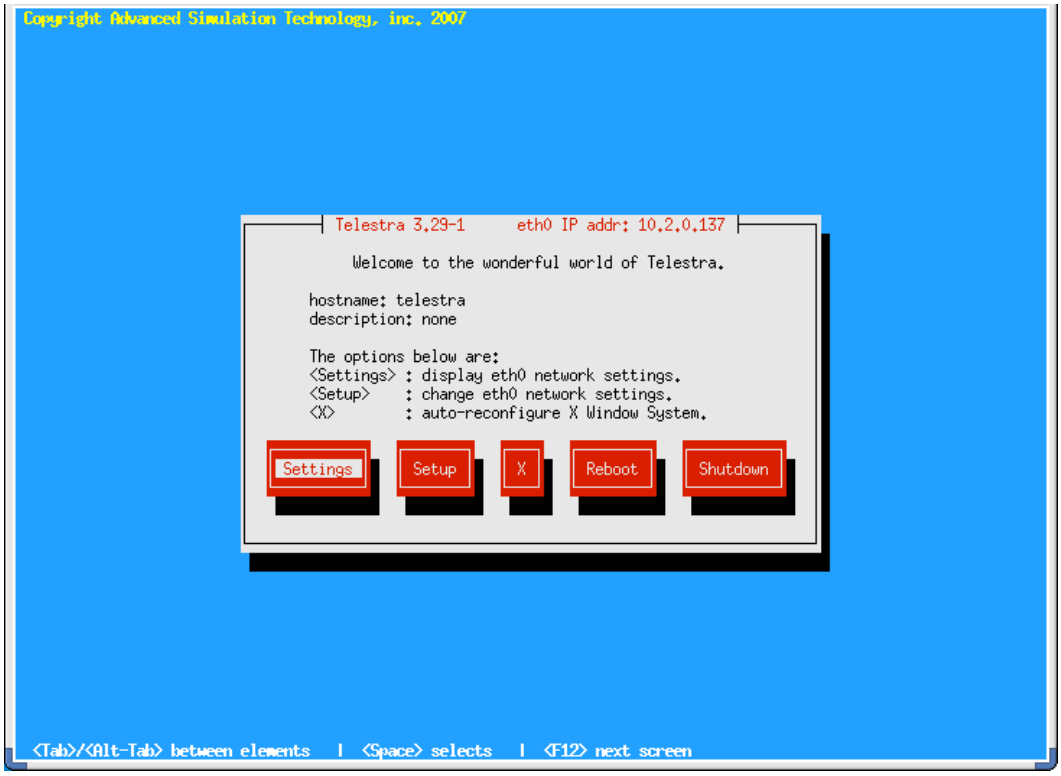


Figure 7: Telestra Configuration Utility

Press the TAB key to move between elements (the current selection will be highlighted), or hold down the ALT key, and press TAB to reverse the toggle order.

NOTE: The Telestra system can be restarted or shut down from this screen, these options are also available from the RMS web interface after initial network configuration.

Highlight the “Settings” option and press the space bar or Enter key to view the system’s current IP address, network gateway, and subnet mask (netmask) settings. An example is shown in Figure 23.

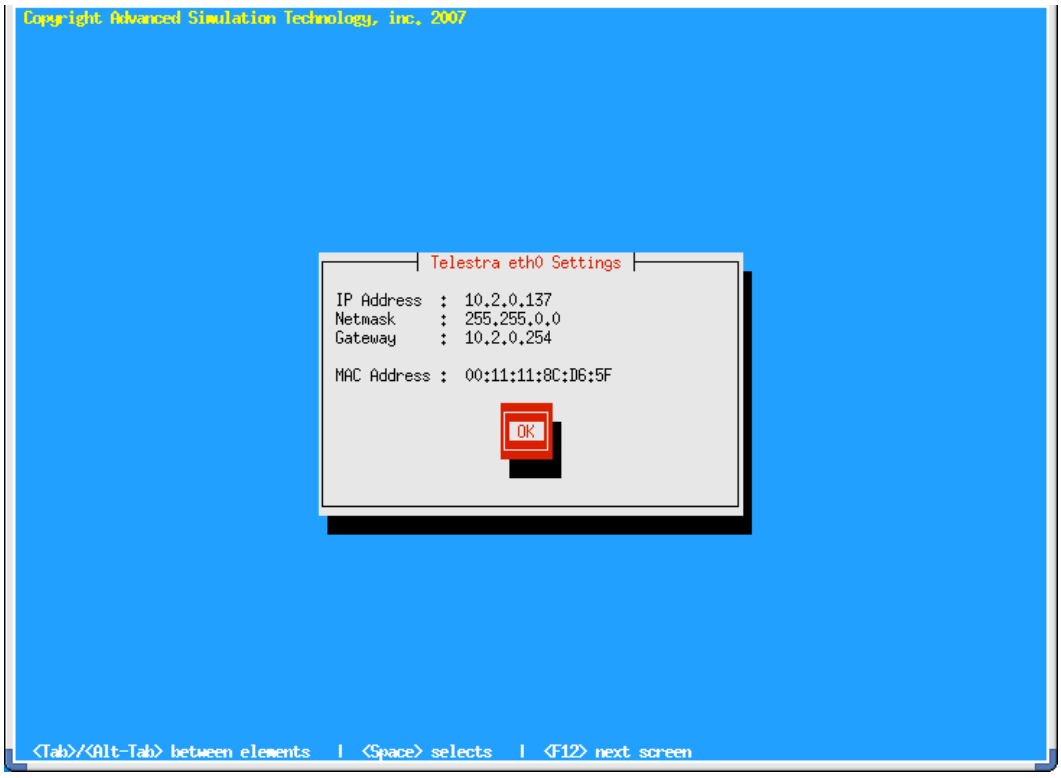


Figure 8: Telestra Settings Screen

Immediately after the initial system installation or cold start, these settings represent ***eth0*** information obtained by a DHCP server on the network, or these settings will show an IP address of 0.0.0.0 with no subnet mask or gateway IP.

Press the space bar or Enter key to select “OK”, or press the ESC key to return to the main menu.

From the main screen, press TAB or ALT+TAB to highlight the “Setup” element, and press the space bar or Enter key. This will display the “Change IP Settings” screen, shown below.

Figure 9: Change IP Settings Screen

Note that this will only affect settings for Ethernet card ***eth0***. To change settings for ***eth1*** or ***eth2*** use the RMS web interface. Specifying network information on this screen will change ***eth0***'s operational mode from "DHCP" to "fixed".

Specify the desired IP address, netmask, and gateway for the simulation network, pressing the Enter key after each element. If you are unsure of these settings, contact your network administrator for more information. Use the TAB key to highlight "OK", and press the space bar or Enter key to write the settings to the Telestra's hard disk; the system will then restart the network software. Afterward, RMS can be accessed via the web-browser interface.

Starting with Telestra software version 3-28.1 the Telestra Configuration Utility has an ‘X’ button, click this button to automatically reconfigure the X Window system for the connected monitor. Then click ‘Ok’ to reboot the Telestra.

The X Window system configuration is the last step during the initial system installation or Cold Start, therefore if a Telestra is moved/shipped to a location with a different monitor after the Cold Start the user should update the window system configuration.

Figure 10: Auto-Reconfiguration of X Windows System

Chapter 5: System Accounts & Services

Telestra User Accounts

Starting in Telestra software version 3.27-1, every Telestra system features two completely separate sets of users: “RMS users” and “system-level users”. This isolation of certain users from some of the Telestra system’s capabilities enhances the inherent security of the Telestra system as a whole.

Regardless of the Telestra system’s built-in restrictions placed upon different types of users, ASTi highly recommends following only the safest practices when granting physical or network access to the Telestra system.

All user account logins and passwords are case-sensitive.

RMS Users

This type of user account grants access to Telestra’s web-based RMS interface only. RMS users do not have any additional access to the Telestra system. They cannot log into Model Builder Visual, nor can they log into the Telestra system’s Linux console or access the system via SSH. Because of this restricted access, RMS user accounts are--to a certain extent--much less powerful than system-level users.

Further, there are two sub-types of RMS users: privileged and unprivileged.

Privileged RMS Users

Privileged RMS users are allowed to perform actions via RMS that unprivileged users cannot. All of these actions will be covered later, but include:

- Creating new RMS users (privileged or unprivileged)
- Changing any RMS user’s password
- Deleting RMS users
- Creating new system-level users
- Deleting system-level users (except root)
- Turning system lockout on or off
- Setting the number of failed user logins that will result in lockout
- Resetting (unlocking) any RMS or system-level user to re-grant access to Telestra
- Viewing Telestra system log files

Unprivileged RMS Users

These users cannot perform any of the functions listed above. They can, however, change their own password, and access all other areas of RMS.

Important: Due to the amount of functionality built into RMS, it is not safe to assume that an unprivileged RMS user is harmless. These users can (among other actions) change the system configuration, load models, change hardware mapping, and reboot or shut down the Telestra machine.

The Default Privileged RMS User

The only RMS user that exists after system installation or cold start is “rmsuser” (without the quotes). The default password for this user is “astirules” (without the quotes). For security purposes, ASTi highly recommends that the Telestra system administrator follow these steps to change RMS’ default configuration:

1. Log into RMS using the default credentials above.
2. Create a new privileged RMS user with a unique password in the “Manage Users” section.
3. Log out of RMS. This is necessary because you are not allowed to delete the privileged account that you used to log into RMS.
4. Log into RMS using the new privileged user’s credentials.
5. Delete the default (rmsuser) account in the “Manage Users” section.

System-Level Users

This type of account is a standard Linux (or Unix) user account. These users can access the Telestra system via the Linux console and SSH. They can also log into Xwindows and launch Model Builder Visual. Model development can only be performed by system-level users.

System-level users do not have access to the RMS interface.

Default System-Level Users

There are two system-level user accounts created on system installation.

User Account	Account Type	Password	Change Password?	Login	Remote Login	SFTP
mbvuser	Linux system	n/a	n/a	no	no	no
rmsuser	Linux system	astirules	yes	yes	yes	yes

Table 2: User Accounts

Of these, only the mbvuser account is required for proper Telestra operation. ***DO NOT delete the mbvuser account***. The rmsuser account can be deleted safely. If you do not delete the rmsuser account, ASTi strongly recommends changing its password immediately after software installation or cold start.

Telestra User Account Management

Creating RMS Users

RMS users can only be created via the RMS interface, and only by a privileged RMS user. After logging in as a privileged RMS user, click the “Manage Users” link in the blue header bar (or the link in the page footer next to the time stamp) to access the “Telestra User Management” page in RMS.

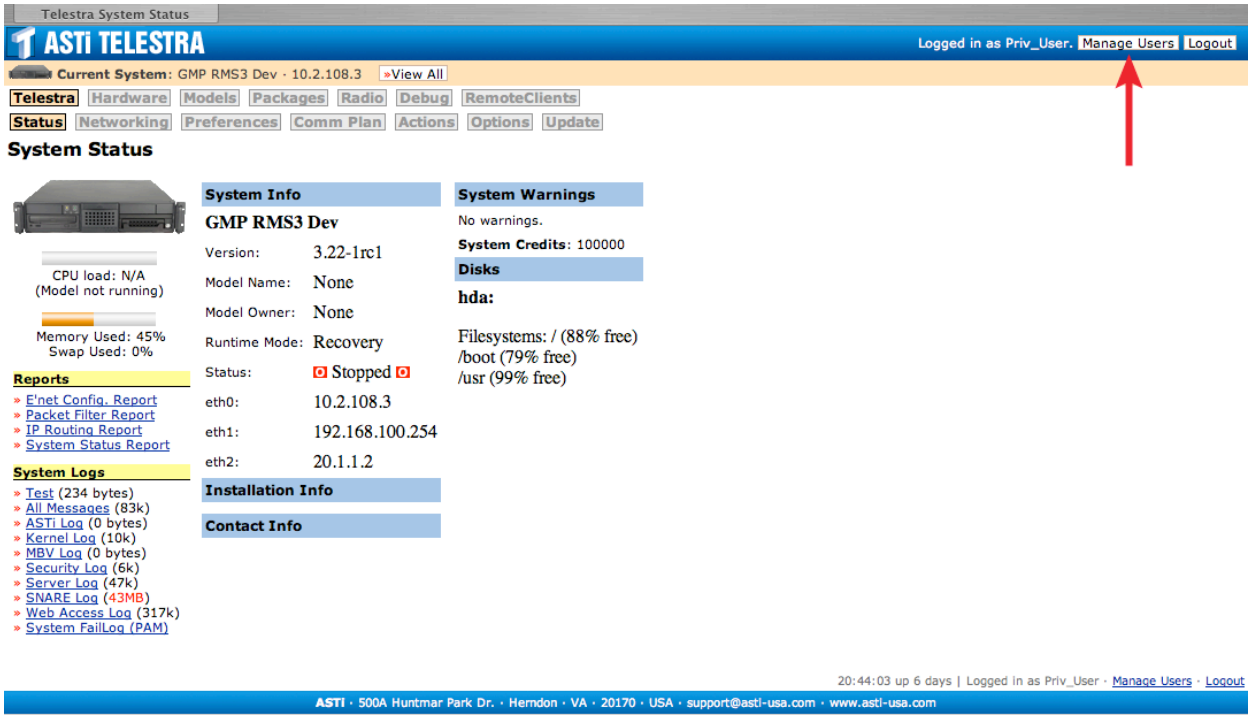


Figure 11: RMS Telestra Status

Under the “RMS Users” section (the middle column), look for the “Add New RMS User” form. Supply your privileged user password, new RMS user name, new RMS user status (standard or privileged) and the new user’s password twice (to guard against typographical errors). Then, click the “Add RMS User” button at the bottom.

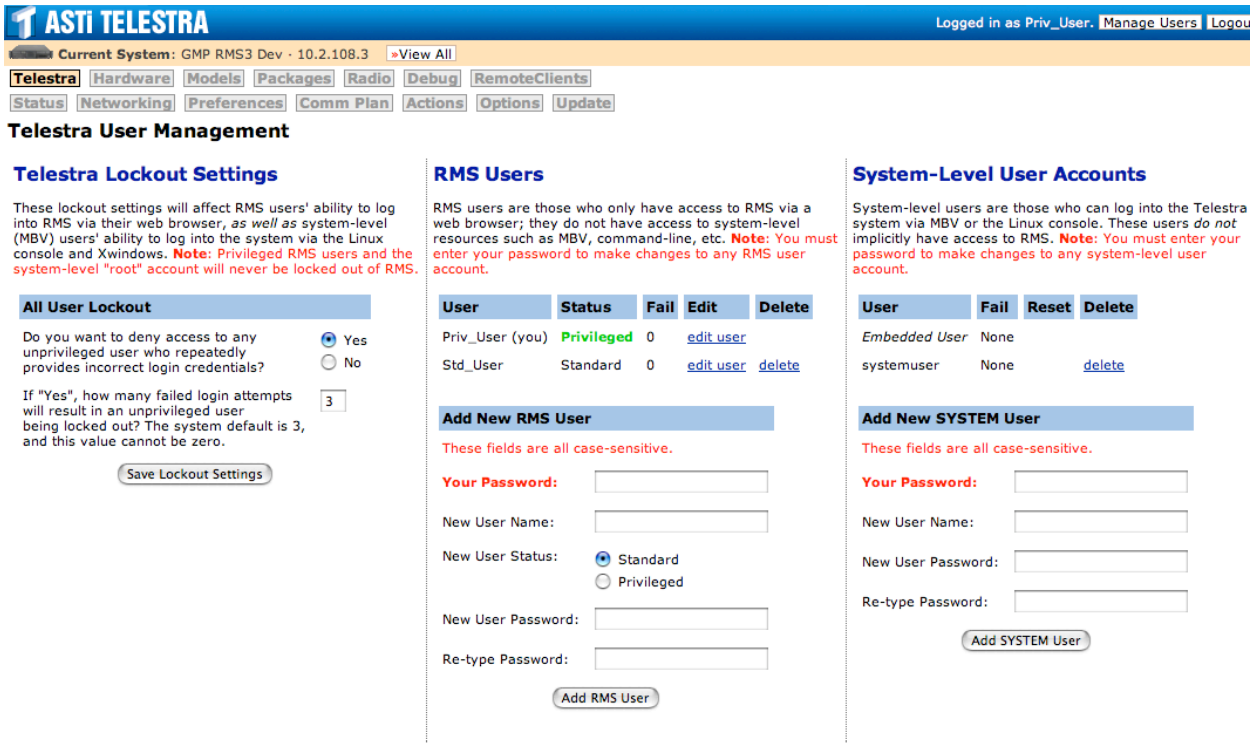


Figure 12: Telestra User Management - RMS Users

After the new RMS user is added, the “Telestra User Management” page will refresh, and the new user will appear in the list above the new user add form.

Changing RMS Users

Any privileged RMS user can change any other RMS user's password or account status (i.e., privileged or standard). To do this, the privileged user must click on one of the "Manage Users" links as shown in Figure 7, and click the "edit user" link in the desired user's row:

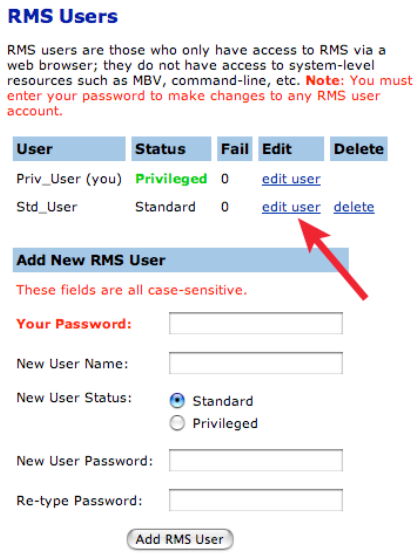


Figure 13: Changing RMS Users

This will display the "Edit RMS User" form.

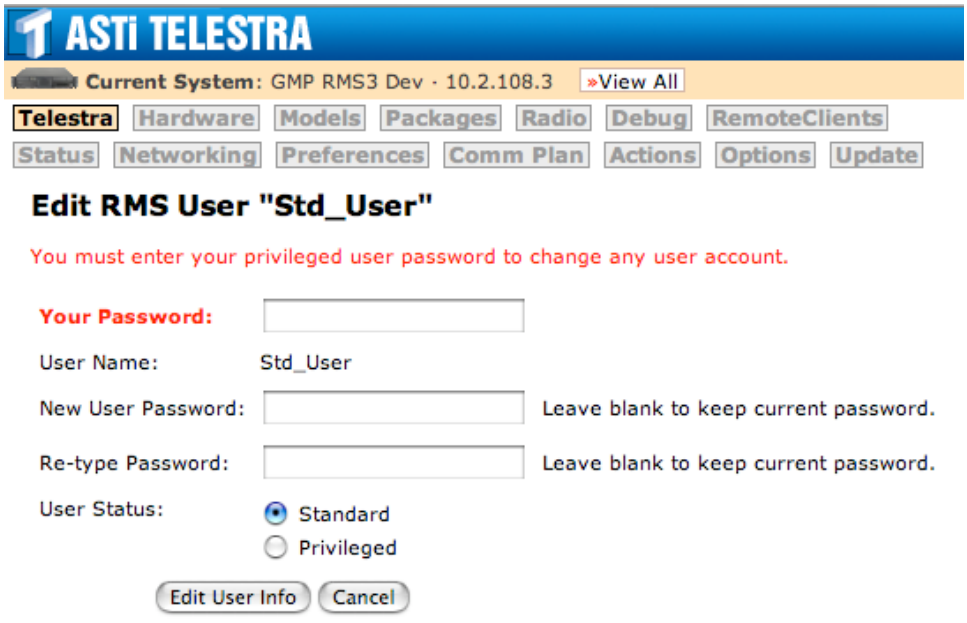


Figure 14: Editing RMS User

The privileged RMS user must supply his/her own password to make changes to any other user account. Any password change requires entry of the new password twice.

A privileged RMS user can also change their own password, but cannot change their own account status (i.e., cannot make it unprivileged) using the same “edit user” link. A privileged user must enter his/her old password to change the password for his/her account.

An unprivileged RMS user can only change the password of his/her account. The standard RMS user must click the “Edit” link in the RMS header.

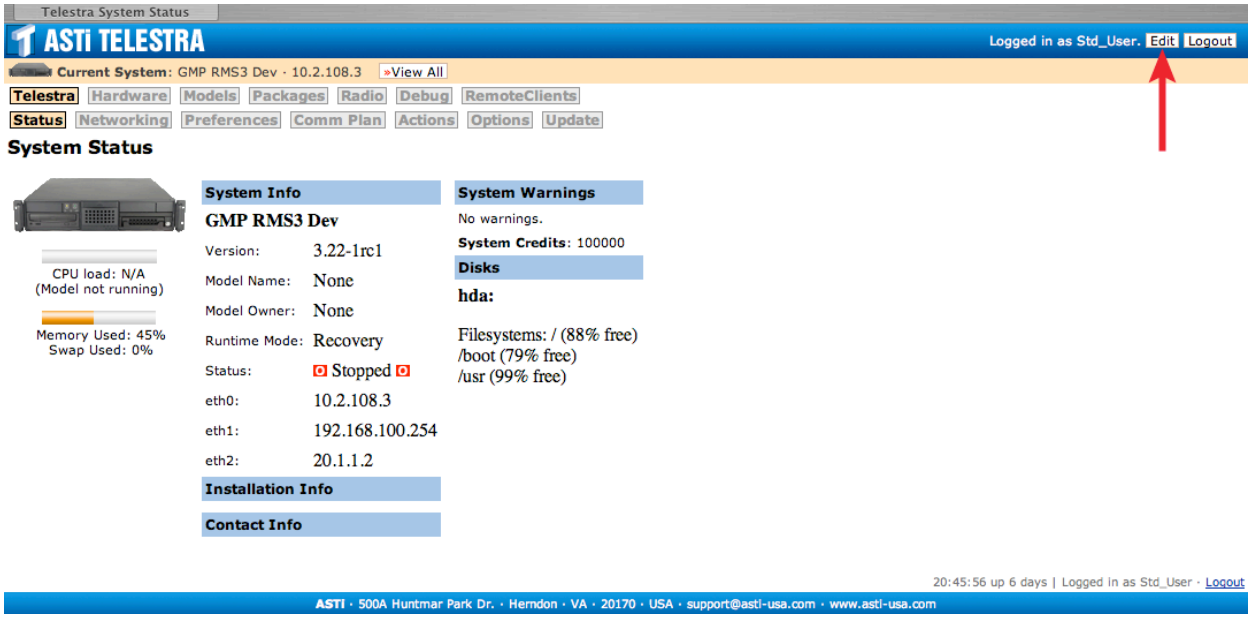


Figure 15: Telestra Status - Editing RMS Users

This will display the “Edit RMS User” form, as shown in Figure 10 above. The standard RMS user must also supply his/her old password in order to change it, and enter the new password twice.

Deleting RMS Users

Only a privileged RMS user can delete another RMS user. To do this, the privileged user must click on one of the "Manage Users" links as shown in Figure 7, and click the "delete" link in the desired user's row:

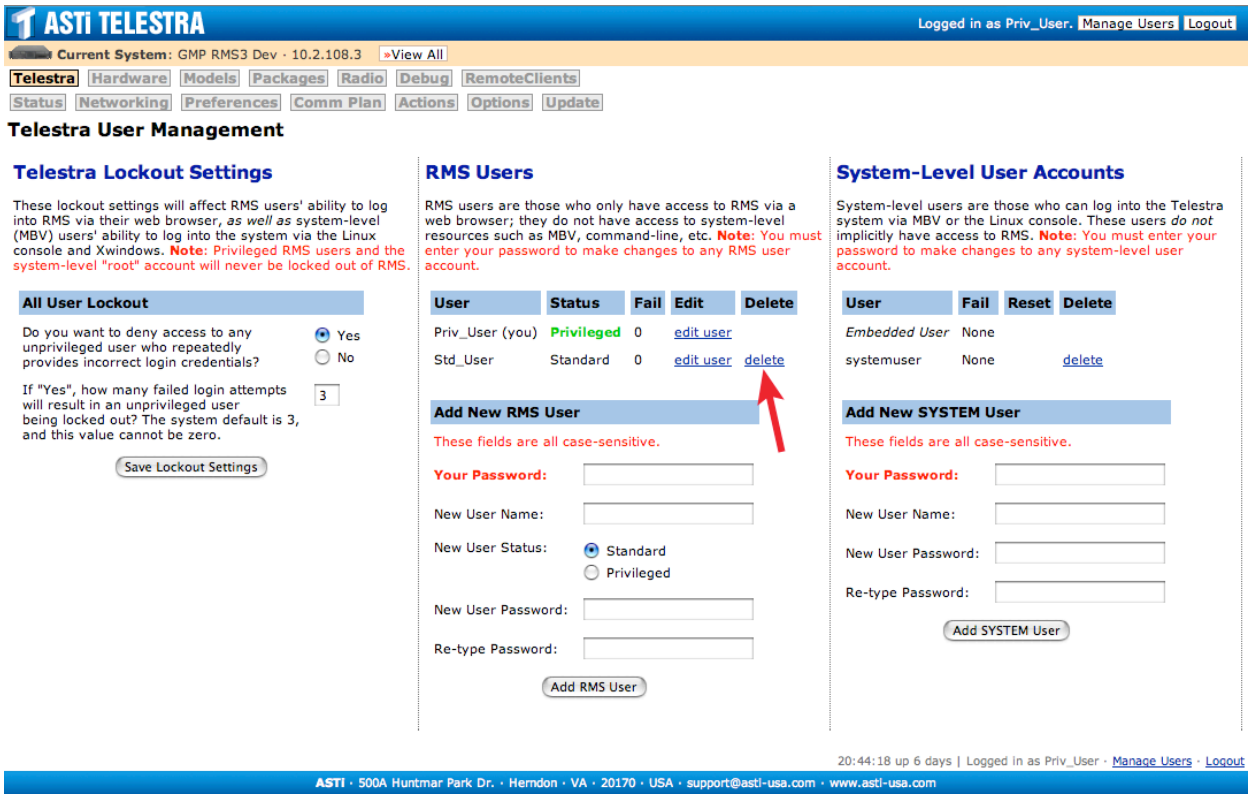


Figure 16: Deleting RMS Users

This will display the "Confirm User Deletion" form.

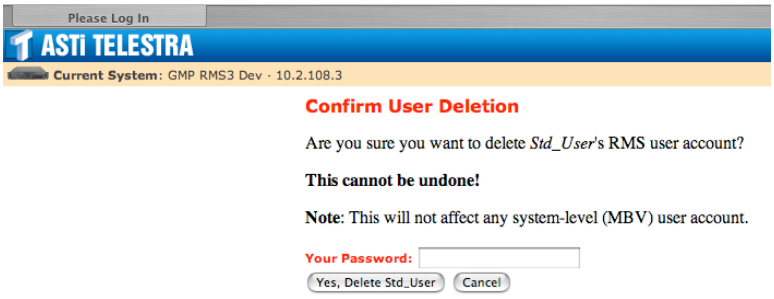


Figure 17: Deleting RMS Users Confirmation

The privileged user must supply his/her password (***not*** that of the user being deleted) in the space provided, and click the "Yes, Delete..." button to continue. After the user has been deleted, RMS will display the "Telestra User Management" page, and the deleted user will no longer appear in the users list.

Creating System-Level Users

System-level users can also be created via the RMS interface. As with RMS users, only a privileged RMS user can create a new system-level user. After logging in as a privileged RMS user, click on one of the "Manage Users" links as shown in Figure 7.

Under the "System-Level User Accounts" section (the right-hand column), look for the "Add New SYSTEM User" form. Supply your privileged user password, new user name, and the new user's password twice (to guard against typographical errors). Then, click the "Add SYSTEM User" button at the bottom.

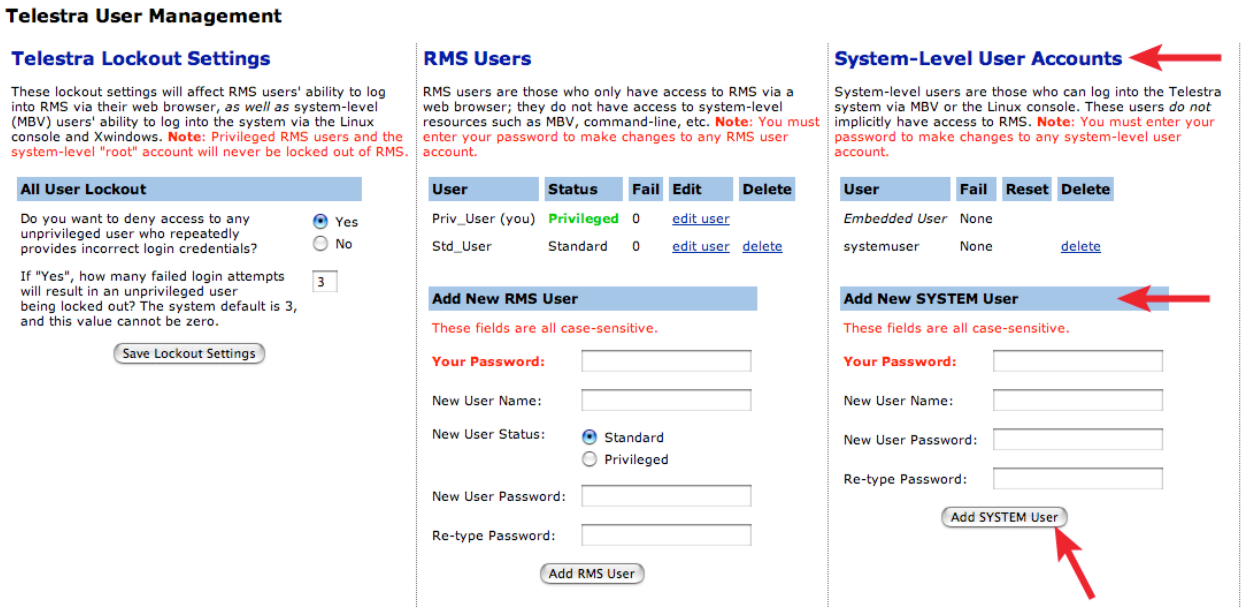


Figure 18: Creating System Level User Accounts

After the new system-level user is added, the "Telestra User Management" page will refresh, and the new user will appear in the list above the new user add form.

Changing System-Level Users

Due to the complexity of the procedure, it is not possible to change a system-level user's password via RMS; this can only be done via the Linux command line.

To change a users password, log into the Telestra system using that user's name and current password via the Linux console or SSH. At the prompt, type "`passwd`" (without the quotes) followed by the Enter key. Then, follow the directions printed on the screen.

The same procedure can be followed to change the password for the Linux system's super user, "root".

DO NOT lose your passwords! The only way to reset the root user's password is to cold-start the Telestra system.

Deleting System-Level Users

The root and "Embedded User" (mbvuser) accounts cannot be deleted via RMS. Only a privileged RMS user is allowed to delete a system-level account. To do this, the privileged user must click on one of the "Manage Users" links as shown in Figure 7, and click the "delete" link in the desired user's row:

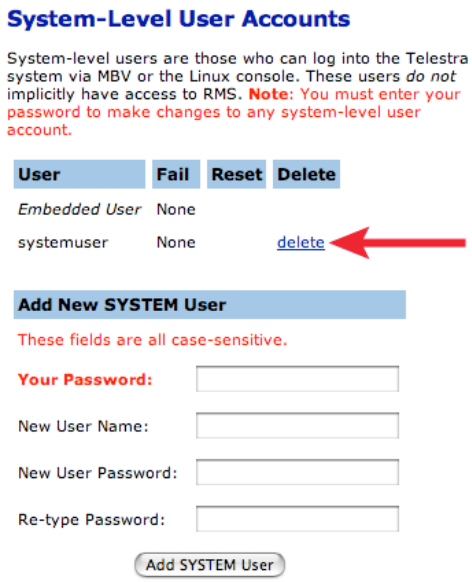


Figure 19: Delete System-Level Users Accounts

This will display the "Confirm User Deletion" form. This page also lists all the MBV models on the Telestra owned by the user.

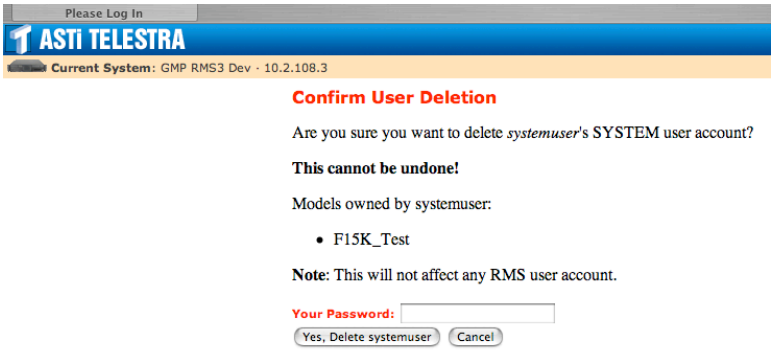


Figure 20: Deleting System-Level Users Confirmation

Important: Confirm the user deletion if--and only if--it is acceptable to delete all their MBV models as well.

To proceed, enter the privileged RMS user's password (***not*** that of the system-level user being deleted) in the field provided, and click the "Yes, Delete..." button. After the user has been deleted, RMS will display the "Telestra User Management" page, and the deleted user will no longer appear in the users list.

Telestra User Lockout

Another new feature of Telestra software version 3.27 is the ability to deny access to users who repeatedly fail to log into the system with proper user name and password credentials.

Only a privileged RMS user may turn user lockout on or off.

The user lockout capability is turned off by default after system installation or cold-start.

Note: Privileged RMS users and the "root" system-level user will never be locked out of the Telestra system, even when this capability is enabled.

Enabling User Lockout

After logging in as a privileged RMS user, click the "Manage Users" link as shown in Figure 7.

In the "Telestra Lockout Settings" section (left-hand column), look for the "All User Lockout" form.

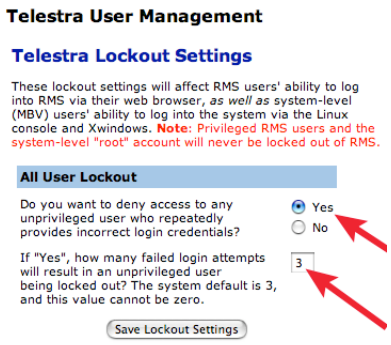


Figure 21: Telestra User Lockout Settings

Click the "Yes" button, and specify the number of failed login attempts that will result in a user being locked out (the "lockout threshold") in the field provided. The system default for this is 3, and the number provided cannot be zero. Finally, click the "Save Lockout Settings" button.

Once the settings have been saved, the "Telestra User Management" page will refresh and display a confirmation message.

How User Lockout Works

The single "Telestra Lockout Settings" section shown in Figure 17 above controls Telestra access to ***both*** RMS users and system-level users at the same time.

For RMS users, the system lockout is implemented in the RMS code itself, and does not utilize any of the Linux-based access restriction packages.

For system-level users, system lockout is implemented via Pluggable Authentication Modules (PAM) inside the Linux system itself. The state of the lockout capability (on or off) is recorded in common files on the filesystem, which are referenced by many individual services, such as console login, SSH, and Xwindows (for running MBV). Changes to these common PAM files affect the behavior of these services (and more) *en masse*, meaning if it is enabled at all, it is enabled for multiple services simultaneously.

When a Telestra (RMS or system-level) user attempts to log into the system, one of three things can happen:

If the user name provided is not a valid user, the attempt fails automatically. Because there is no record for that user name (it doesn't exist), there is no way to increment its failure count.

If the user name is valid, but the password is incorrect, the attempt will also fail. But, because that user's account actually exists, Telestra will increment its failure count by one.

If the user name and password are both valid, the attempt may or may not fail, based on that user's failure count. If their failure count is equal to or more than the lockout threshold, the system will deny all access until that user account is explicitly unlocked by a privileged RMS user. If the failure count is less than the lockout threshold (including no failed attempts), then the login will succeed, and the user will be granted access to Telestra. Note that any successful login will reset that user's failure count (if any) back to zero.

When user lockout is enabled, the "Telestra User Management" page in RMS will display each user's lockout count. If a user is locked out, RMS will display "Locked" next to the user's name.

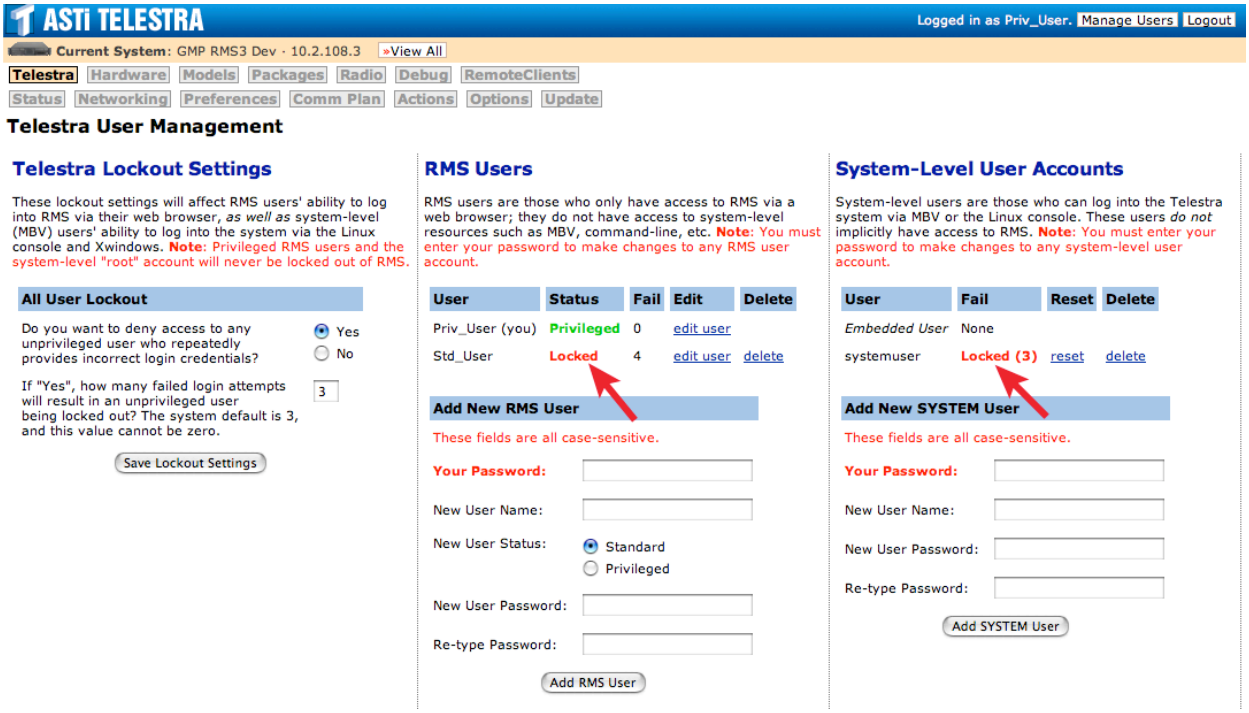


Figure 22: Users Locked out of RMS

Unlocking RMS Users

Any privileged RMS user can unlock any standard RMS user's account. To do this, the privileged user must click on one of the "Manage Users" links as shown in Figure 7, and click the "edit user" link in the desired user's row:

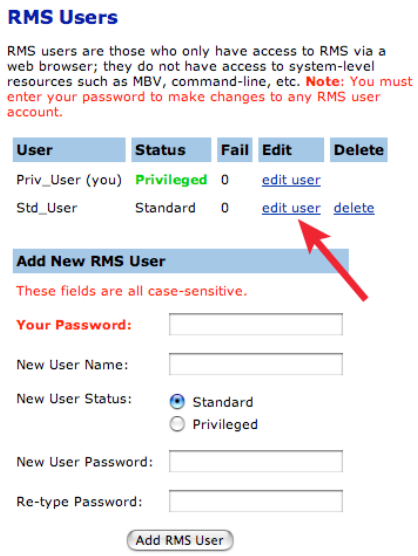


Figure 23: Unlocking RMS User

This will display the “Edit RMS User” form.

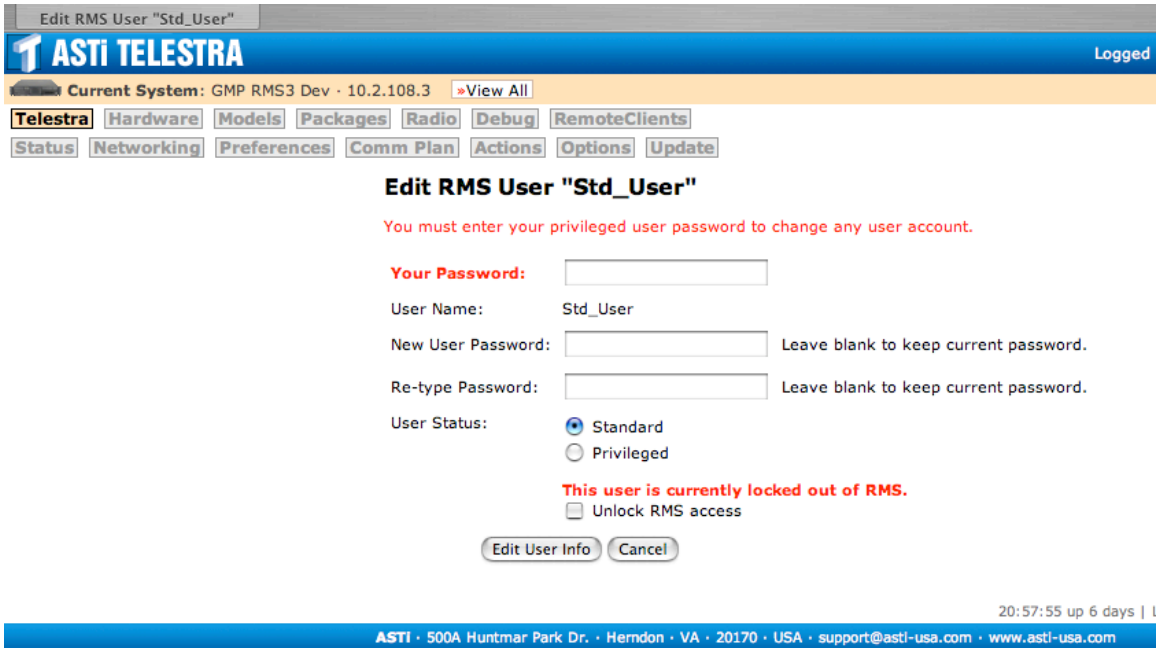


Figure 24: Editing RMS User

Only if the user account is locked out will RMS display “This user is currently locked out of RMS” on the edit form. As shown above.

To unlock the user’s account, provide the privileged user’s password in the slot provided, and mark the check box next to “Unlock RMS access” by clicking on it. Then, click the “Edit User Info” button at the bottom.

Unlocking System-Level Users

Any privileged RMS user can unlock any system-level user's account. To do this, the privileged user must click on one of the "Manage Users" links as shown in Figure 7, and click the "reset" link in the desired user's row:

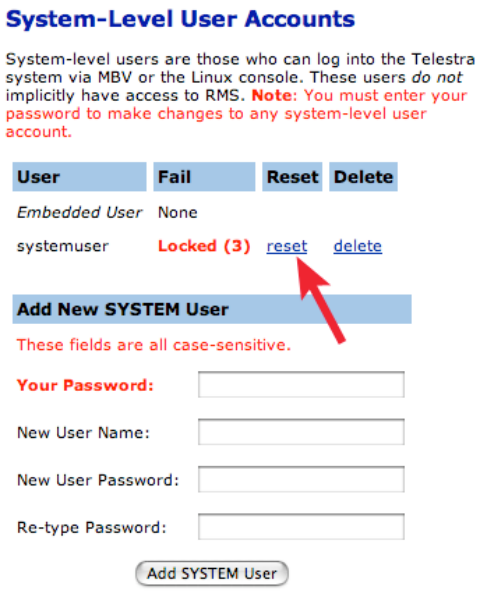


Figure 25: Unlocking System-Level Users

RMS will automatically reset that user's failure count.

File Transfer Protocol (FTP)

Telestra systems running version 3-series software do not provide a FTP server due to inherent security issues, but it does have a FTP client to connect to other FTP servers. Users can transfer files using Secure FTP (SFTP).

Command Line Access

Users can access the Linux system command line by logging in directly (monitor and keyboard connection to Telestra required), or remotely using the "`ssh`" network service. Local login prompts can be found on Linux virtual consoles 2 through 6; console 1 is used for the Telestra Configuration Utility. 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 ALT+F2.

If the Telestra system is started in Development Mode (displaying a Debian login window), users can access a system login prompt by pressing CTRL+ALT+2. To return to the Debian login window from the Linux console, press ALT+F7.

Altering the Telestra system from the command line can result in the system becoming unstable or unusable. Completely rebuilding the hard drive through Cold Start is the only path to recovery. All prior changes to the system will be lost upon Cold Start.

Secure Network Services

Telestra allows remote shell access via the "`ssh`" network service and secure file transfer through the "`sftp`" service. See your network administrator for more information.

Chapter 6: Telestra RMS Web Interface

After Telestra's ***eth0*** interface is configured to the proper network settings, the system can be accessed via any standard web browser on that network through the RMS web interface.

Browser Compatibility & System Configuration Tips

Different operating systems and web browsers offer varying levels of support for "standard" Internet technologies, such as JavaScript, Cascading Style Sheets (CSS), and Extensible Hypertext Markup Language (XHTML), all of which are used by RMS. While ASTi designed RMS with cross-platform compatibility in mind, certain combinations of OS and web browser may not render RMS' web interface properly.

Browser Settings

These are usually referred to as "Preferences" or "Internet Settings".

In order to take full advantage of RMS's features, you may have to change some of the settings for your web browser. Many of these are default settings, but ASTi recommends that you verify or configure your browser to perform the following functions:

- Automatically Load Images
- Enable JavaScript for web pages
  (enabling JavaScript for email is unnecessary, not to mention dangerous)
- Enable Style Sheets
- Accept Cookies
  (all cookies or those which are returned to originating servers)
- Disable Full Caching
  (set the browser to "compare page in cache to page on network" every time)
- Disable "Pop-Up" Blocking

Please refer to your browser's documentation or help system for information regarding these settings.

If you are concerned about the information stored by RMS "cookies", or the nature of JavaScript code used by RMS, please consult the "Web Technology Security Issues" section on the next page for more information.

Screen Resolution

1280 x 1024 resolution or higher is recommended. See Chapter Two for information on compatible monitors.

Web Technology Security Issues

The Telestra Remote Management System uses modern Internet client/server technology (like cookies and JavaScript) to extend its functionality, and enhance the quality of features offered to ASTi's customers.

Unfortunately, due to less-than-well-meaning Internet users (and the media exposure their exploits elicit), much of the Internet's "general public" has rightfully become wary, if not completely paranoid, about these technologies. Here, ASTi will attempt to allay any concerns you may have about the use of these technologies in RMS.

Cookies

What are "cookies"?

They are small bits of text that come from a web server, and are handled by your web browser. There are two types of cookies: "session" and "persistent".

"Session" cookies only live as long as your web browser program is running. When you close the application, or shut down your computer, the information contained in the session cookie is then lost. "Persistent" cookies are stored on your local computer's hard disk, in a "cookie list". The information contained in persistent cookies will remain available to the web browser and web server until it expires, or is deleted.

How does RMS use cookies?

There are only a few ways that RMS employs cookie technology.

- Are you logged into the system?

  The first time you attempt to access the RMS system, you are asked to log in with a user ID and password. Once you have successfully provided these two bits of information, a session cookie is passed back to your browser from the RMS server, allowing you to access any RMS page without having to log in again. ***Please note***: ASTi recommends shutting down your browser application when you've finished accessing an RMS server. This will clear the session cookie, and RMS will force another log-in the next time someone (even you) tries to access the system.

- Setting your "Automatic Refresh Rate" preference

  The majority of web pages generated by the RMS server will automatically refresh themselves after a given period of time (our attempt to ensure that you get the most up-to-date information). The first time you access an RMS server, a persistent cookie is placed on your hard disk which specifies that the refresh rate is 300 seconds (5 minutes). After you've logged into the system, you can change this setting in the "Preferences" section. When you specify your preferred refresh rate (in seconds), the RMS server will replace the previous cookie with another persistent cookie reflecting the new waiting period.

The persistent cookie mentioned above is the only piece of information that RMS writes to your computer's hard disk, and is the only information that RMS can access on your computer. No information whatsoever is transmitted to ASTi, or anywhere else.

JavaScript

What is "JavaScript"?

It is a simple programming language that extends a web browser's capabilities beyond that which is possible using only X/HTML (the standard language for generating web pages).

How does RMS use JavaScript?

There are only a few ways that RMS employs JavaScript.

- Launching Remote Windows

  At times, RMS will open remote windows to keep information separate from the "main window".

- Pop-up Notes

  If you move your mouse pointer over many of RMS' menu items and links, a small note pops up to further explain the consequences of clicking that item.

The JavaScript code in RMS will NOT attempt to access, change or manipulate any information on your local computer at any time. Again, no information whatsoever is transmitted to ASTi, or anywhere else.

Secure Connection

Starting in Telestra software version 3.27, the Remote Management System (RMS) has the ability to serve its web pages over a secure connection with the user's web browser. This secure connection uses industry-standard, 128-bit strong encryption, like the vast majority of online banking and shopping sites.

Note: Secure operation is turned on by default for Telestra systems shipped within the United States and Canada, and may be optional when shipped to other countries. Its availability is subject to export controls imposed by the Bureau of Industry and Security of the U.S. Department of Commerce. Contact ASTi for more information.

When running over a secure connection, RMS will still handle requests to its web server over the standard HTTP port 80, but will automatically forward these requests to the secure HTTPS port 443.

Part of this secure operation relies on a certificate residing on the RMS server, which is passed to the user's web browser as a form of identification. Basically, this certificate tells the web browser who the server is (i.e., "I am an ASTi Telestra system").

This certificate will raise a security warning in the vast majority of contemporary web browsers.

Here's why:

In publicly-available applications like an e-commerce site, the certificate is used to verify that the server is "trusted" by comparing it to a database provided by third-party companies called "Certificate Authorities" (e.g., Verisign et al) who have already verified that a certificate holder is who they claim to be. Conveniently, these Certificate Authorities also create the server certificates for businesses who pass the test and pay a fee.

For Telestra systems with secure capability, however, the certificate is created and issued by ASTi. In other words, ASTi is acting as the Certificate Authority in place of a professional registrar like Verisign. As such, the Telestra system's certificate will not be in the database of "trusted" sites that the web browser will check against, so it will alert the user.

Another circumstance that may prompt your browser to issue an alert deals with the "hostname" information contained in the certificate. ASTi uses the name "telestra" for the hostname when the certificate is created. This is not a fully-qualified domain name (e.g., "server.domain.com"), so the browser may complain that it is invalid.

Because ASTi does not have access to every customer's network to determine the ultimate, fully-qualified domain name (FQDN) to be used by the customer's DNS server, it is impossible to tailor these certificates on an installation-by-installation basis. Further, if you access the RMS server by entering an IP address (e.g., 10.1.1.123) or a network-specific FQDN (e.g., telestra4.yourdomain.com), neither of these will match the hostname as specified in the certificate, and your browser will likely alert you with a security warning.

In any case, you should examine the certificate's information to verify that the machine you are trying to access in your web browser is, in fact, an ASTi Telestra system. ***After that, it is safe to accept the certificate and continue connecting to and working with Telestra RMS.***

Many web browsers allow the user to change the “trust settings” for any individual certificate. If you opt to change the trust settings for the Telestra’s certificate, then that browser (on that computer) will no longer raise the security warning.

IMPORTANT: When visiting “secure” web sites on the Internet, ***DO NOT*** treat any security warnings as you would those coming from your Telestra system(s). When working in a public environment like the Internet, every security warning must be thoroughly examined and only disregarded at your own peril.

Pointing the Browser to RMS

In order to access RMS using a web browser, the computer you use must be on the same network segment (LAN or WAN) as the RMS server itself. Contact your network administrator if you have any questions.

Launch your web browser application. In the “Address” or “Location” field of the web browser’s display, type:

```
http://xxx.xxx.xxx.xxx/
```

where “xxx.xxx.xxx.xxx” is the IP address previously assigned to **eth0** using the Telestra Configuration Utility.

System Login: Factory Default User ID & Password

The factory default user ID is: **`rmsuser`**

The user ID is case-sensitive, and you cannot change it.

The factory default password is: **`astirules`**

The password is also case-sensitive, but you can change it through Telestra's command-line interface.

Change your password! Since each RMS is shipped with the same default password, this affords virtually no security for your system. Changing your login password immediately after installation will prevent the possibility of another RMS user accessing your system.

Remember your password! If you forget your new password, the only way to recover the system (i.e., restore the factory default) is to reinstall the Telestra software via the Cold Start Procedure (DOC-01-TELS-CS-3).

RMS Display & Navigation

After pointing your browser to the Telestra system, RMS will respond by displaying the “Telestra Status” screen, which shows general information about the Telestra system.

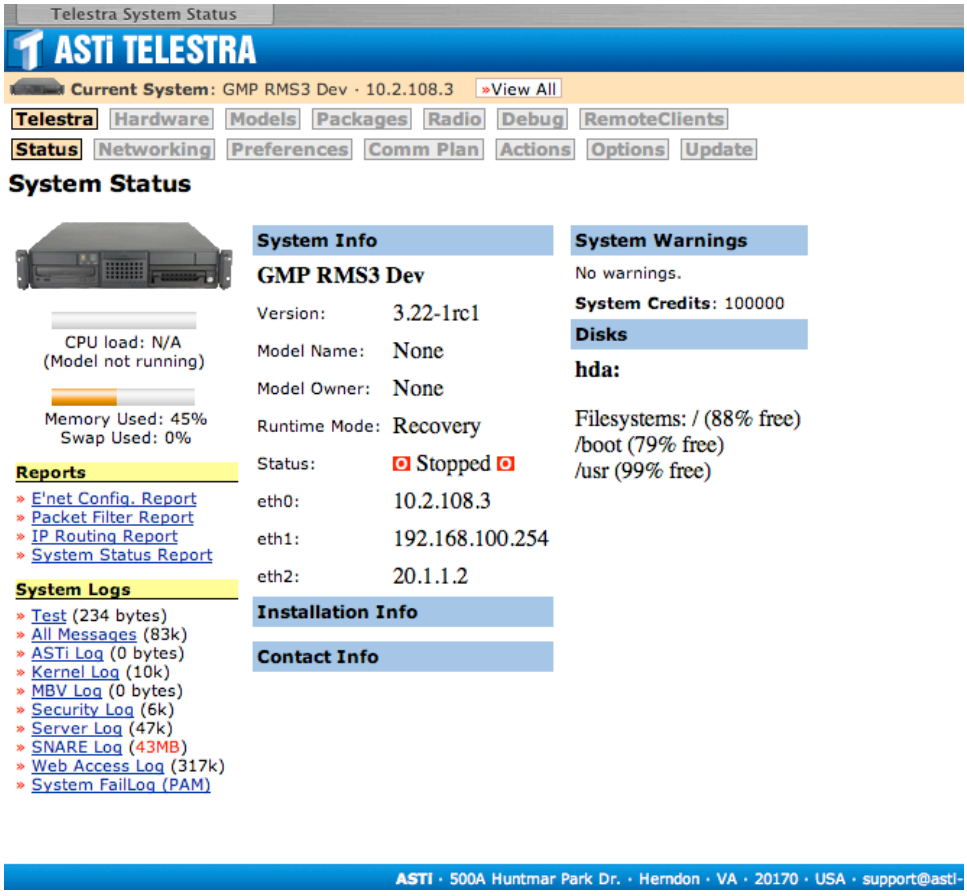


Figure 26: RMS Telestra Status Screen

The System Indicator bar and navigation buttons at the top of this page are common to all RMS screens.

The System Indicator bar displays which Telestra system on the network you are currently accessing, showing its description, and IP address or hostname. It also provides a “View All” link to show all Telestra systems on the network.

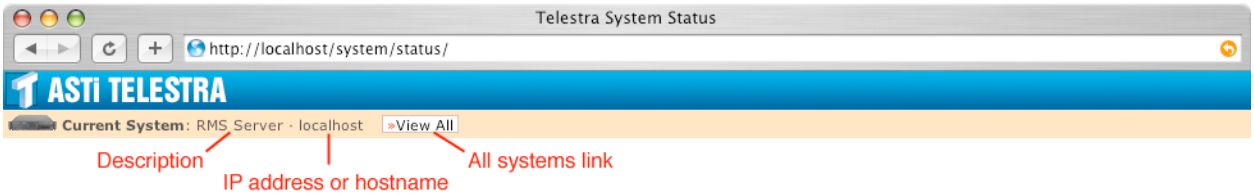


Figure 27: RMS System Indicator Bar

The top row of navigation buttons represent the major categories of RMS pages.

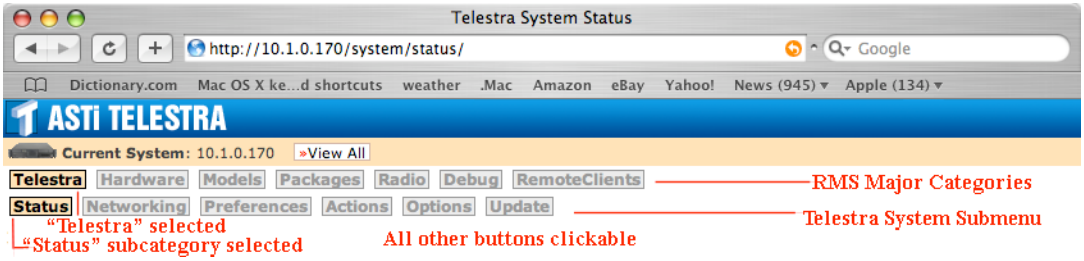


Figure 28: RMS Navigation Buttons

- "Telestra" for system-wide, Telestra-only configuration and information
- "Hardware" for USB hardware and peripherals
- "Packages" for Telestra-based software packages (HLA, MBV, etc.)
- "Models" for administration of Model Builder Visual software models.

The lower row of navigation buttons represents the subset of pages for the chosen major category; the displayed buttons will change to reflect only that major category's available pages. Note that the "chosen" major category button and subset page button are highlighted to indicate your current location. All other non-highlighted navigation buttons are clickable.

Other features common to every RMS screen are the page timestamp and footer. The timestamp displays the time, according to Telestra's internal clock, that the page was delivered. This can be important in discerning the "freshness" of any screen. Since pages in RMS will automatically refresh themselves based on user setting (see "System Preferences", page 41), this timestamp will show when the page was last rendered, and--by inference--how long it will be before auto-refresh. Of course, any Telestra page can be manually refreshed using your browser's corresponding controls.

The footer bar simply contains ASTi's contact information, with links to ASTi's support email address and website as a convenience. Please note, these links may not operate properly if your workstation lacks an email client, or if the network does not have access to the external Internet.

Figure 29: RMS Timestamp & Footer

Telestra System Information & Configuration in RMS

Again, the Telestra System Status screen is the default start page when you first point your browser to the Telestra system. This page displays the system CPU load percentage, memory used percentage, basic system and contact information, and provides a quick overview of software functionality, as defined by the Telestra Options file. For debug and diagnosing the user can also open various reports and system logs.

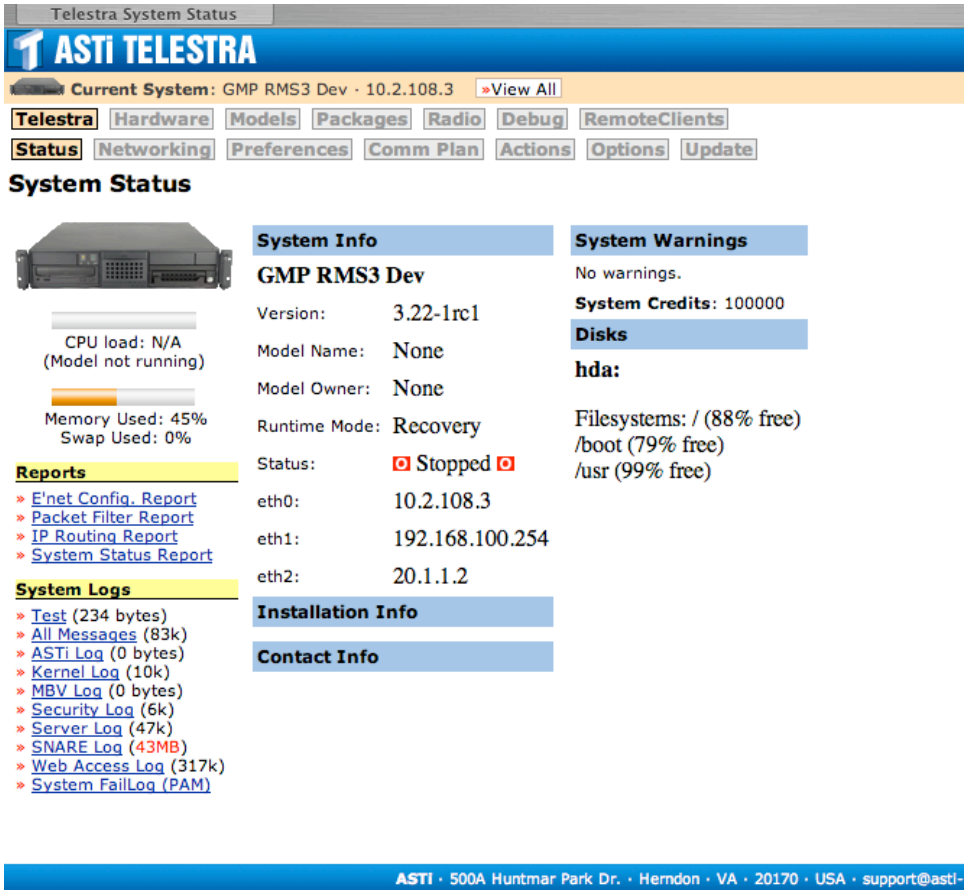


Figure 30: Telestra System Status Screen

New Log File Viewer

As of Telestra version 3.27-1, RMS offers a new, flexible method of viewing log files via the web browser. Any system-level user with "root" access can customize which log files can be viewed from the "System Status" page. Note that starting in version 3.27-1, only privileged RMS users can view system logs; unprivileged users cannot.

Adding or removing (or commenting) a line of text in the file:

`/usr/local/asti/etc/logfiles.txt`

... dictates whether or not it will be accessible via RMS.

To add a log file, edit this file and add a line of the following comma-separated format:

`<display_text>: <path_from_root>`

... where <display_text> is how you want the linked text to appear in RMS (e.g., Server Log), and <path_from_root> is the full path from the system's root directory to the location of the log file (e.g., /var/log/server.messages).

To remove a log file from the list in RMS, edit the logfiles.txt file and delete the line corresponding to that log file's location. Alternately, insert a hash (#) as the first character in that line; any line starting with the # symbol is considered a comment, and is ultimately ignored.

For security purposes, RMS will not display any file that exists outside the `/var/log` branch of the filesystem.

Finally, each page displaying a log file's contents now includes a "Download Log File" link at the top. Clicking this link (or right-clicking on some systems) will download the entire log file to the user's local computer (where the web browser is running).

Network Configuration

All Telestra network settings can be accessed from the "Telestra Networking" screen, shown here:

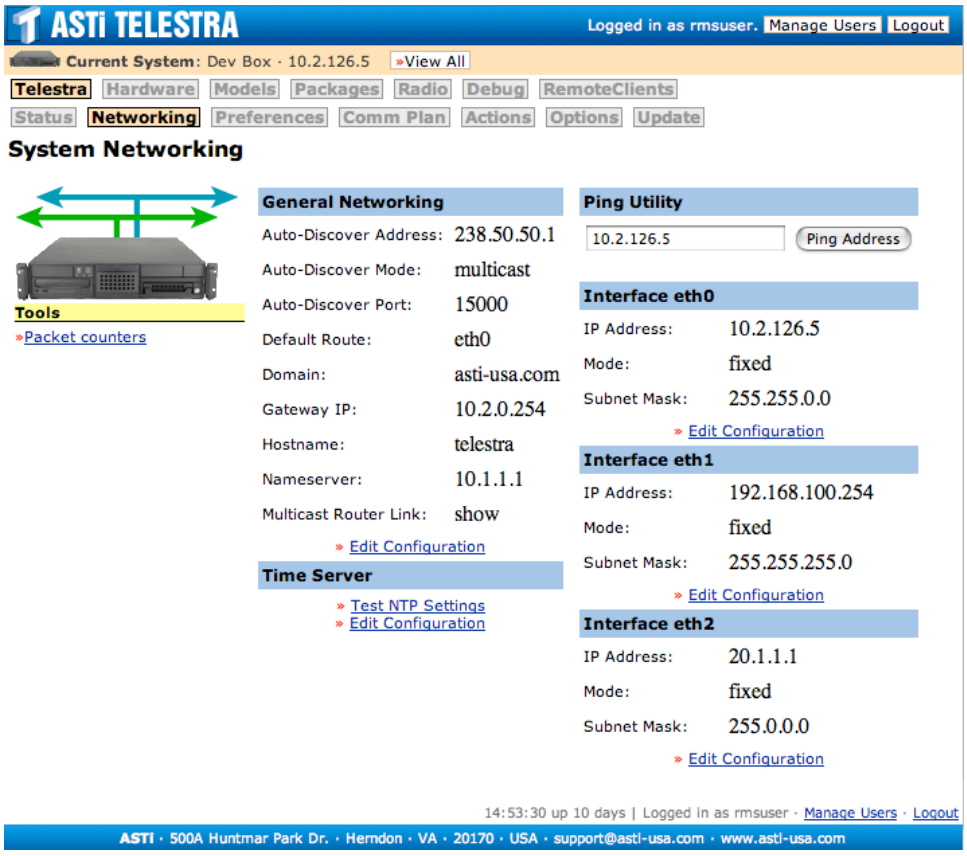


Figure 31: Telestra Networking Screen

General Networking. This section encompass network-wide, interface-independent settings such as Autodiscovery, DNS nameserver and router gateway IP addresses.

Time Server. This section allows you to specify and test the connection to a network time server (NTP server) for synchronizing Telestra's internal clock. Other settings allow you to tweak Telestra's NTP client variables.

Ping Utility. Enter another computer's hostname or IP address to send five pings (echo requests) to it. Positive response indicates that computer is reachable over the network, using any of Telestra's three network interfaces.

Network Interfaces. These sections allow you to specify IP address, card mode and subnet mask for each of Telestra's three Ethernet interface cards.

Operational Warning: Making changes to the interface settings (especially ***eth0***), such as changing manual IP address, or setting card mode to DHCP may result in you not being able to access RMS at the original (previous) IP address. If you change these settings, you must then specify the new IP address in your browser's address slot to access RMS at its new network location.

System Preferences

The “Telestra Preferences” screen shows the system’s basic settings, such as installation and contact information. It also provides the ability to add and delete Telestra user accounts, which are important in MBV model management.

The automatic refresh rate for pages in RMS can also be changed from this screen.

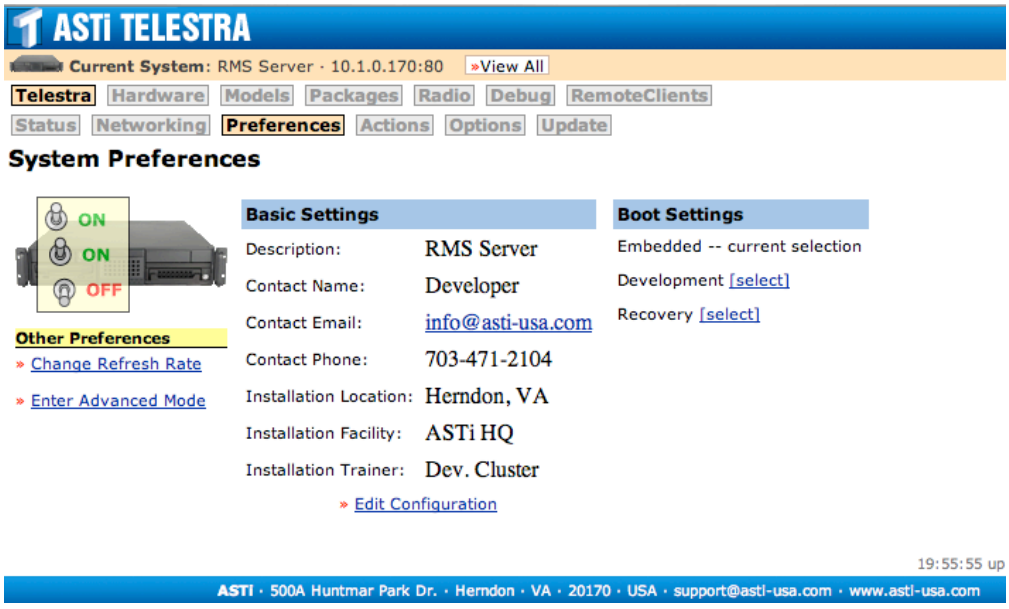


Figure 32: Telestra Preferences Screen

System Actions

The “Telestra Actions” screen allows users to restart Telestra software (e.g., multicast routing and other networking daemons, RMS webserver software, etc.), reboot or shutdown the system.

Operational Warning: Instantiating any of these options will interrupt software that is currently running on the Telestra system, especially model operation. Users must confirm the action before it will be performed.

When shutting down the Telestra system, it may not power off after the system halts. If not, the power switch on the front of the Telestra chassis can be used to power off the system.

Figure 33: Telestra Actions Screen

Backup System Configurations

The user can select to back up or restore the system in the Telestra Actions page. When the user selects to backup system configurations it creates an archive of these files. Check all or some of the configuration sections and click “Start Backup.”

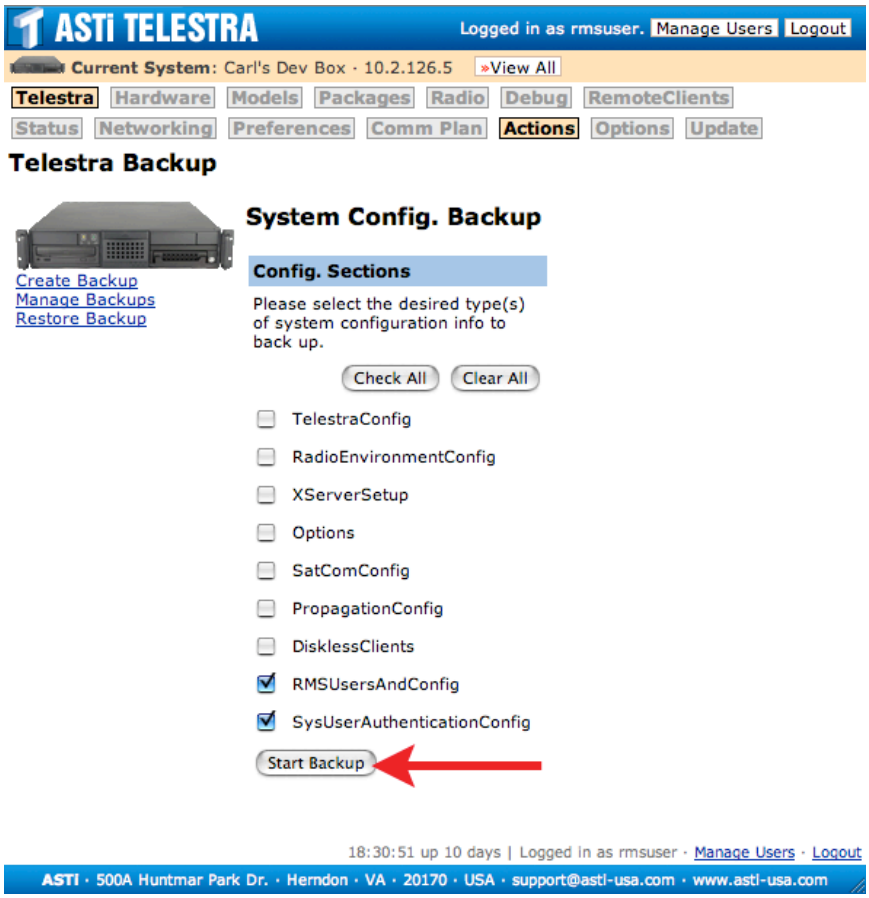


Figure 34: System Configuration Backup

The System Configuration Backup categories include:

- “TelestraConfig” will back up all configuration settings such as network settings and system preferences.
- “RadioEnvironmentConfig” will back up all Radio Environment settings including filter lists.
- “XServerSetup” will back up all monitor screen settings such as your specified screen resolution.
- “Options” will back up all option files loaded on your system.
- “SatComConfig” will back up all satellite communications settings.

- “PropagationConfig” will back up all radio system configurations used to produce realistic communications in the virtual environment including time-of-day, time-of-year, global location, solar cycle, sunspot activity and more.
- “DisklessClients” will back up all settings for the Remote Clients including name, mac address, and model name.

As of Telestra software version 3.31, there are two new categories in the RMS’ System Configuration Backup: “RMSUsers Accounts” and “UserLockoutSecurityConfig”.

- “RMSUser Accounts” will back up RMS user accounts and the associated information.
- “UserLockoutSecurity Config” will back up all PAM files, including system user failcount configuration and RMS failcount configuration.

After backing up the selected categories, click the file name to download the file into your local Telestra archives.

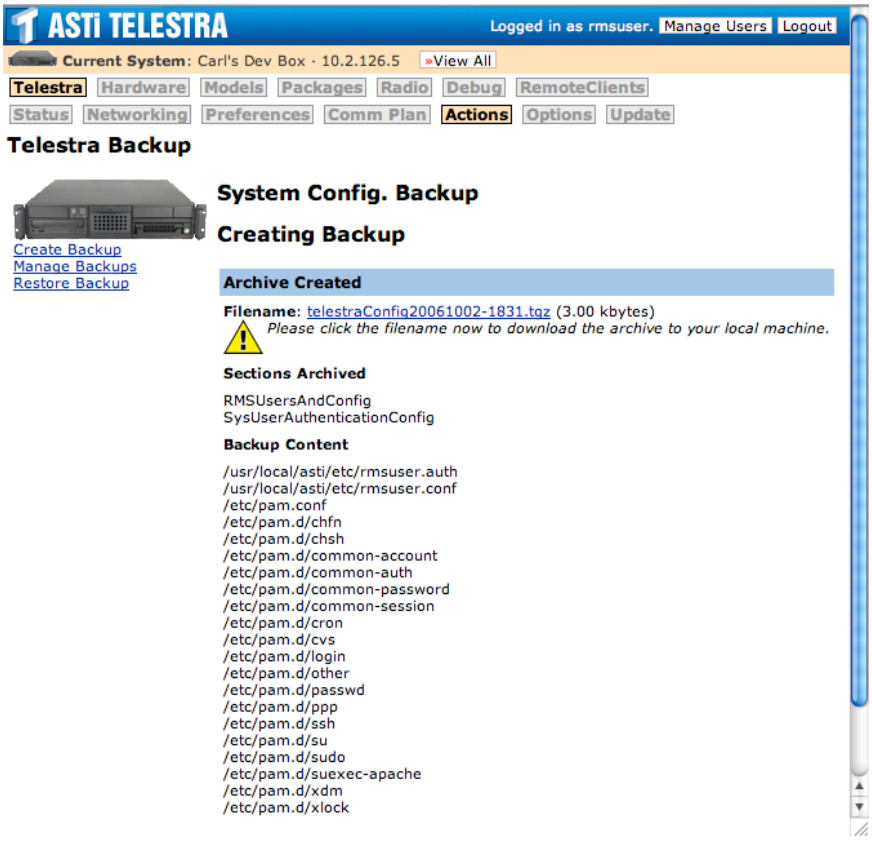
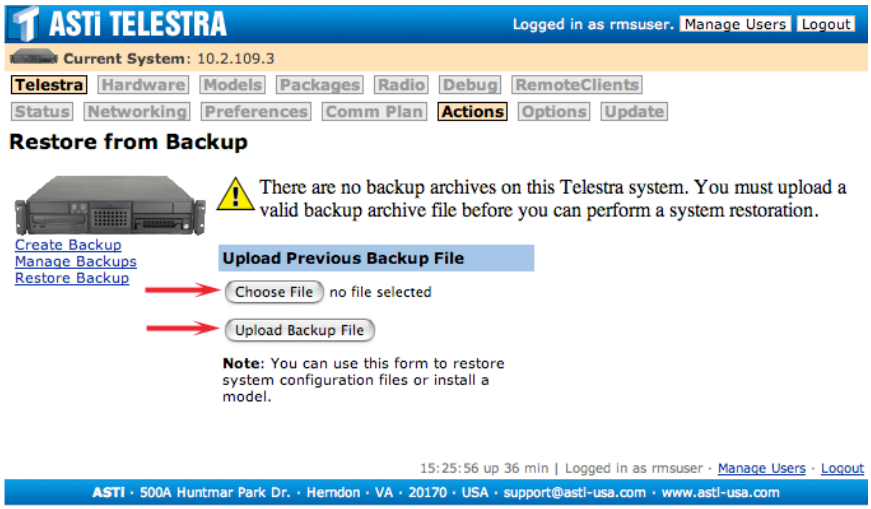


Figure 35: Creating the Backup

Restore System Configuration

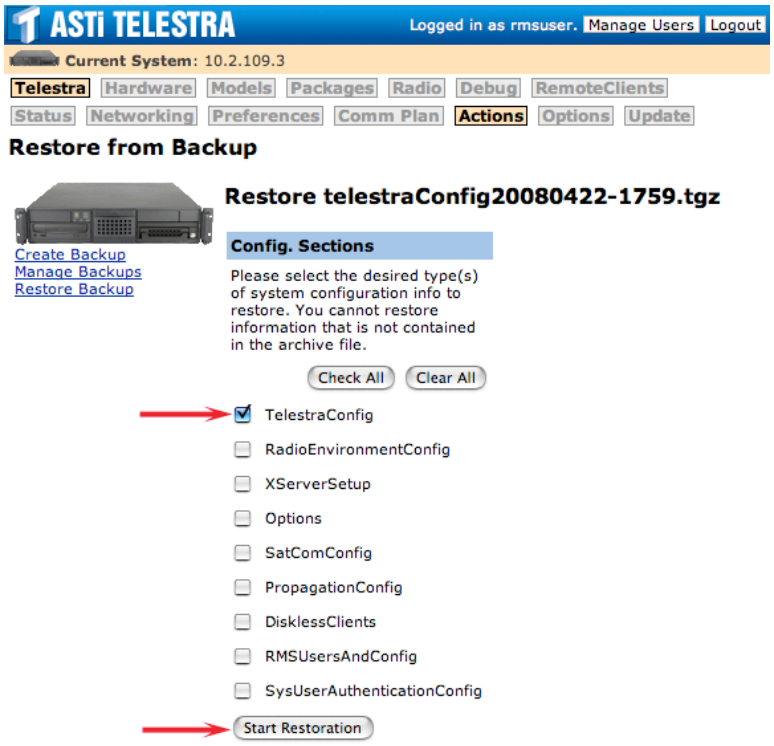
Navigate to the RMS Telestra >> Actions page and select "**Restore System Configuration**."

Select the "Choose File" button and navigate to find the backup file. Then select the "Upload Backup File."

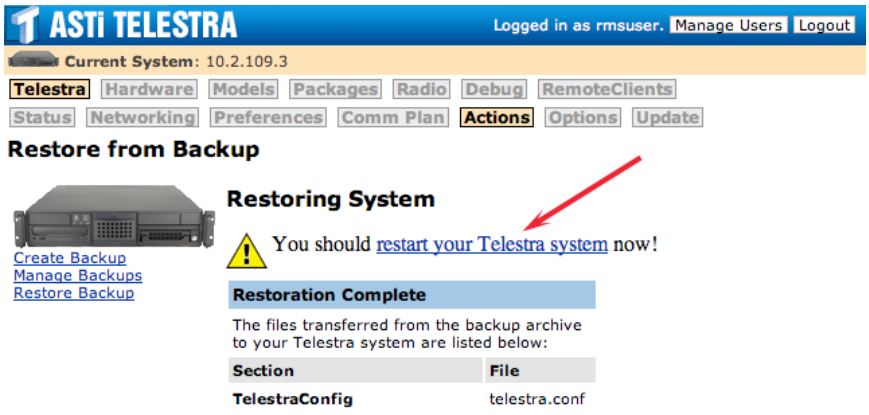


Select the file(s) you would like to restore by checking the proper box(es). Then select the “Start Restoration” button.

Note: If restoring the RMS Users and Configuration files, and the restored file replacing the user-name you are currently logged in with you may have to re-login.



The RMS page will show the files for restoration. Review the list and select to restart the system.



System Options

The “Telestra Options” screen allows the user to manage the Telestra Options File. The Telestra Options File is an encrypted file provided by ASTi that is used to activate certain software packages on the Telestra system(s).

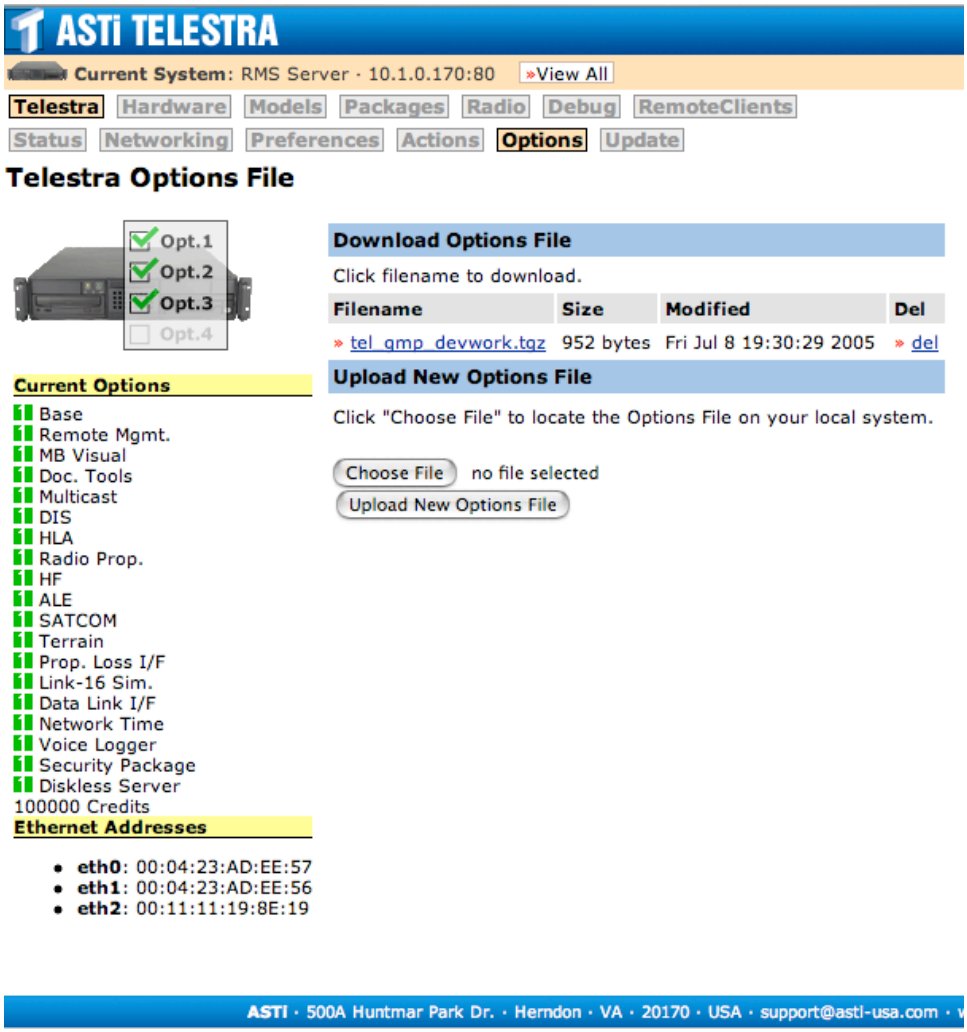


Figure 36: Telestra Options Screen

The Telestra Options File is a program-specific file containing information about all of the Telestra systems delivered under that program. A single Telestra Options File may be installed on multiple Telestra platforms, but will only activate the appropriate software packages on each platform. Software functionality as defined by the Telestra Options File is linked directly to the Telestra system’s hardware configuration.

For example, say ASTi ships two Telestra systems with serial numbers 98001 and 98002. If Telestra 98001 is intended for use as an HLA and HF radio server, while Telestra 98002 is to be the network Terrain Propagation server, then a single Telestra Options File will activate only what has been ordered. HLA and HF software will be activated on 98001, and only Terrain software on 98002. The same Options File takes care of both systems.

If, however, that same Telestra Options File is installed on Telestra system 97123, then it will not activate any additional software, since it does not contain information for this system.

Please note: As program requirements grow, and additional Telestra systems are added to the network, ASTi will re-issue the Telestra Options File to include all previously-delivered systems, as well as any new ones. Again, one Options File will take care of all the Telestra Systems.

Telestra systems will run with base software functionality if no Telestra Options File is installed on the system, or if the installed Options File does not contain information for that system.

The "Telestra Options" screen will display all activated software.

Uploading the Options File

A new Options File may be uploaded at any time by clicking the "Choose File" button to locate the file on your local workstation, followed by clicking the "Upload New Options File" button.

Please note: Selecting an Options File with the same name as the currently-installed Options File will result in the new file overwriting the existing file.

Click on the filename of the existing Options File to download it to your local workstation for archiving and backup purposes.

Ensure that you upload the proper .tgz file that contains the Options File. If you upload a file that does not contain an Options File, the system will not operate properly.

System Update

The "Telestra Update" menu button serves as a shortcut to the "Packages Update" screen. This screen and its procedures will be covered later (see section "Updating Telestra Software Packages").

Telestra Hardware Facilities in RMS

Clicking the “Hardware” button in the top major category menu will display the “Hardware Mapping” screen in RMS. This screen bridges the current configuration of the Telestra USB hardware and software model allowing the user to determine if the Iris devices are connected and if they are running properly with the model.

Hardware Mapping Display

The “Hardware Mapping” page displays the Telestra operating Iris hardware and MBV software status. This allows the user to quickly scan the page to determine if the hardware and model are running properly. The first column of the “Hardware Mapping” page displays the assigned Iris devices that are physically hooked up to the Telestra. If the Iris device is mapped to the model but is not recognized by the USB Bus, the Iris icon will read “not detected” as shown below for Iris number 3-599. The warning at the bottom of the page will also show which Iris is not detected.

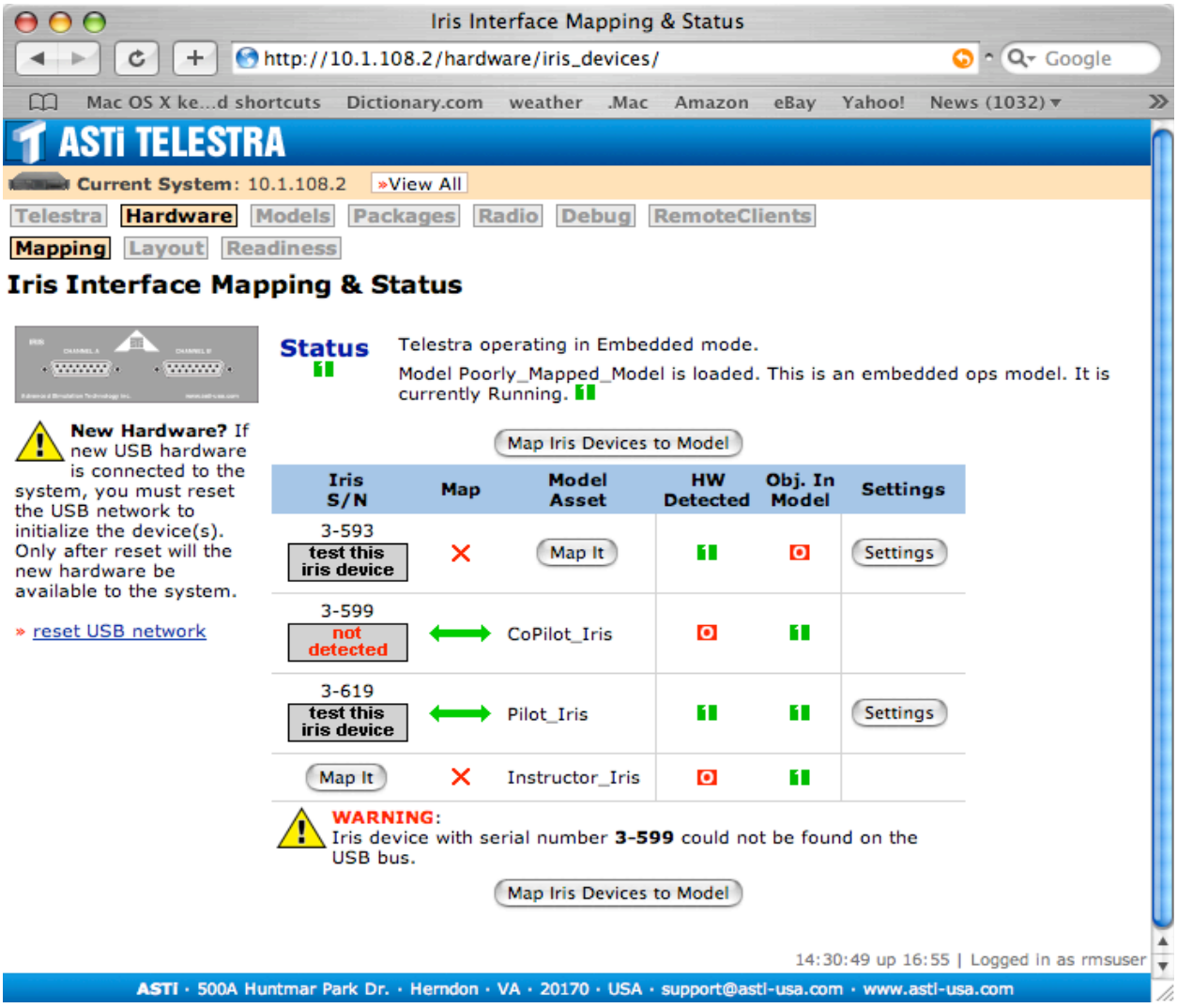


Figure 37: Hardware Mapping Screen

The “Map” and “Model Asset” columns display whether the Iris is properly mapped in the model. If the Iris is not mapped the “Map” column will display a red “X” and the user can click “Map It” to map the Iris to its appropriate object in the model. There are two of these buttons, the second one is underneath the warning to map the Iris to the model. Clicking “Map It” will open the Iris Hardware Assignments page, discussed in the Hardware-to-Software Mapping section below.

The “HW Detected” and “Object In Model” columns allow the user to quickly scan for problems. If the red “0” is displayed the corresponding object is not recognized by the USB Bus or model.

The user can adjust Iris settings by clicking “Settings.” After manually adjusting the Gains and checking the Inputs, click “Set Gains and Inputs” to activate the new Iris model settings.

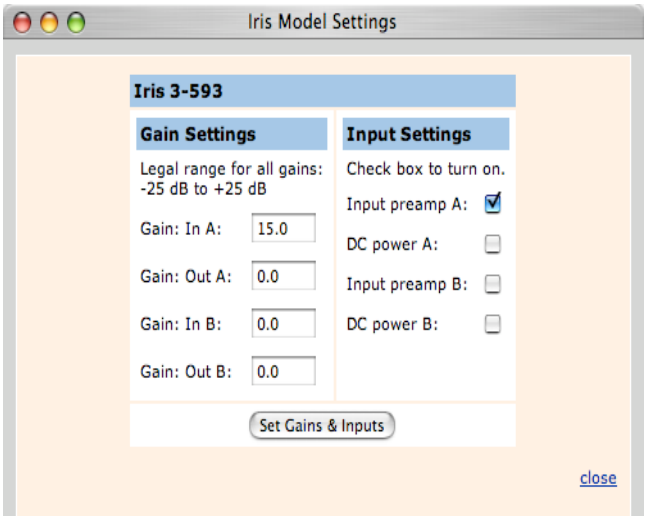


Figure 38: Iris Model Settings

Hardware-to-Software Mapping

An important concept in tying together physical hardware with software model objects is that there must be a one-to-one correlation between a single model object and a single Iris device. In the figure above, note that the names of the model objects are applied only when they exist in the model. In this example, CoPilot, Pilot, and Instructor model objects show up under Model Assets.

However, the assigned CoPilot hardware Iris device 3-599 is not detected. If a device is not showing up in the Iris S/N column, check power supply, cable connections, and attempt re-initialization by clicking the “Reset all devices” button on the Hardware Layout screen. For more information on Iris hardware see the “Accuracy & Timeliness of Hardware Layout” section further in this chapter.

The Instructor row is not detecting an Iris because it does not have the Iris hardware assigned (it is not yet mapped). This can be rectified by clicking “Map It,” and choosing an “on-wire” Iris device.

On the “Iris Hardware Assignments” page shown below, each of the audio output objects in the model are listed. Below each object is a pull-down list containing only “on wire” Iris devices. These pull-down lists also include a blank entry if you wish to leave any model objects unassigned. ***Please note: You cannot assign the same Iris device to more than one model object***. In this example, you would select Iris serial number 3-599 in the pull-down under Instructor, and click the “Map Hardware” button to save the hardware mapping configuration.

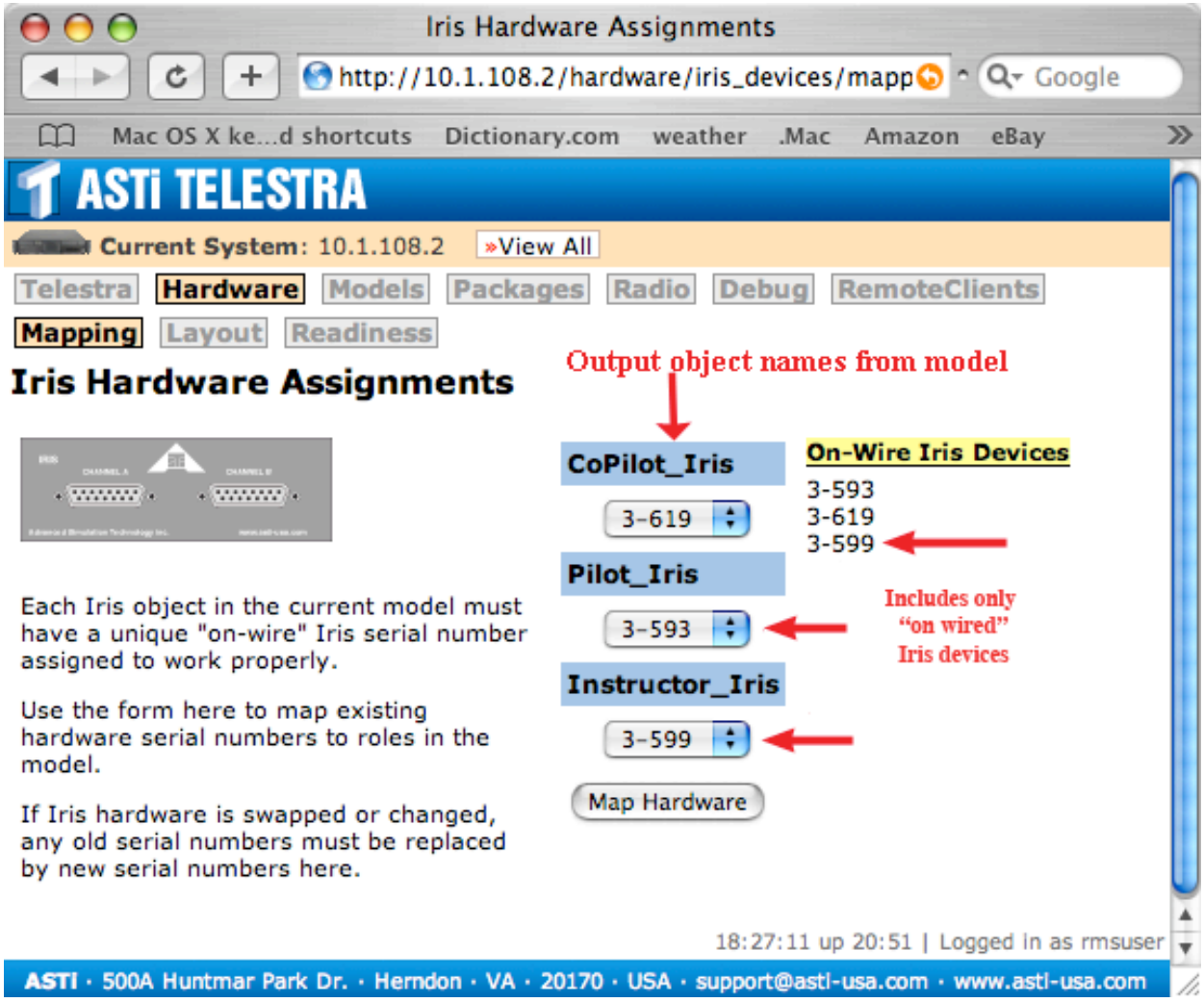


Figure 39: Iris Hardware Assignments Screen

After navigating back to the Hardware Mapping screen, you would then see that all model objects have been assigned to “on wire” Iris devices, and there is not extraneous or unused Iris modules on the USB network.

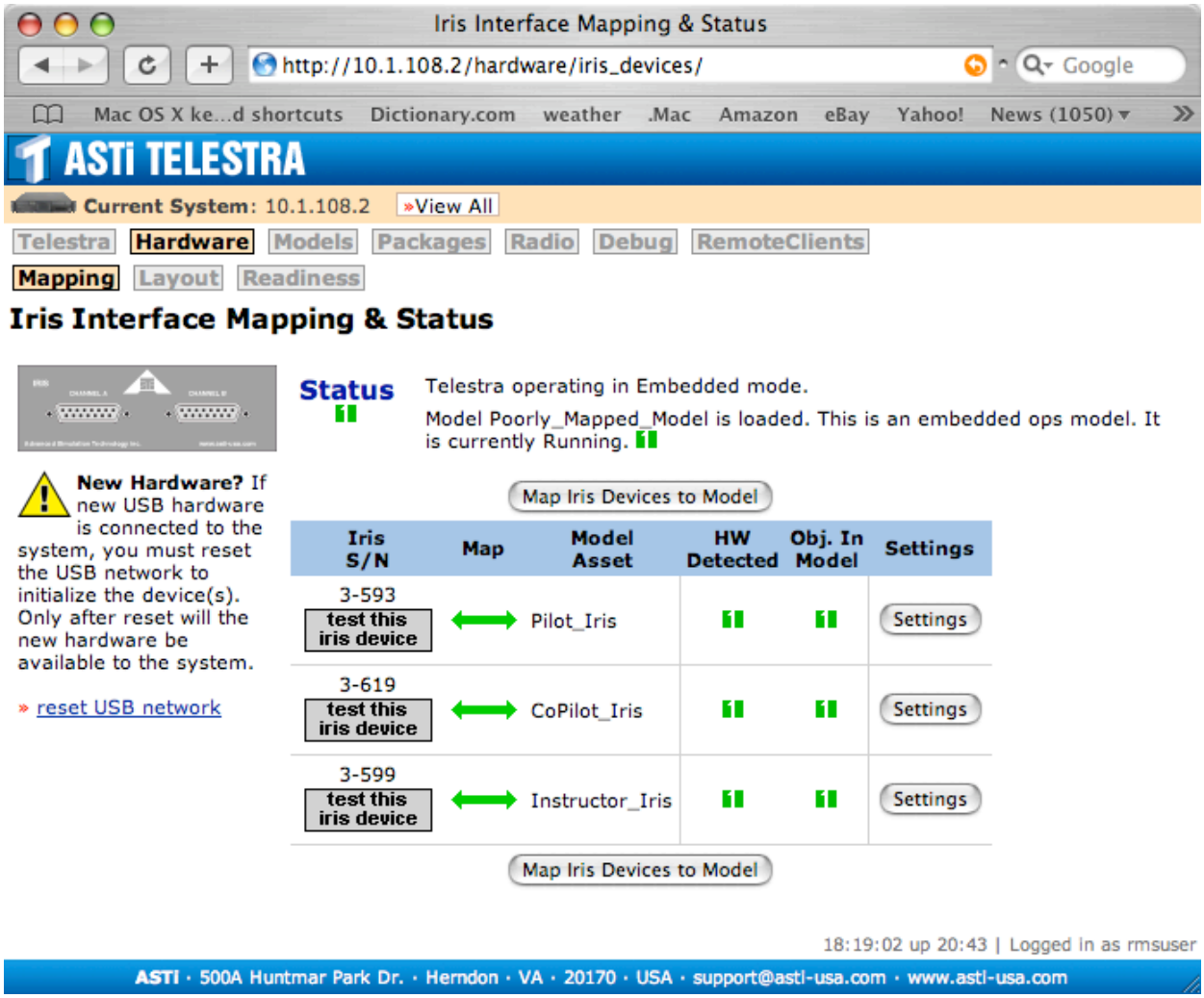


Figure 40: Hardware Mapping Screen after Hardware Assignment

Important: Any time an Iris device with a new serial number is introduced to the USB system (if it’s new or replaces a failed device), the corresponding model object must be assigned or re-mapped to it for the model to operate properly with the installed hardware.

Note: The tabs under “Hardware” now read Mapping, Layout, and Readiness as shown in the figure above. Please note the “Iris Devices” tab shown in the remaining Hardware Figures is renamed “Mapping.”

Hardware Layout Display

While the Mapping screens bridge the physical hardware and software model, the Hardware Layout screens address only “on wire” hardware, without regard to MBV. This multi-function screen displays the current configuration of Telestra USB hardware, and has the ability to compare that configuration against an ideal set of information, called a *Hardware Profile*.

Each type of USB hardware device has its own icon in the layout tree. The colored arrows in each icon represent the type of traffic each device handles. For example, the Spectrum icon in the figure below shows a curved, blue arrow coming into the device, representing extender cable traffic originating from its parent Prism module. The orange arrow leaving the Spectrum icon represents local distribution of USB traffic, presumably to a downstream Iris device.

The dotted arrow between two device icons represent the cable connection between them. Where determinable, these dotted arrows are labeled with the connection point as silk-screened on the panel face of the parent USB device. For example, the dotted arrow between Iris 2-168 and its parent Axis module in the figure below is labeled “Out A.” This means the physical cable connection originates from the type A connector labeled “Out A” on the Axis’ faceplate, and terminates at the miniature type B “In” connector on the Iris module. This cable port labeling can assist in troubleshooting faulty devices, cables and/or connections. (For more information about connectors see Chapter 2 Connecting Telestra USB Devices.)

If Telestra is unable to determine the proper label to apply to a cable connection (due to various circumstances), it will simply display the port number as reported by the USB subsystem.

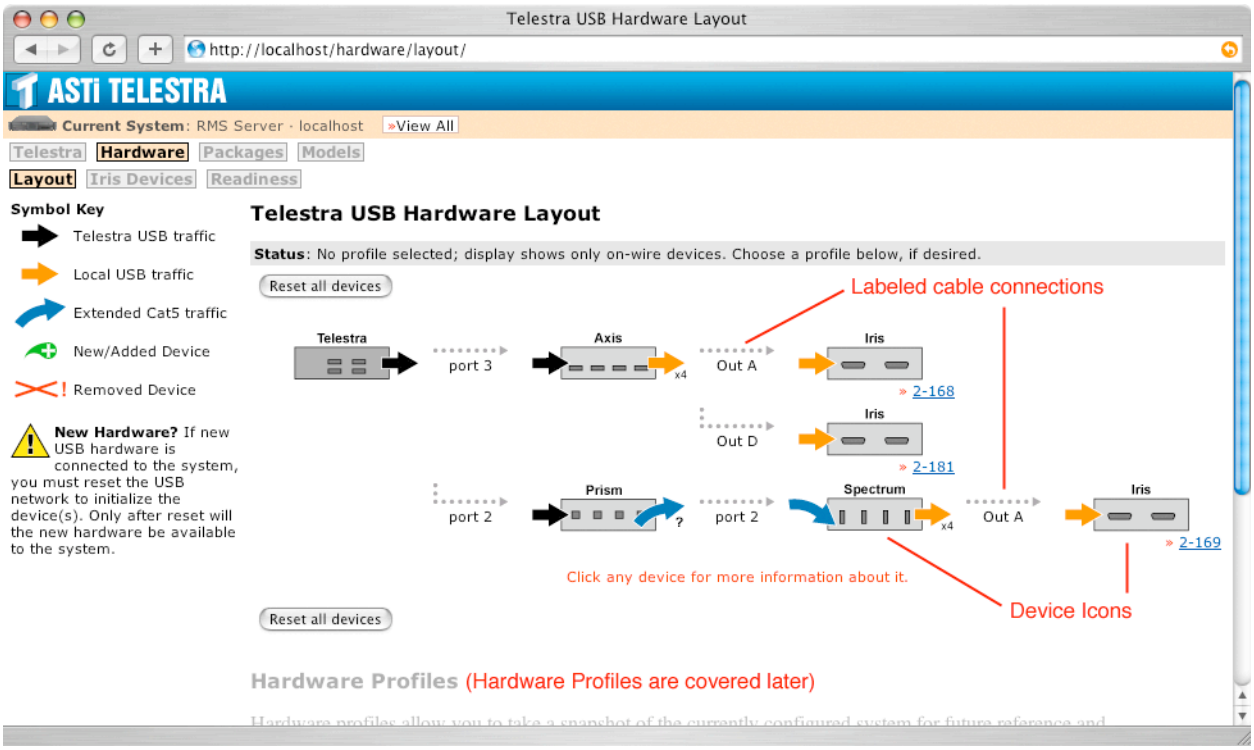


Figure 41: Telestra USB Hardware Layout Screen

Accuracy & Timeliness of Hardware Layout

Disregarding Hardware Profiling for the moment, the RMS system needs to be able to discern primarily what devices are "on the wire," i.e. physically connected to the Telestra system through some series of cable connections. Several factors can affect how well RMS determines and displays the "on wire" status for any USB device. These include:

- Proper power and USB cable connection(s)
- Proper USB device initialization

  If the USB device is not properly initialized, RMS will not be able to display it, or any of its downstream-connected devices. If a device is not showing up in the hardware tree, check power supply, cable connections, and attempt re-initialization by clicking the "Reset all devices" button on the Hardware Layout screen. See "***Important"*** below.

- Whether or not an MBV model is loaded and/or running

  If the Telestra system ***does not*** have an MBV model loaded and/or running, the USB subsystem cannot immediately notify you of a missing USB device. This is due to the inability to constantly "ping" or otherwise poll a connected device for an answer in the absence of a model.

  If there is a loaded and/or running model on the Telestra system, the removal or failure of an Iris device can be immediately discerned by the USB subsystem and reported by RMS. The MBV model will only be concerned with Iris audio and I/O devices, therefore RMS cannot flag an upstream device (e.g., an Axis) as "missing" with the same timeliness. If, however, that upstream Axis device fails, then all of its downstream Iris devices will be immediately marked as "missing" in the display tree.

  Missing or removed devices in the hardware layout tree will be marked with a large, red X.

- Automatic page refresh frequency

  The Hardware Layout screen will automatically refresh itself at the user-defined interval, as specified in "Telestra Preferences." If an Iris device fails on a running model, then it is immediately flagged in the USB subsystem as having done so. RMS cannot display the device as missing until the Hardware Layout page is re-rendered, either through automatic page refresh or manual refresh via the browser. This time difference can reduce the veracity of the information displayed on a "stale" hardware layout tree.

Important: In addition to the operational restrictions listed above, and regardless of Hardware Profiling being enabled or disabled, the only way RMS can find a newly added hardware device "on the wire" is through a USB hardware reset. This is performed by clicking the "Reset all devices" button on the Hardware Layout screen, and confirming the action on the subsequent page. ***This will halt a running model, affecting audio output***.

Hardware Profiling

RMS' "Hardware Layout" page also has the ability to compare its known set of "on wire" USB devices against a pre-defined set of ideal information, the Hardware Profile. With Hardware Profiling disabled, RMS ***can only display what it finds*** "on wire," but does not have information regarding what devices ***are supposed to be*** "on wire." Hardware Profiling thus allows RMS to show not only what it finds, but also what devices are missing or extraneous, based on the information inside the Hardware Profile.

To determine whether the devices displayed in the hardware layout tree are "on wire" only versus "should or shouldn't be there," check the Hardware Layout status bar at the top of the display.

If Hardware Profiling is disabled (no profile selected as "active"), the status bar will state, "No profile selected; display shows only on-wire devices," as shown below.

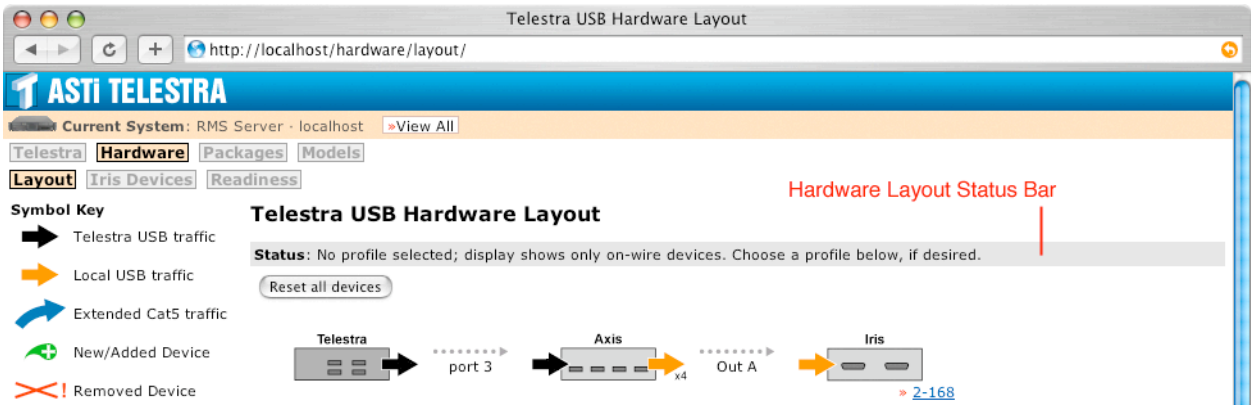


Figure 42: Hardware Layout Status Bar: No Hardware Profiling

If Hardware Profiling is enabled (a profile has been selected as "active"), the status bar will state, "Results shown against profile <profile name>," as shown below.

Figure 43: Hardware Layout Status Bar: Hardware Profiling Enabled

Hardware Profile controls and management tools are located below the USB hardware layout tree on the Hardware Layout screen.

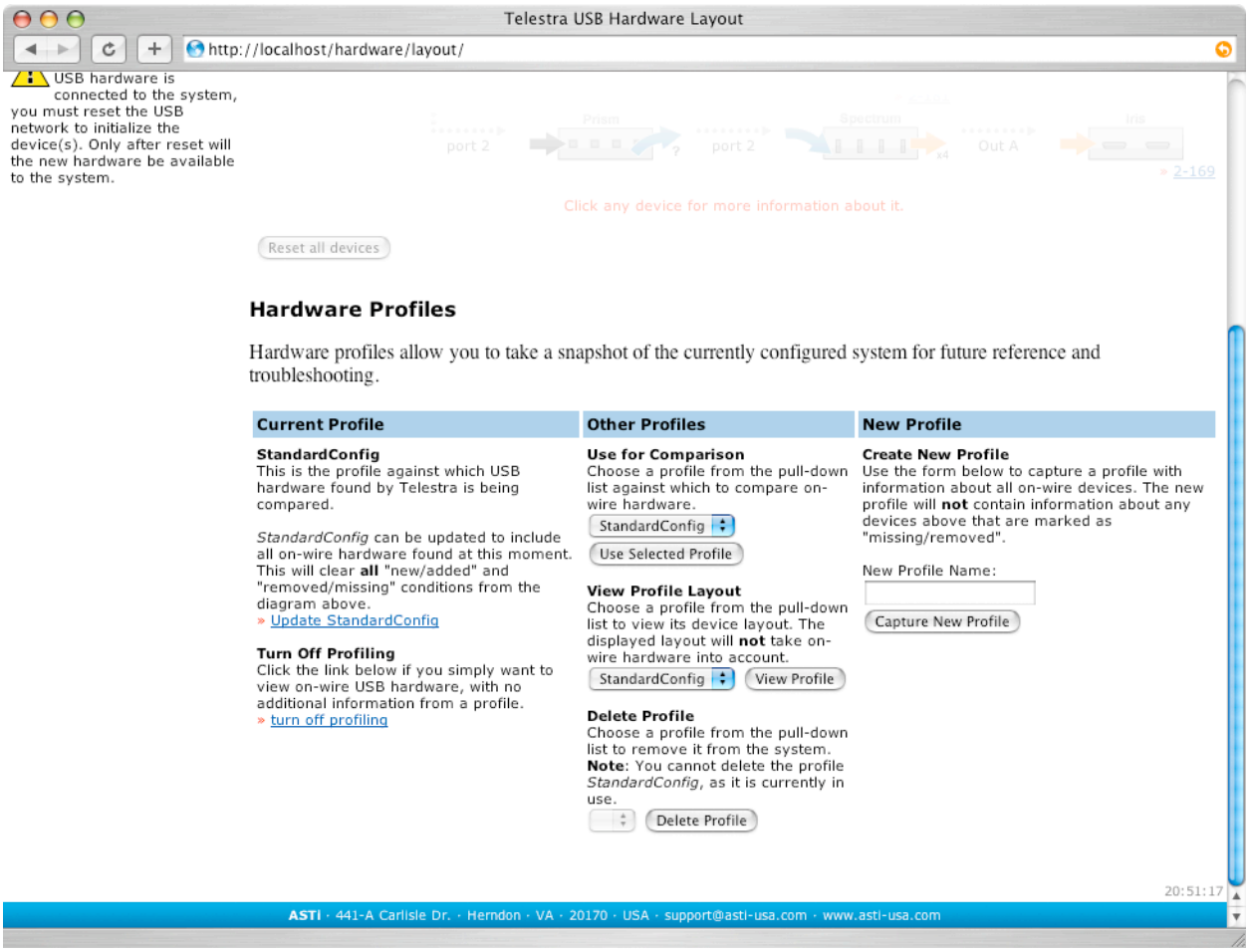


Figure 44: Hardware Profiling Controls and Management Tools

The Hardware Profiling controls and tools displayed by RMS will depend on whether profiling is enabled, and if previously-captured profiles already exist on the system.

If a Hardware Profile does not exist on the Telestra system, your only option will be to create a new profile, as shown in the figure below.

Capturing Hardware Profiles

To create a Hardware Profile, provide a profile name in the “New Profile” form slot, and click the “Capture New Profile” button.

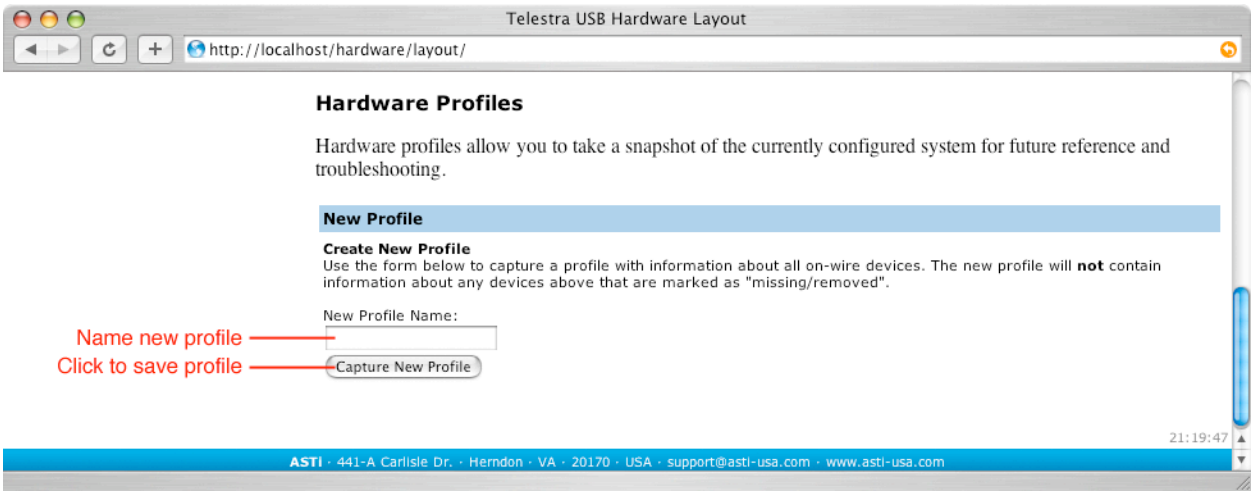


Figure 45: Creating the First Hardware Profile

This will save information about all “on wire” devices to the Telestra system under the name you provide. It will not, however, save information about any devices that are marked as “missing/removed” (with a large, red X) in the hardware layout tree, as they are not “on wire.”

Please note: Saving a new Hardware Profile with the same name as a previously-captured Profile will ***over-write the existing data*** on the Telestra system. RMS provides the ability to update any Hardware Profile (covered on page 62), if you intend to over-write old data.

After the new Hardware Profile has been saved, the confirmation screen will give you three options:

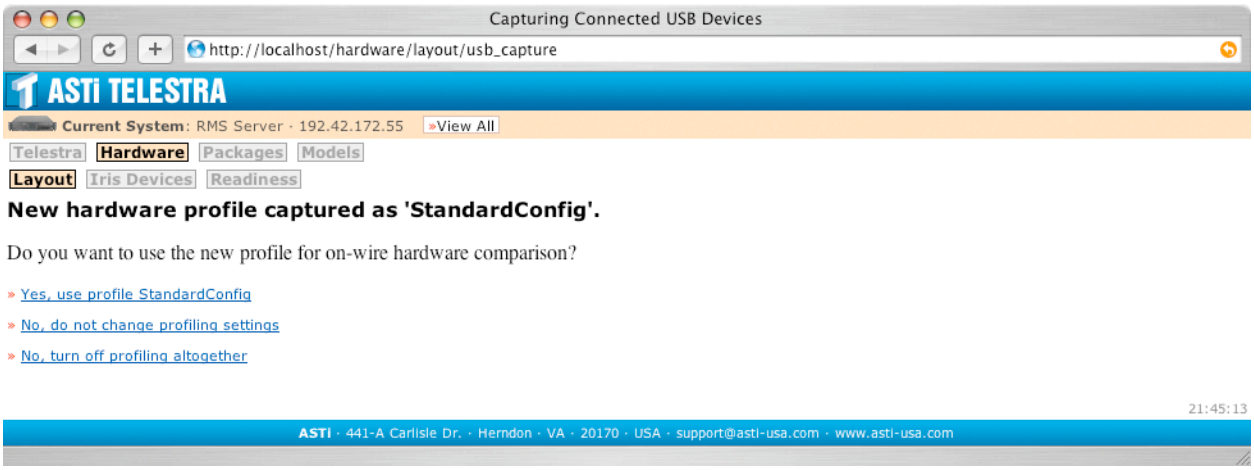


Figure 46: New Hardware Profile Confirmation Screen

1. Use the new Hardware Profile for comparison on the Hardware Layout screen. This will implicitly activate profiling if previously disabled.
2. Do not change Profiling settings. This will maintain all previous settings, either profiling disabled, or enabled with the previously-activated Hardware Profile (not the new one).
3. Turn off profiling, regardless of previous settings.

For our purposes here, consider that profiling was not yet activated from the confirmation screen.

Now that a Hardware Profile exists on the Telestra system, the Hardware Profiling controls at the bottom of the Hardware Layout screen will change.

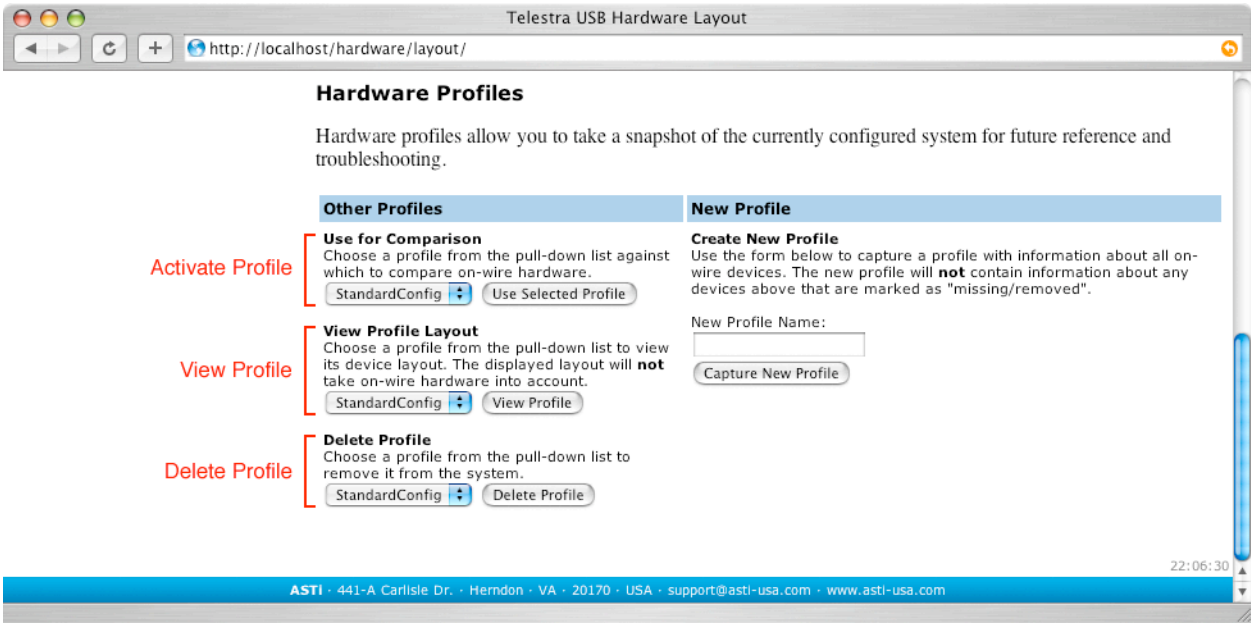


Figure 47: Hardware Profiling Management Tools

Under the “Other Profiles” section, you can now turn on Hardware Profiling by selecting the desired profile from the pull-down list and clicking the “Use Selected Profile” button under the “Use for Comparison” heading.

You may also choose to view any saved Hardware Profile by selecting it from the appropriate pull-down list and clicking the “View Profile” button under the “View Profile Layout” heading.

Please note: This will only display the device information captured in the Profile’s snapshot, with no regard to “on wire” USB devices. This view will display what hardware is expected to be found when the Profile is activated.

You may also delete any Hardware Profile using the “Delete Profile”button at the bottom of this section.

Active Hardware Profiling Controls

For our purposes here, consider that a Hardware Profile was activated, which implicitly turns on Hardware Profiling. Again, the Hardware Profiling controls at the bottom of the Hardware Layout screen will change.

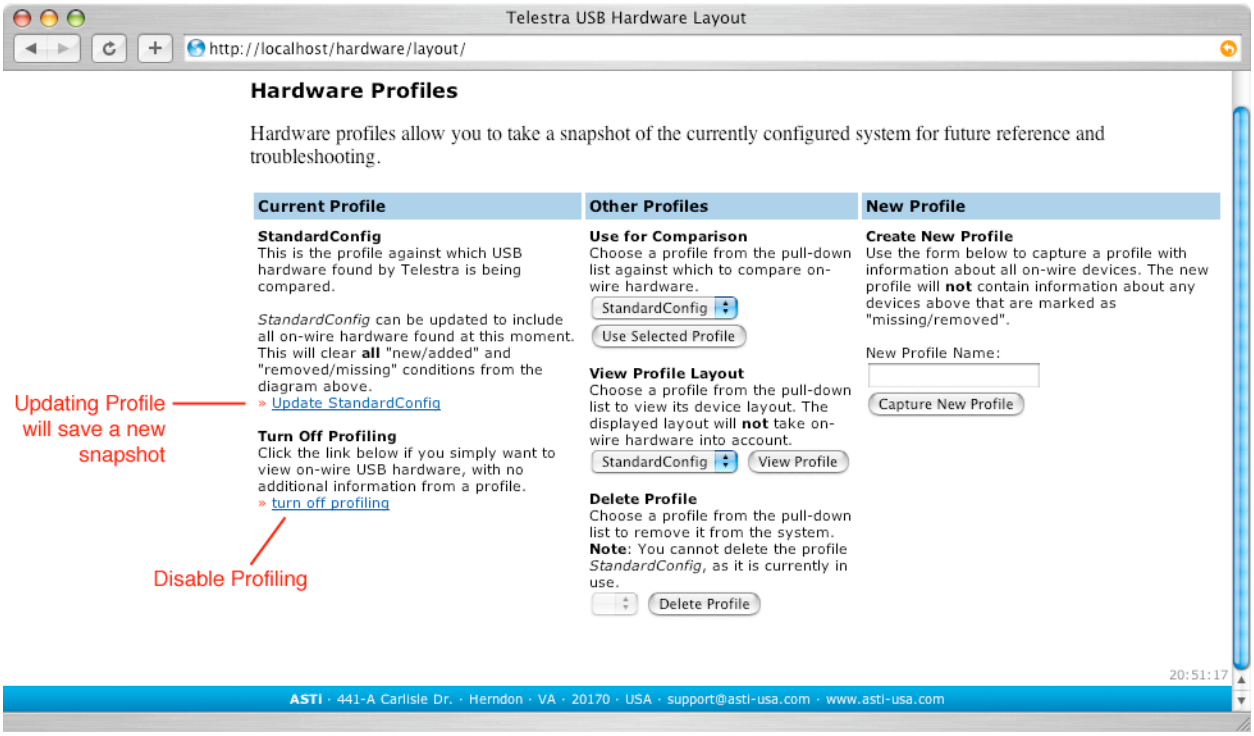


Figure 48: All Available Hardware Profiling Controls & Tools

One control allows you to turn off Hardware Profiling. This will not affect any of the Hardware Profiles on the Telestra system; it will simply prompt RMS to show only “on wire” USB hardware, without comparing it to a Hardware Profile.

The other control allows you to update the currently-active Hardware Profile. This will capture another snapshot of “on wire” hardware, and save it to the active Hardware Profile, thus over-writing it. As discussed next, updating the active Hardware Profile will clear any “new/added” and “removed/missing” conditions from any USB device that is marked as such in the hardware layout tree.

Hardware Profiling in Action

Without activating Hardware Profiling, RMS can only display the USB devices it can locate "on wire." If a model is running, and an Iris device is unplugged or fails, RMS will place a large, red X over that Iris' icon (see "Accuracy & Timeliness of Hardware Layout", a previous section in this chapter). While this can be helpful during model operation, it assumes that all USB devices were properly initialized when the whole system was powered up. Without Hardware Profiling, RMS cannot indicate if one of the expected Iris devices has not been initialized and will not be displayed at all.

Hardware Profiling allows you to save your "perfect" hardware setup for use as a reference baseline. RMS will compare what it finds "on wire" to the hardware profile, highlighting any discrepancies between them.

To illustrate this concept, consider the "ideal" hardware configuration shown below, an example of using the "View Profile" tool.

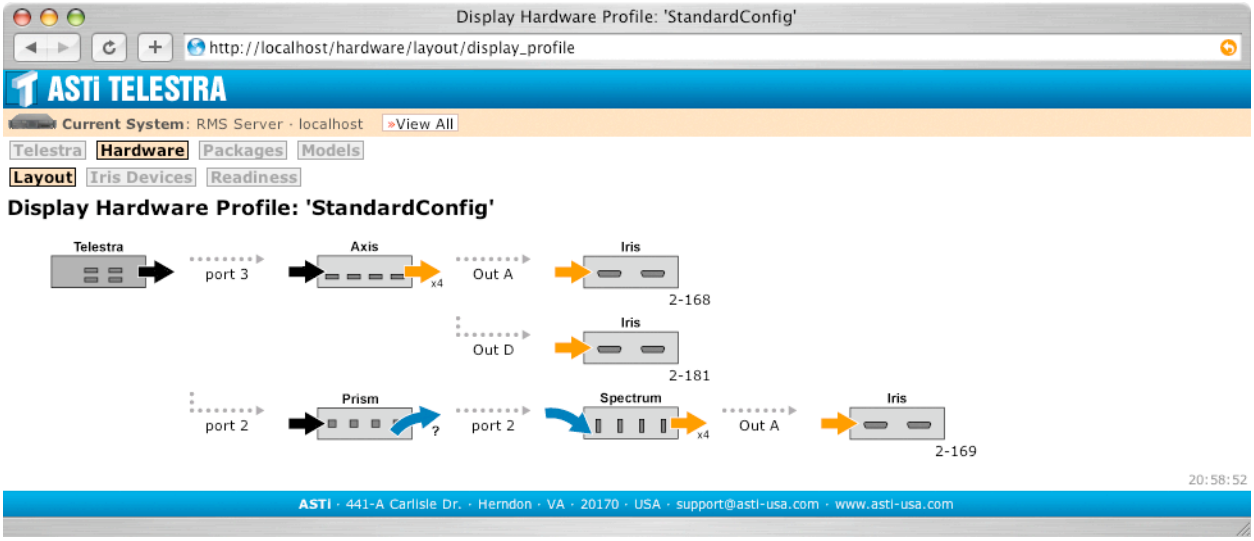


Figure 49: Example Hardware Profile "StandardConfig"

With Hardware Profiling turned on, and "StandardConfig" being the activated profile, all "on wire" USB devices are compared against this ideal setup. Consider the Hardware Layout screen shown below, the results of the comparative process.

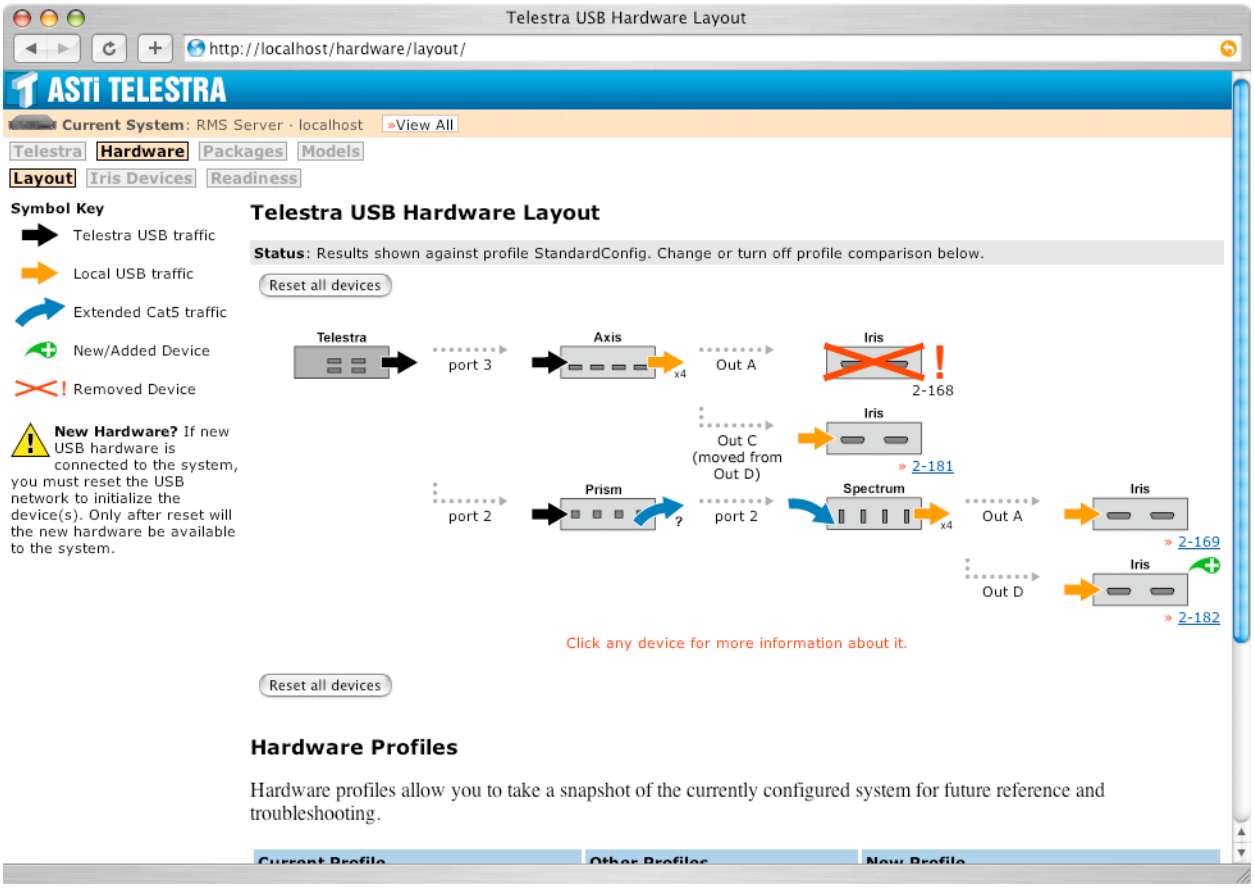


Figure 50: Example Hardware Layout with Profiling Enabled

This Hardware Layout screen shows that there are three differences between our ideal setup "StandardConfig" and what is physically connected to the system.

1. Iris 2-168 is ***supposed*** to be "on wire", but it is not connected, or has failed. You should check power and cable connection, or attempt re-initialization by resetting all devices.
2. Iris 2-182 is ***not supposed*** to be "on wire", but is connected and properly initialized.
3. Iris 2-181's cable is ***supposed*** to be connected to its parent Axis module via its "Out D" connector. Instead, it is connected to the Axis' "Out C" port.

You can then troubleshoot these discrepancies in attempt to achieve the ideal hardware setup.

If, for example, your application requirements have changed, and all of the differences displayed on the Hardware Layout screen are expected, then you can update the Hardware Profile. This will only collect information about the currently "on wire" devices, and will make the following changes to the "StandardConfig" profile:

1. Remove all information about Iris 2-168
2. Record new information about Iris 2-182
3. Reassign Iris 2-181's cable connection to the Axis' "Out C" port.

After updating the profile, it will exactly match what is "on wire" and any discrepancies and/or icon indicators (new or removed) will be cleared. The Hardware Layout screen will then display your new set of "ideal" information.

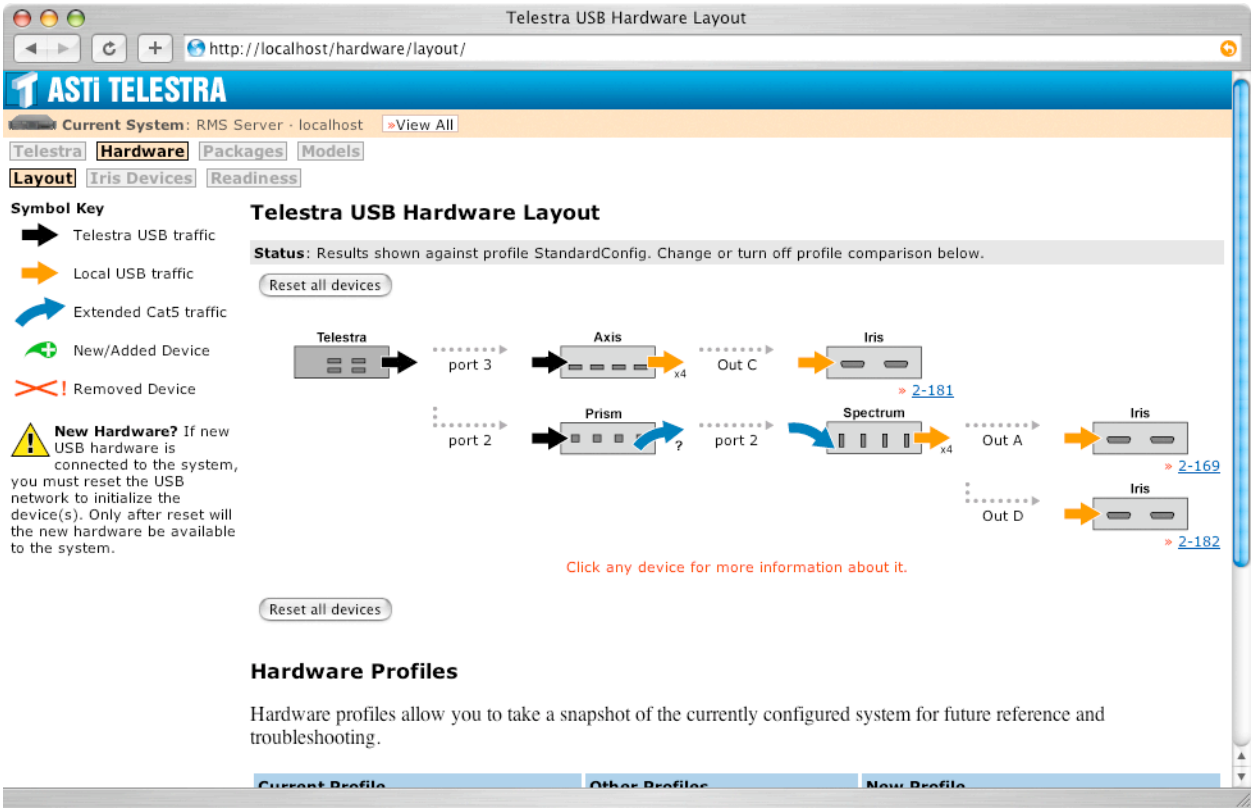


Figure 51: Example Hardware Layout after Updating Profile

Hardware Readiness Test

RMS' hardware readiness test allows you to verify hardware setup, cable connections and Iris operation. Clicking on the "Readiness" button under the "Hardware" major category will display a confirmation screen.

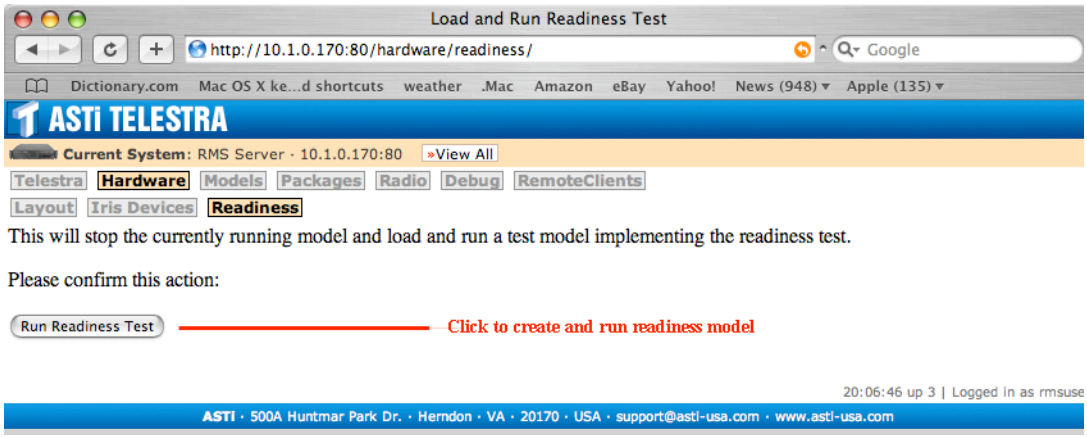


Figure 52: Hardware Readiness Confirmation Screen

The test will create a custom readiness model based upon all the "on wire" USB devices that have been properly initialized. This readiness model provides testing of audio in and out channels, as well as digital in by way of PTT. To perform the test, you will need at least a headset for connecting to the Iris device(s) to be tested. The recommended test rig (shown below), consists of:

- Iris-to-PTT cable (DB-15 male to female, 6-pin XLR)
- Inline ASTi PTT box
- Stereo headset with microphone and male, 4-pin XLR connector

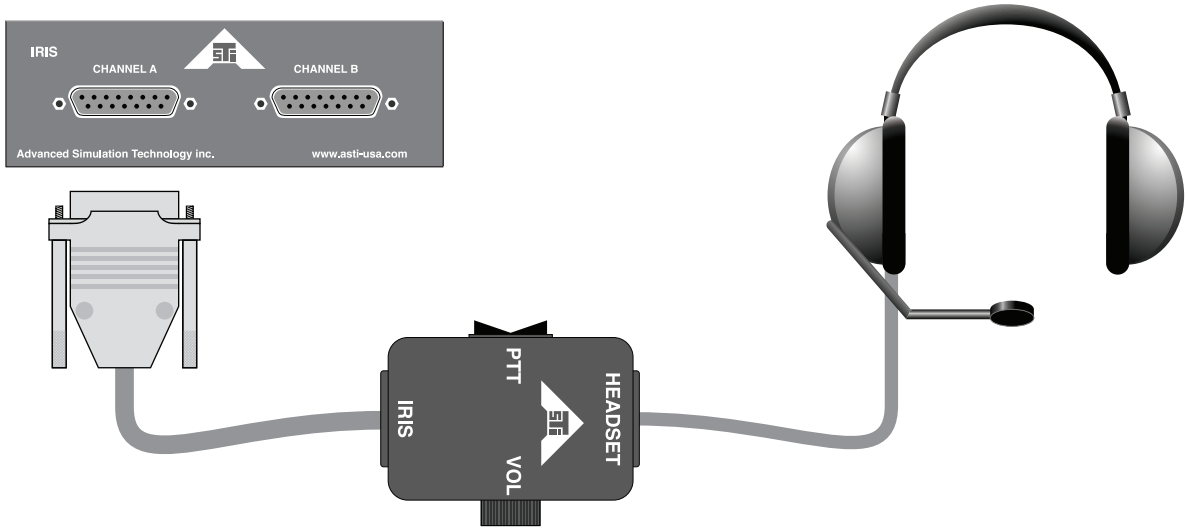


Figure 53: Recommended Readiness Test Rig

Once you are prepared to test your Iris device(s), click the “Run Readiness Test” button on the confirmation page. Telestra will then construct, load and run the custom readiness model.

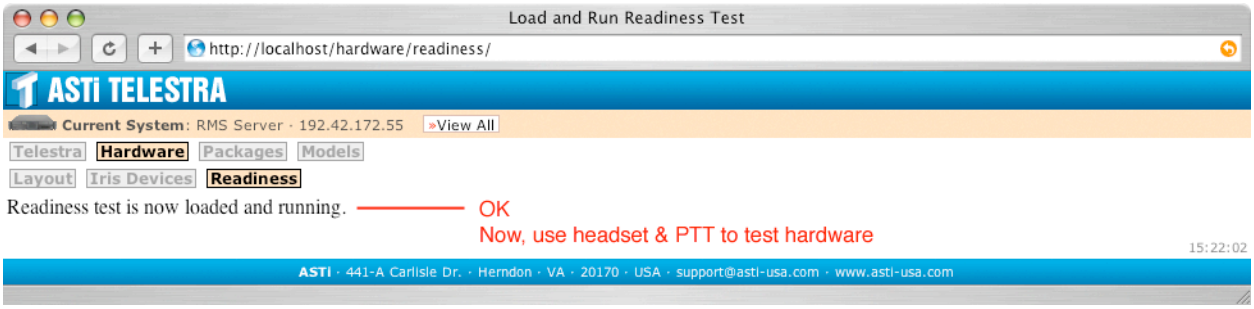


Figure 54: Readiness Test Running Screen

At this point, all “on wire” Iris devices that have been properly initialized will behave in the same manner.

1. Plug the test rig into either channel (A or B) of any Iris device.
2. Speaking into the microphone will produce audio output on both left and right channels of the headset as sidetone.
3. Depressing the Press-to-Talk (PTT) button on the PTT box will produce an audio tone in the headset. It is an intermittent tone on Channel A and a constant tone on Channel B. The tone will cease when the PTT button is released.

   Note that on four (4) channel PTT’s an additional tone is produced regardless of the PTT button selection. Each position of the channel selector knob produces a different frequency tone.
4. If your PTT box features a volume knob, audio output volume to the headset will behave as expected. ***Remember***: If audio output is not heard, make sure the volume knob on the PTT box is not turned all the way down.

If the expected results described here are not produced by an Iris device, check all cable and device connections, as well as device initialization. Further troubleshooting suggestions can be found in the Iris Technical & User Guide (ASSY-01-UMAU-UG-1)

Important: When you are done with the readiness test, you must reload the desired MBV model to replace the custom readiness test model. See “Software Model Facilities in RMS” starting on page 70 for more information.

Software Package Management in RMS

Clicking the “Packages” button in the major category menu will display the Packages screen in RMS. This screen displays a list of all Telestra software packages, each package’s status and version.

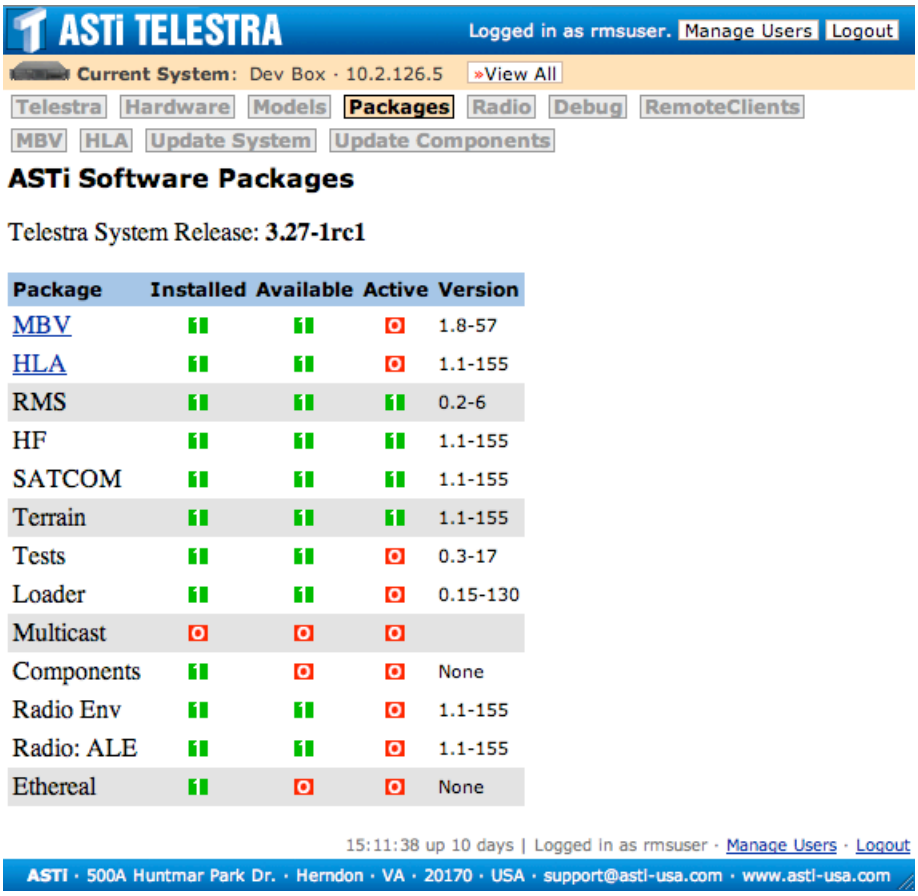


Figure 55: Telestra Software Packages Screen

Each package has three levels of status: Installed, Available, and Active.

“Installed” means simply that the software components of that software package exist on the Telestra system.

A package will only be “Available” if the system’s Telestra Options File enables use of the software (see “System Options,” in a previous section of this chapter for more information).

If a package is installed and available, it will only be marked as “Active” if the software is currently running on the Telestra platform.

Also displayed on the Packages screen are links to individual software package management screens (in the Packages submenu). In the figure above, the MBV and HLA software packages have a link in the submenu. This list of manageable software packages will grow in the future.

To access package information and management screens, simply click its submenu button.

The MBV management screen is shown below.

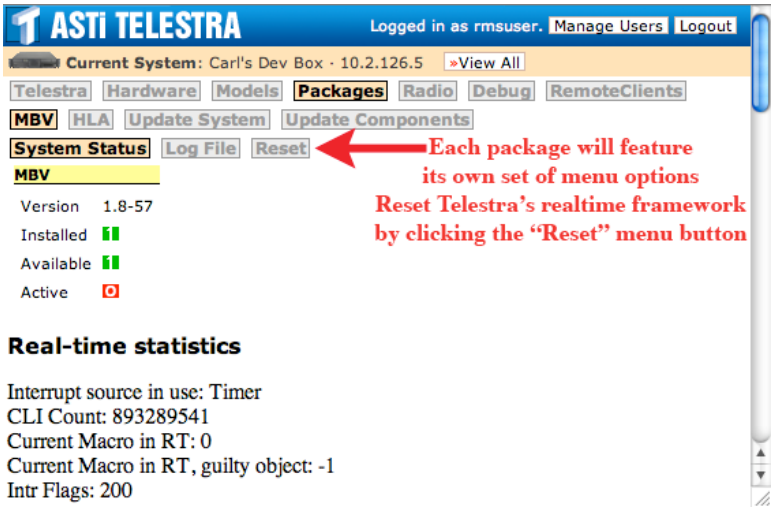


Figure 56: MBV Package Management Screen

Each Telestra software package's management screens will feature its own set of menu options.

Resetting the Realtime Framework

At this time, the most important feature of the MBV management section is the ability to reset the Telestra's realtime framework. To do this click the "Reset" button in the MBV submenu, and confirm the action on the subsequent screen.

After resetting the realtime framework, the desired MBV model must be reloaded and started to resume operation.

Updating Telestra Software Packages

Clicking the “Update” button in the Packages submenu (or Telestra submenu) will display the Software Update screen, shown below.

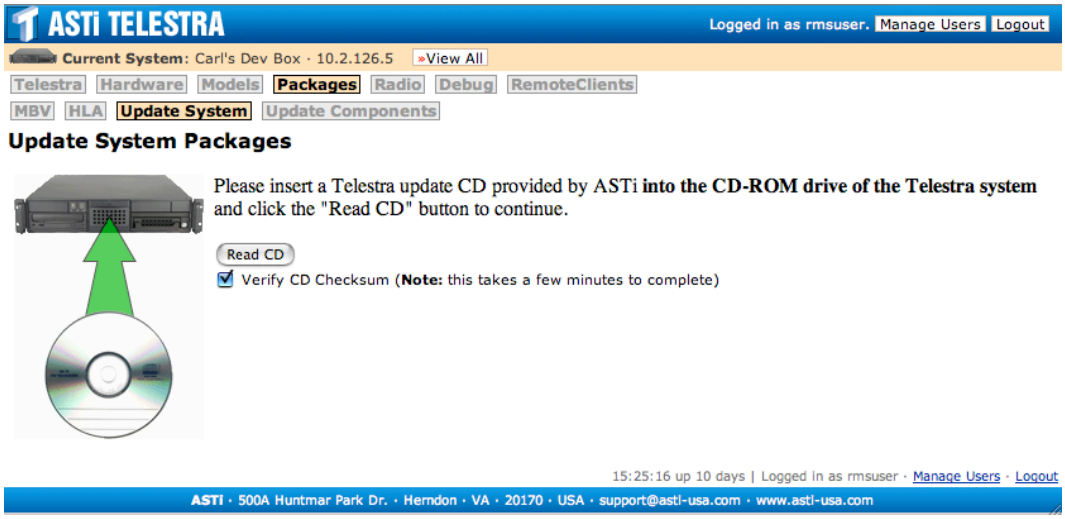


Figure 57: Software Update Screen

Insert an ASTi-supplied Telestra software CD in the Telestra system’s CD-ROM drive, and ensure the drive tray closes completely. Then, click the “Read CD” button on the Update screen.

The Telestra system will then mount the CD-ROM and check the contents of the update CD. Please be patient, this may take a few minutes.

After the Telestra system has determined which packages to update, another page will display showing any appropriate release note, and lists the packages to upgrade on your system.

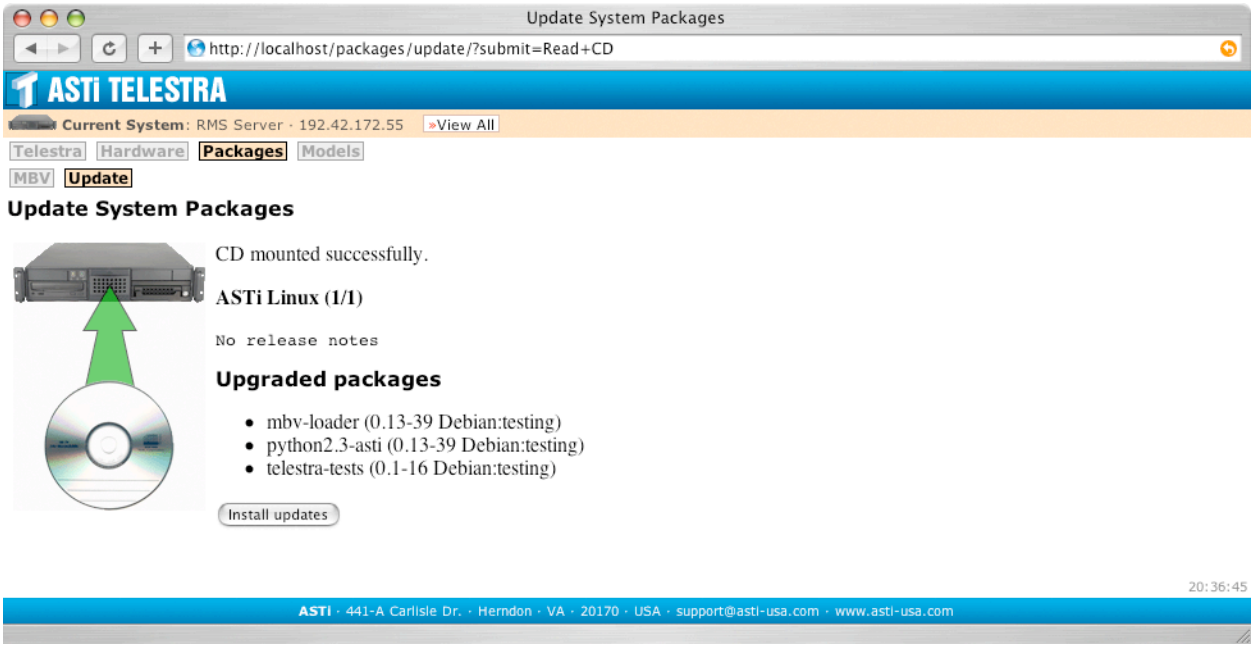


Figure 58: Software Update Review Screen

After reviewing the packages to upgrade, click the “Install updates” button on this screen. Telestra will then proceed to install the necessary package updates. When done, RMS will display a confirmation screen, as shown below.

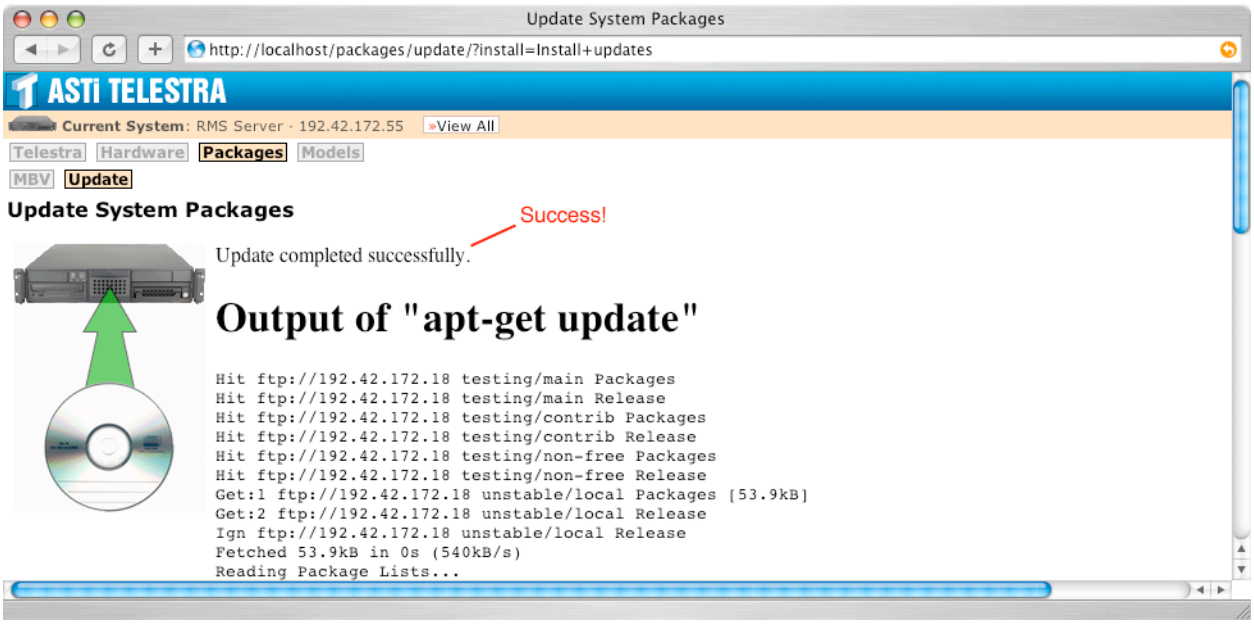


Figure 59: Software Update Confirmation Screen

The first line is most important. It should read, “Update completed successfully.” You can ignore the rest of the displayed output.

IMPORTANT! At this point, you must remove the CD from the CD-ROM drive of the Telestra system before doing anything else! Failure to remove the update CD from the drive will result in a full-up system installation (including complete erasure of the hard disk) the next time the Telestra system is started.

After removing the CD, reboot the Telestra system using the option in System Actions, or through the Telestra Configuration Utility.

Software Model Facilities in RMS

Clicking on the “Models” button in the top major category menu will display the Model Management screen, as shown below. Model Management allows the user to load, copy, delete, and backup the models. This page also displays the users that exist on the Telestra system and their models. For more information on users and their models, see Managing Users and Models.

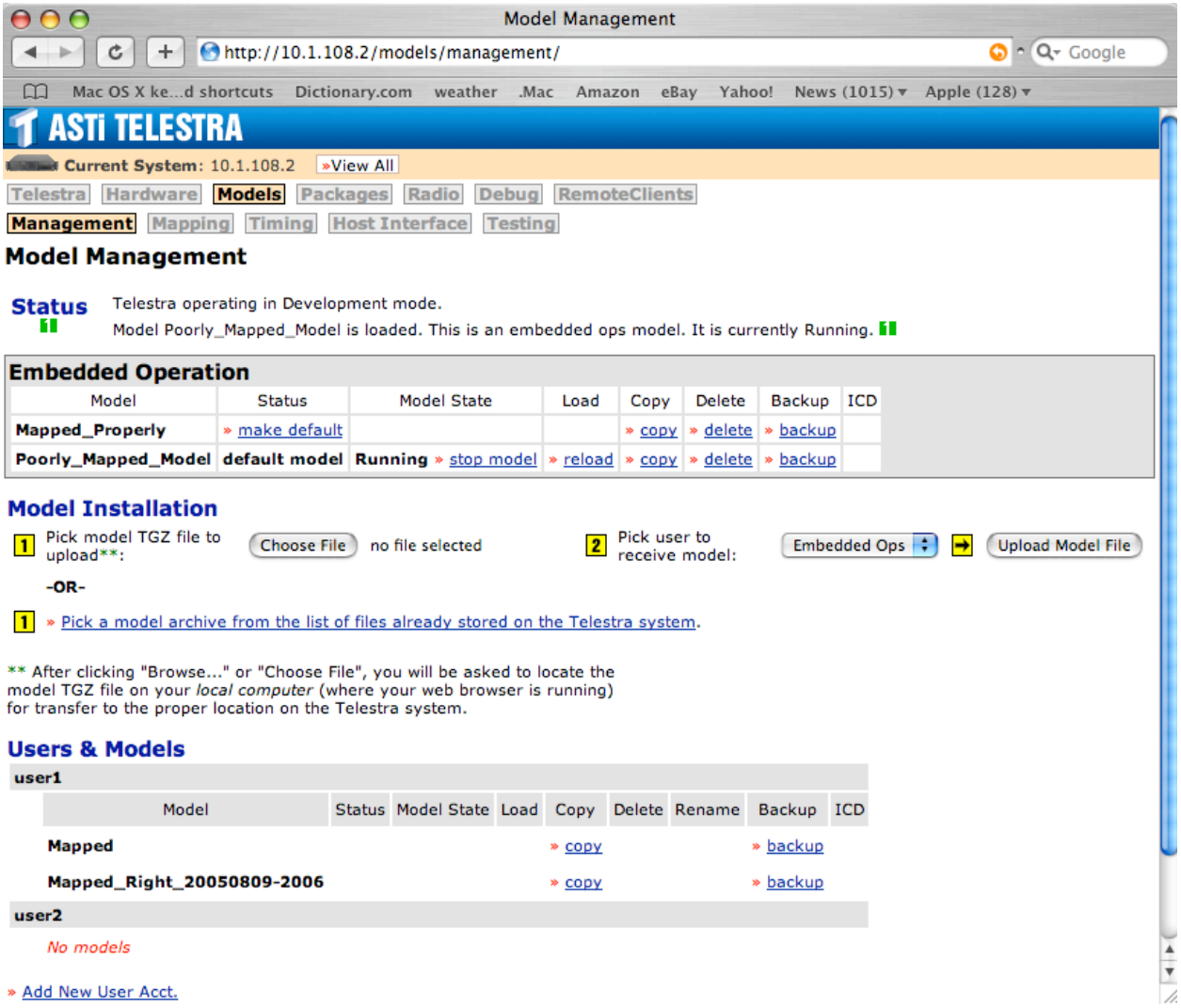


Figure 60: Model Management Screen

Uploading & Installing Model Files

There are two ways for the user to start a model installation. **Note:** When using RMS, the terms *restore* and *install* can be used interchangeably, as in this document. The user can choose to upload a model from their workstation (Step 1-A) **OR** choose to restore a model archive already stored on the Telestra (Step 1-B). To install a model, you must complete a multi-step process. To upload a model from your workstation start with Step 1-A below or to choose an existing model archive go to Step 1-B on the following page. Step 2, 3 and 4 are common to both approaches. Note: Some older versions of RMS do not have this multi-step process.

Step 1-A

To install a new MBV model, you must upload the model's TGZ file (zipped tape archive) to the Telestra system and assign it to a user account. Click the "Choose File"* button to locate the TGZ file on your local workstation.

Next, choose a user to receive the model under the pull down menu, in the example below the user is "user1." When ready, click the "Upload Model File" button to transfer the model to the Telestra.

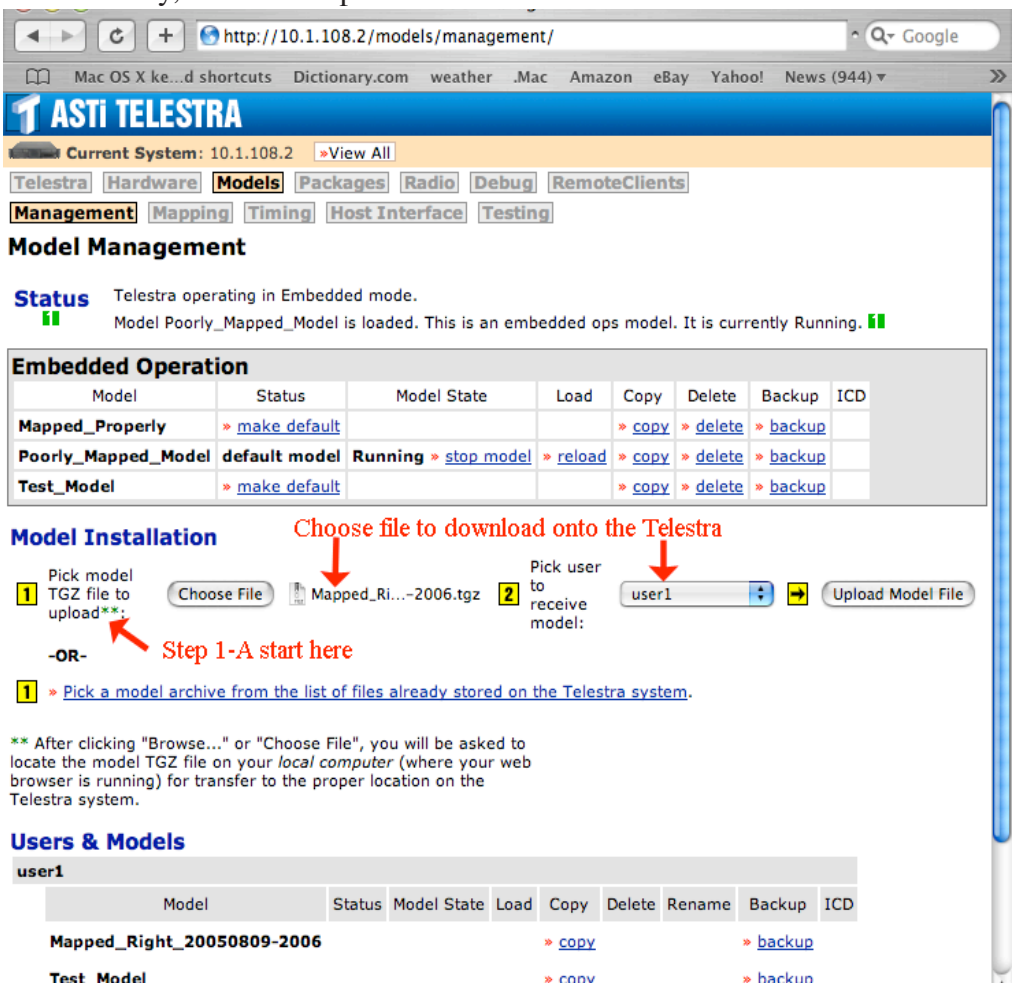


Figure 61: Choosing and Uploading a Model

*Button may be labeled differently depending on your operating system and/or web browser.

Step 1-B

The user can choose to restore a model archive that is already loaded on the Telestra. Click “Pick a model archive” to view the list of model archives already stored on your Telestra system.

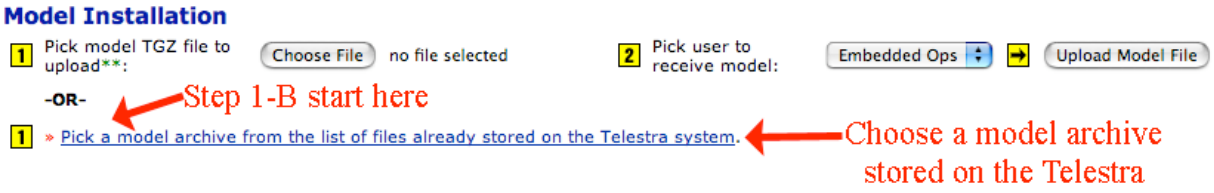


Figure 62: Archive Model

Step 2

After clicking “Pick a model archive” from the Telestra, RMS will display a list of files to choose from, as shown below. The user can click “info” to display the model’s details. The details will include all of the archived files for that specific model. Click “restore now” to start the installation. The user can also choose to upload a backup file that has been saved on the Telestra. This option allows the user to restore system configuration files or install a new model.

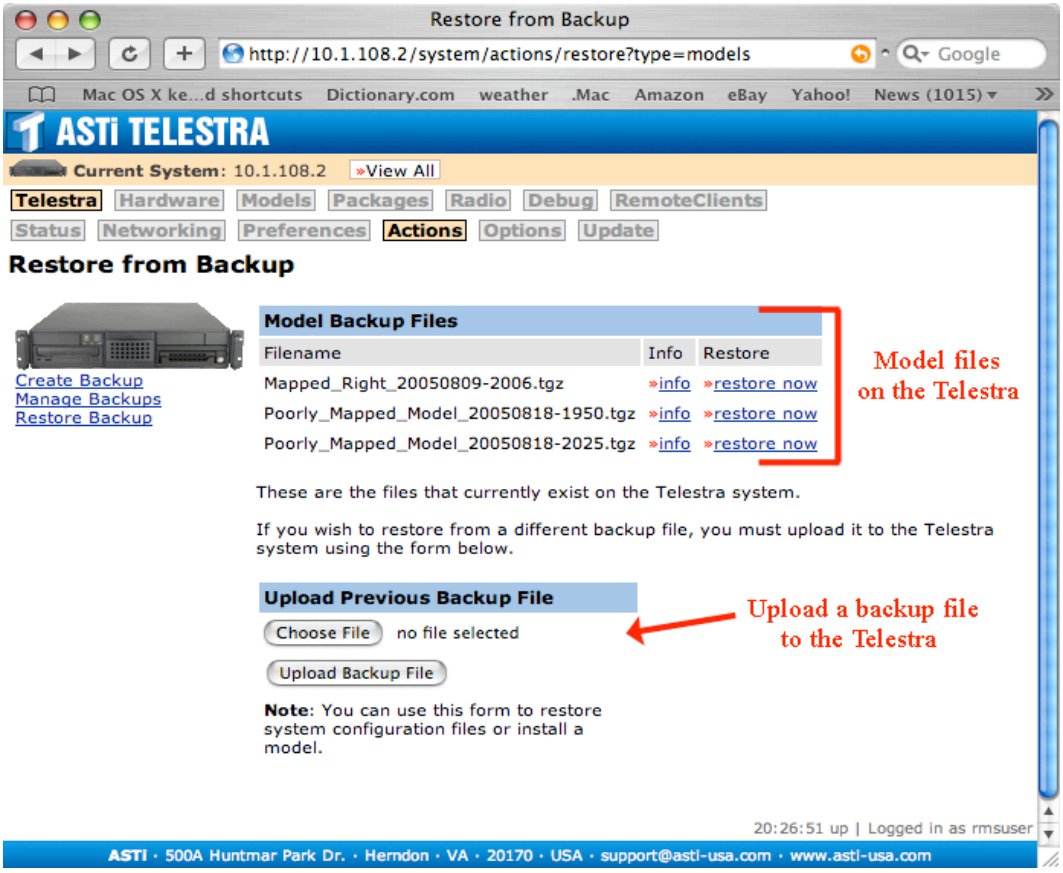


Figure 63: Restoring Backup Files

Step 3

If you started with Step 1-B, you may have to choose a target user to receive the model before installing a model. Next, choose to install the new files onto an existing model or type in a new model name. ***ASTi recommends the user choose a new model name to avoid model functionality issues.***

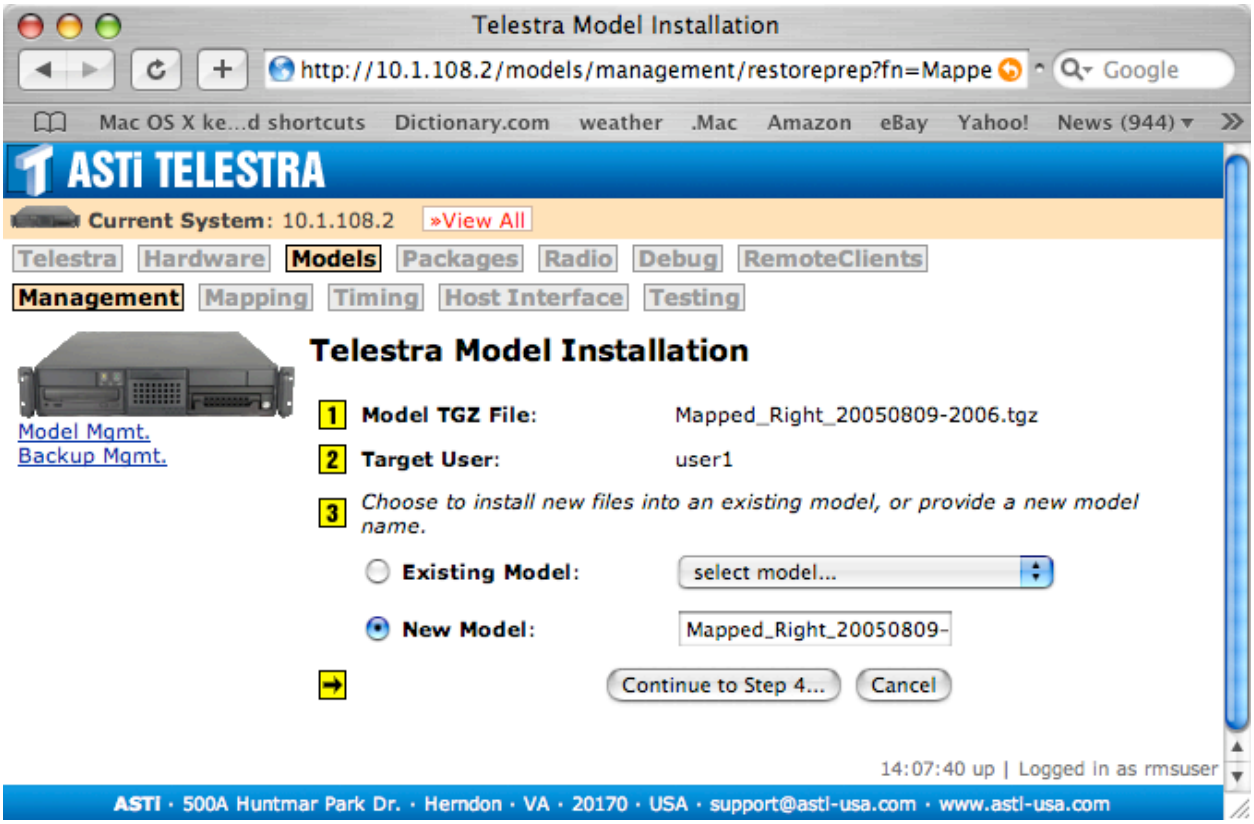


Figure 64: Model Installation

Step 4

RMS will then display each section of the model archive and the user must choose which files to install. The “In TGZ” column displays the model files that are about to be installed on the Telestra. If you choose to install new files onto an existing model, RMS will ask if you want to overwrite any existing files. The “Exists” column displays a warning if you are about to overwrite existing information. The user can choose whether or not to overwrite existing files by clicking the “Yes” or “No” buttons. ***Note: Overwriting will delete the existing files.***

In addition to overwriting and installing, the “Action” column will display “missing” when there are no files for a section. The “Action” column will also display “No effect” to confirm that the installation will not affect the existing model. After verifying all the actions, click “Install Files Now” to complete the installation.

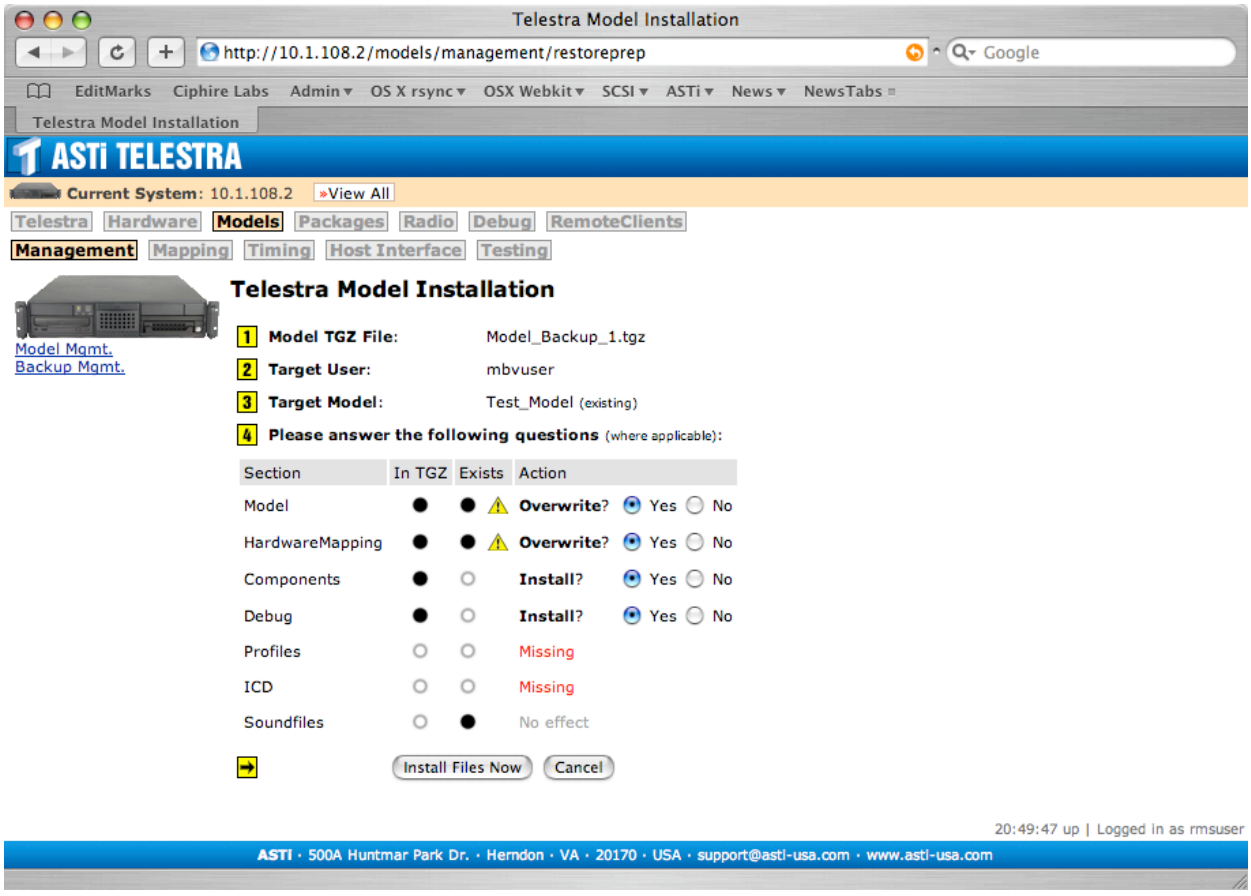


Figure 65: Selecting File Sections

After completing the model installation, the confirmation page will show all files that were restored onto the system. The model is now ready for management.

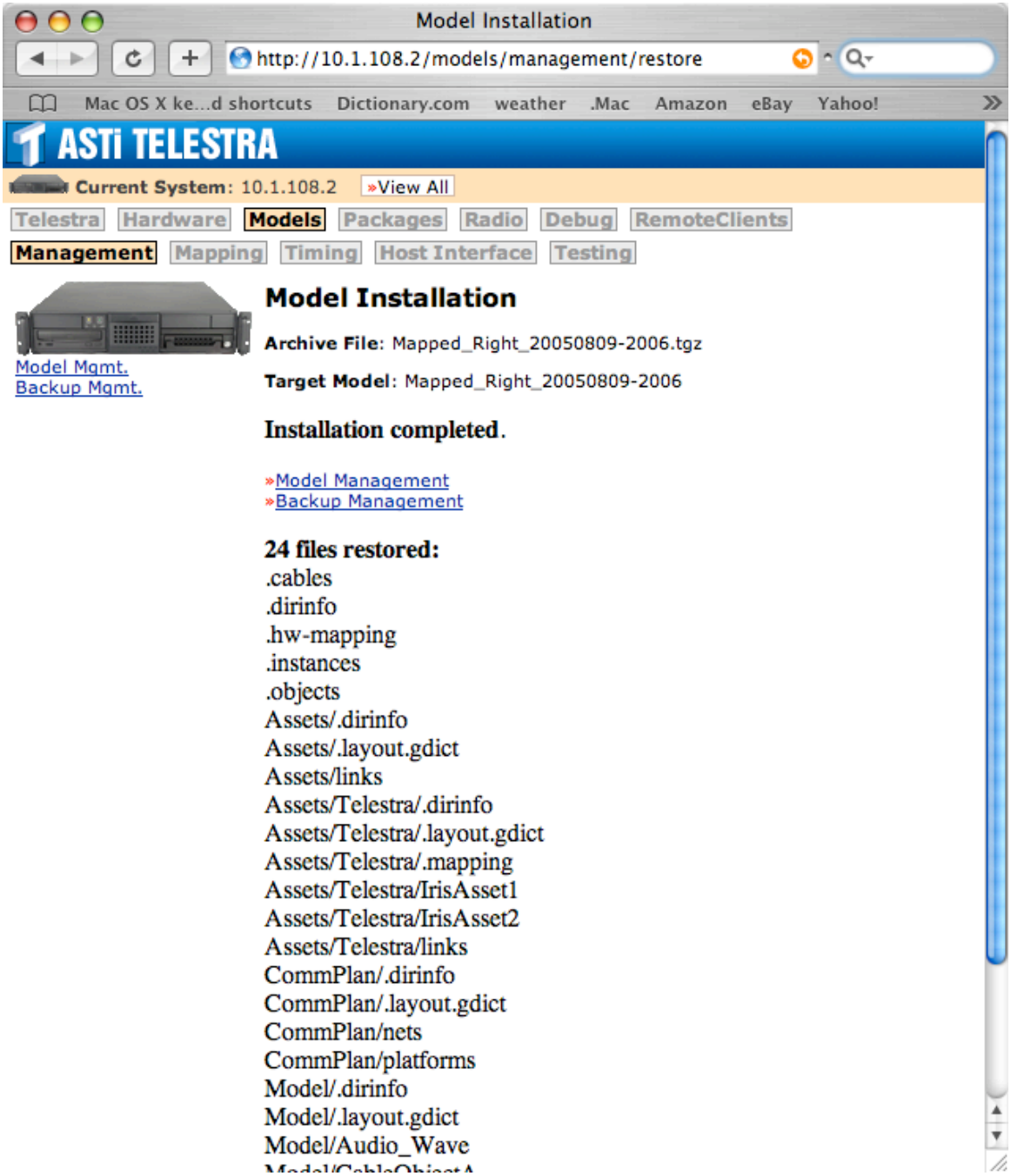


Figure 66: Model Installation Confirmation

Model Management

Model management allows you to stop, reload, copy, delete or backup the model. In Development mode, each user's "default" model will load into the Model Builder Visual environment when launched. In embedded mode, the "Embedded Operation" default model will automatically load and start after booting the Telestra system.

First, click the "make default" link next to the desired model. Once the model is designated as the "default" model, the available management tools will change, allowing the user to load the model.

The user can check the status of the model at the top of the page or under the "status" column. Next to "Status" at the top, a green "1" is displayed if the model is running, and a red "0" is displayed if the model is stopped.

The user can stop and start the model by clicking the appropriate link in the model state column. Clicking "reload" will stop the model if it is running and reload the model, updating any changes made to the model.

For this example, the Mapped_Properly model is shown as the default model and it is running on the system.

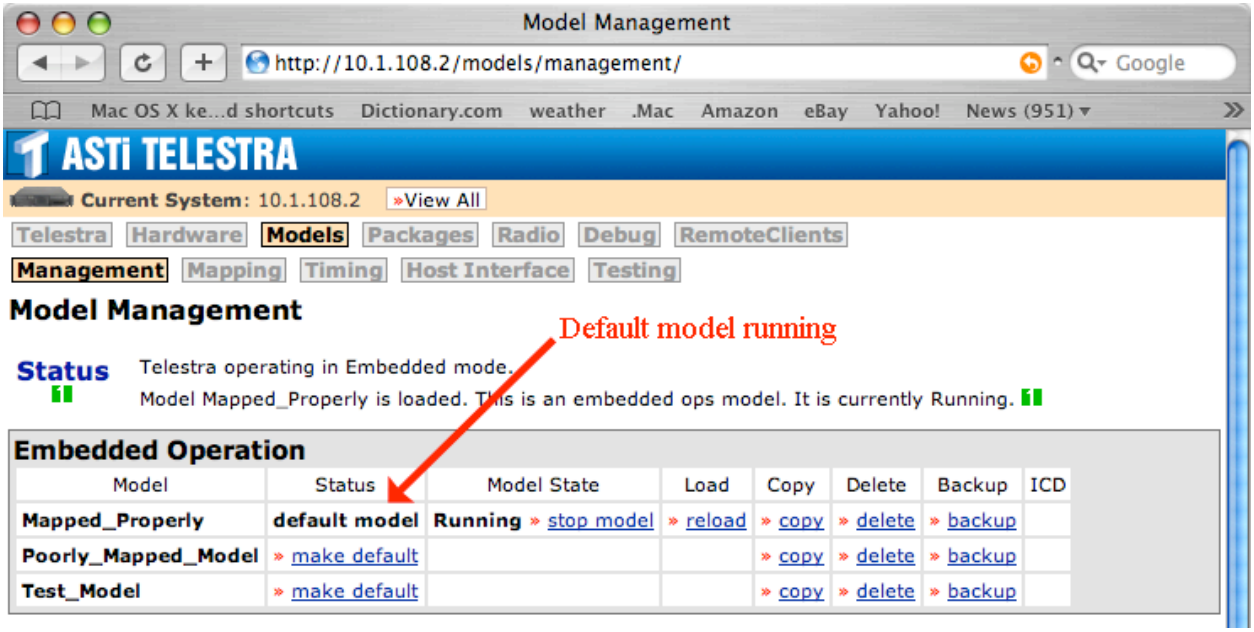


Figure 67: Model Management with Default Model

Managing Users and Models

Model management controls do not exist for other users' models; you can only manage the models owned by the user you originally provided when logging into RMS. Any user may manage the Embedded Operation models. Other users' models are displayed for download or copy purposes. To load and use another user's model, you must either download it first, then upload the TGZ file with your user as the recipient, or copy the model to your account.

Click "copy" to copy a model to a different user. The screen will display the model to copy from the existing user to the new user. Choose a user to receive the model from the pull-down menu, and click "Copy Model."

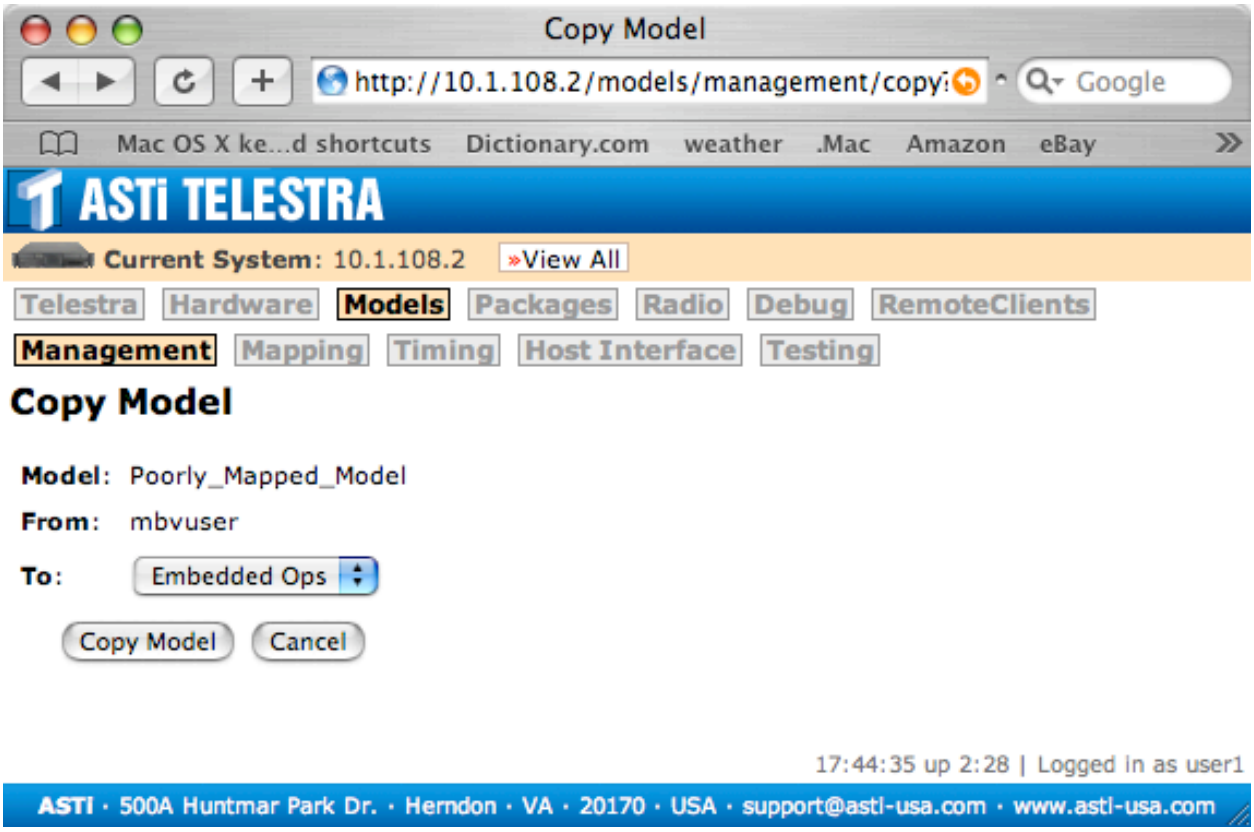


Figure 68: Copying Model

Backing up the Model

Click “backup” to open the backup management options for the model on your workstation. In the backup management page, the user can choose which model sections to backup. The backup function allows the user to create, manage, and restore backups.

When a user chooses to backup a model in RMS, a TGZ file is created with some or all of the following, based on what you select:

1. **Model**- The model contents consists of 3 main folders as seen in the MBV model window. These three folders and their contents are backed up when the Model option is selected.
   - Model-The Model folder contains all the subfolders and the corresponding components, links, etc.
   - Services- The Services folder contents (intercom service, playsound service, etc.) is created automatically based on the model components.
   - Assets- The Assets folder contains Iris Assets and UDP input/output assets.
2. **Hardware Mapping**- The Hardware Mapping option refers to the mapping file that links the names given to the Iris assets in the model to the serial numbers of Iris devices discovered on the USB tree. The Hardware Mapping file also contains the Host Interface parameters for the UDP input and output assets contained in the model.
3. **Components**- These are any custom components that are embedded in the model folder or its subfolders.

   Note: Most components are common and included in the software. However, ASTi can create custom components that are embedded in the model, if required.
4. **Debug**- The debug pages created in RMS that can be configured to set and read certain object values.
5. **Profiles**- The profile allows the user to compare its known set of “on wire” USB devices against a pre-defined set of ideal information, the Hardware Profile. Hardware Profiling thus allows RMS to show not only what it finds, but also what devices are missing or extraneous, based on the information inside the Hardware Profile. For more information see “Capturing Hardware Profiles.”
6. **ICD**- The Interface Control Definition is an XML file that is used to create the host assets in the model. The XML file contains the source files to create the host assets and it is managed through the ICD tool.
7. **Soundfiles**- This is the library of soundfiles, which includes an index and all of the WAV files that are used in the model.

Note: RMS facilitates archiving and restoring **only the models** in the user accounts. If users choose to store any other information in their directories they are responsible for backing it up.

Replacing Model parts in an Existing Model

RMS users have the ability to install parts of one MBV model into/over an existing model already installed on the Telestra.

This is useful in the following example situations.

- You have two Telestras that are using identical models, and you are making changes to the model on one Telestra, that you want to now transfer to the second Telestra. In this case, the only difference between the two models is the hardware mapping file, because the two Telestras have two different sets of USB audio peripherals.
- You are sending an aural cue model back and forth via email, and the model has many large soundfiles that make the file size too large to easily email. In this case, once both sites have a single copy of the soundfiles, you can backup a copy of the model without the soundfiles, exchange that via email, and then use the procedure below to insert the soundfiles into the new model.

Note: The system cannot combine objects within a file part only replace it. For example, the user cannot combine objects in an existing model hardware mapping file with another hardware mapping file. The new hardware mapping file will completely overwrite the old file.

The user should note that when completing the following steps RMS will warn against overwriting existing files. ***Note: Overwriting will delete the existing files.***

The user can choose to replace any of the following files to their existing model:

- Hardware Mapping
- Components
- Debug
- Profiles
- ICD
- Sound files

The following steps describe the procedure for installing a new model, Model_2, and then installing the soundfiles from an existing model, Model_1, **onto** Model_2, so that it now has the soundfiles from Model_1.

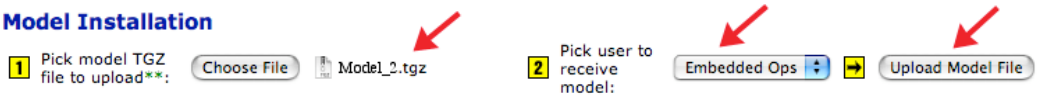
Note: For the steps below Model_ 1 is the existing model and Model_2 is the new model.

Step 1: Backup the Existing Model

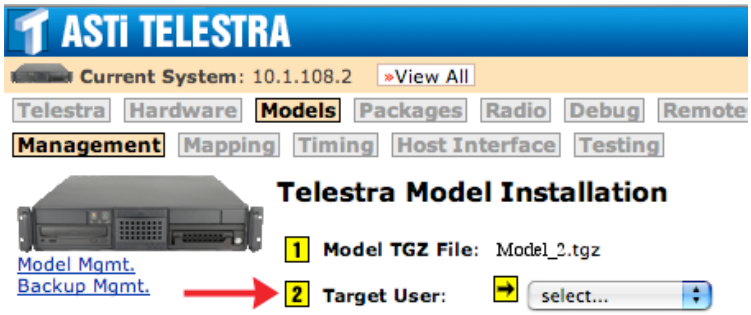
1. Click “backup” to open the backup management options for Model_1 on your workstation.
2. In the backup management page, choose to back up all model sections.

Step 2: Install the New Model

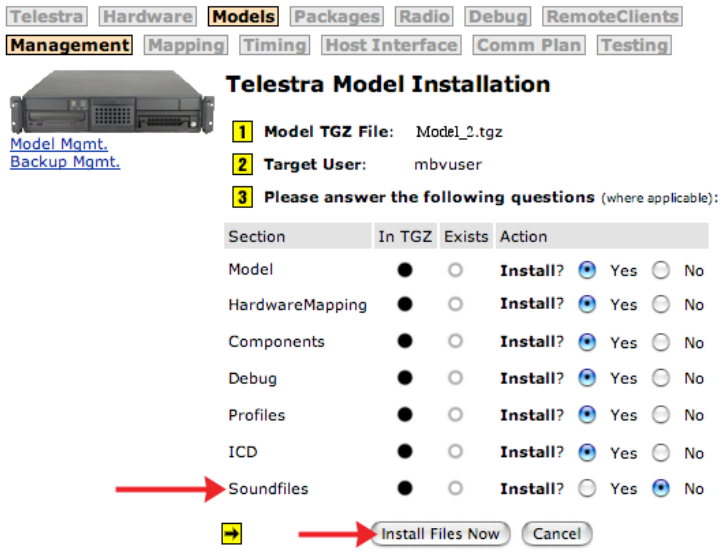
1. Download the new model, Model_2, onto your telestra.
2. Next you need to install Model_2. Under “Model Installation” select the “**Choose File**” button, browse and select the file.
3. Pick a user to receive the model and then select the “**Upload Model File**” button.



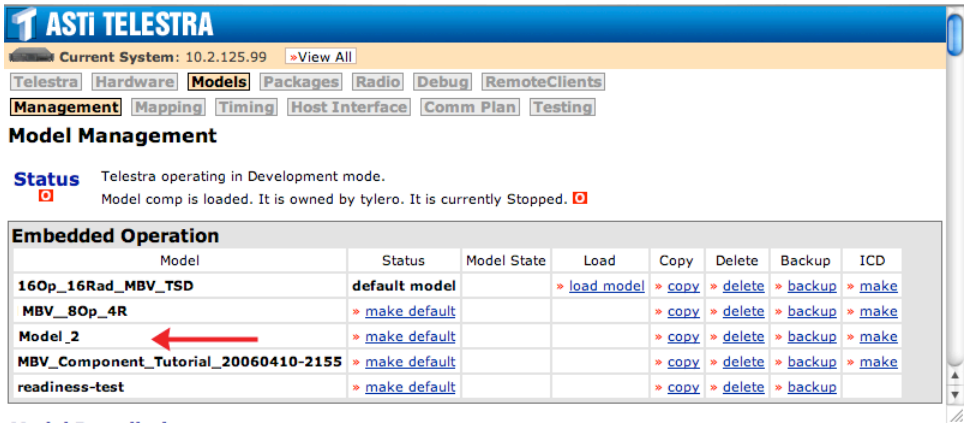
4. In the Telestra Model Installation page, select a “**Target User**” to receive the new model.



5. Install the files from the new model by selecting "**Yes**" next to the files you want to install. Verify that the correct files are selected.
6. Select "**Install Files Now**."

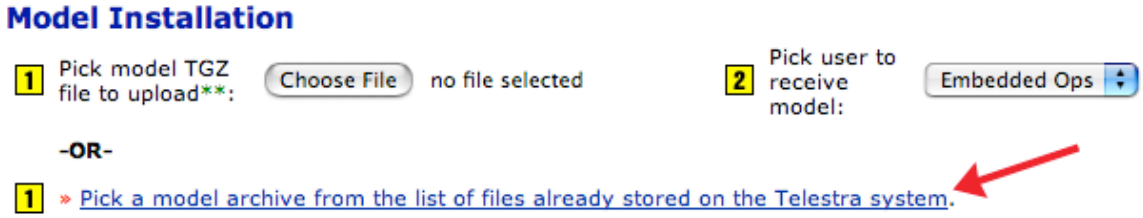


7. RMS will display a confirmation screen stating the "**Installation Completed**."
8. Return to the RMS Model >> Management page and you should see Model_2 installed in the model section.

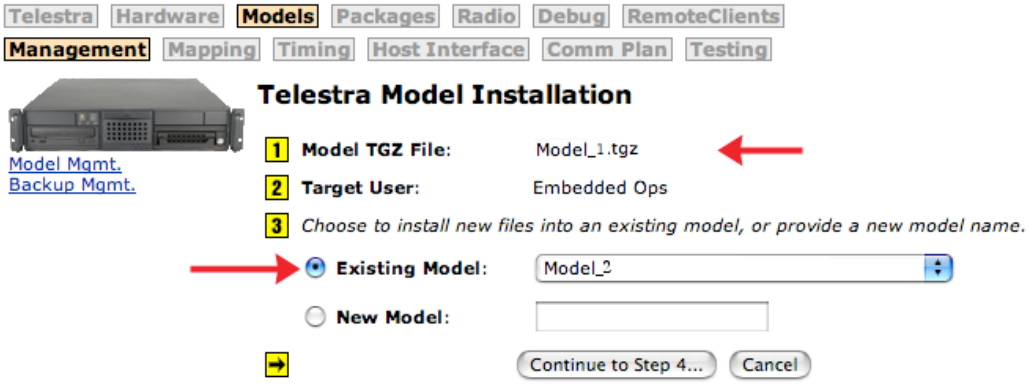


Step 3: Install the Soundfiles from Model_1 onto Model_2

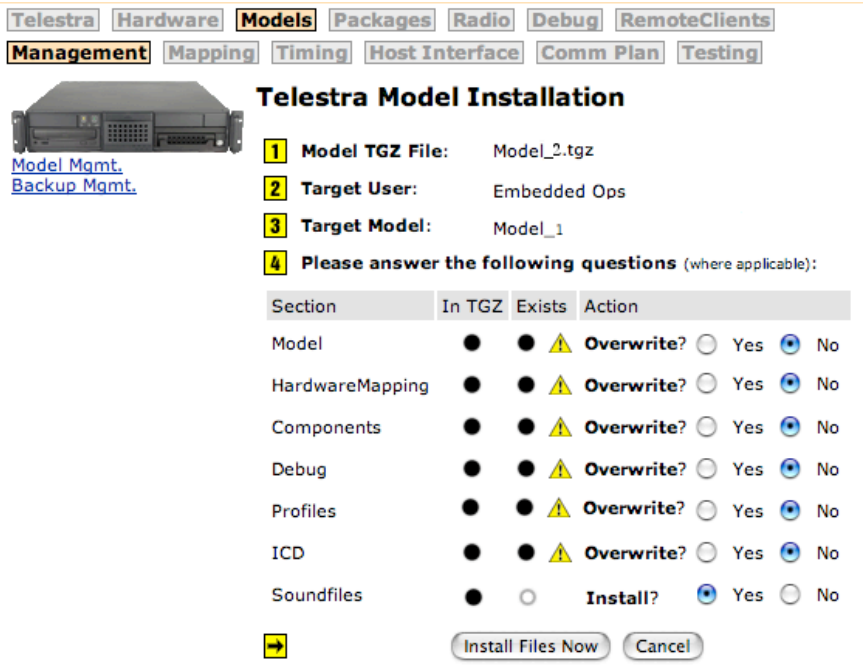
1. In Models>>Management under "**Model Installation**" select to pick a model from the list of existing files stored on the Telestra.



2. In the list select Model_1.
3. The Telestra Model Installation screen will open and you must choose to install the files to the Existing Model.
4. Next, select the model to install "over" the current model, in our case this is Model_2.
5. After verifying your selections, click the '**Continue to Step 4**' button.



6. Select to install the soundfiles. If you have existing soundfiles in this model, you will be asked if you want to overwrite, ***this will erase any existing soundfiles***. Verify your selected model parts and click the "**Install Files Now**" button.



Your model replacement installation is now complete.

Models Mapping

Clicking the "Models" and then "Mapping" button in the top category menus will display the Iris Interface Mapping & Status page. This page is described in the "Hardware Mapping Display."

Models Timing

Clicking the "Models" and then "Timing" button in the top category menus will display real time statistics. The user can click the column headings to sort the times by category. Operation and use of Models Timing facilities will be further explained in a future release of this document.

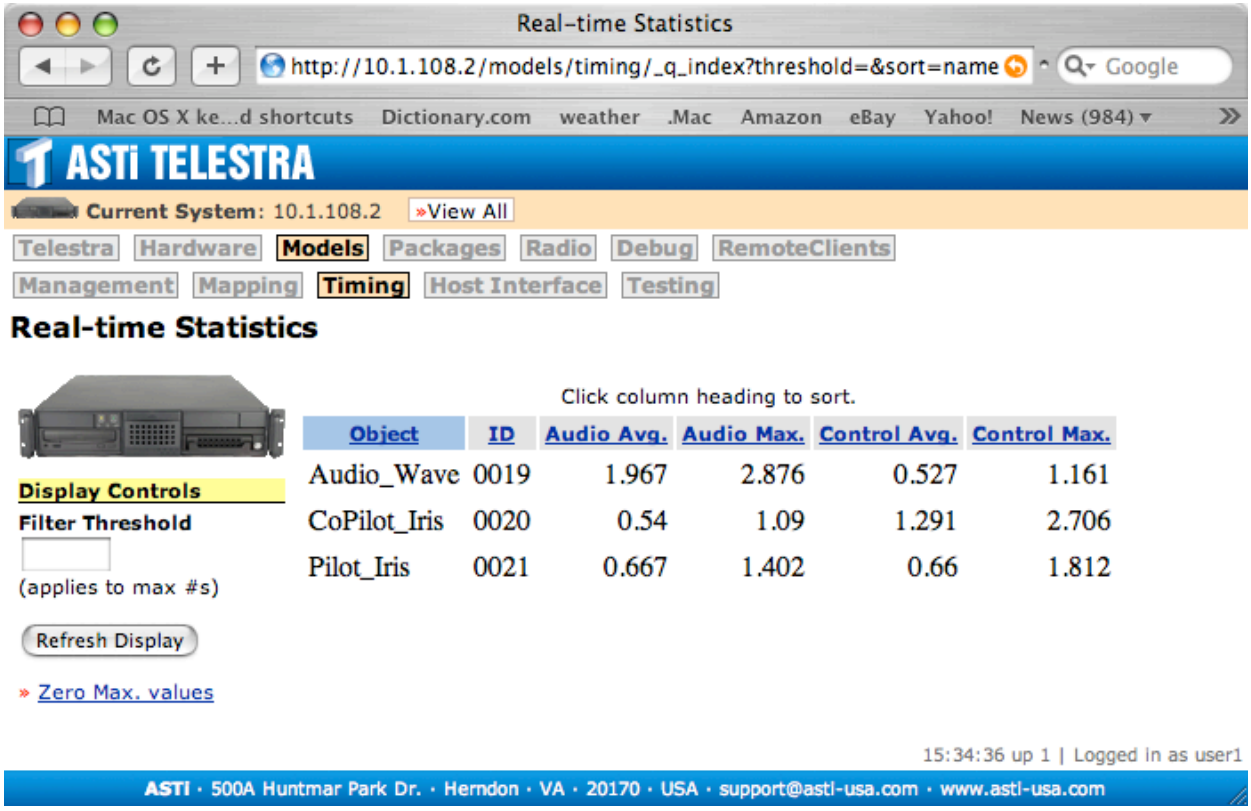


Figure 69: Model Timing

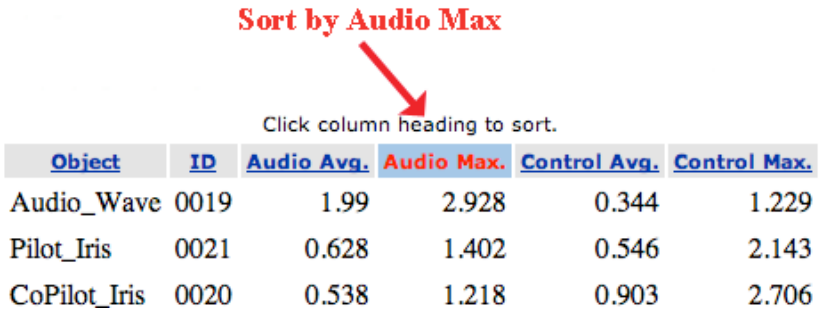


Figure 70: Model Timing Sorted by Audio Max.

Models Host Interface

This RMS Model>> Host Interface screen allows the user to reconfigure the IP address and UDP ports for the host interfaces in the current model. The user can also select the interface on which all multicast UDP host traffic is output. Submitting any changes causes the model to reload.

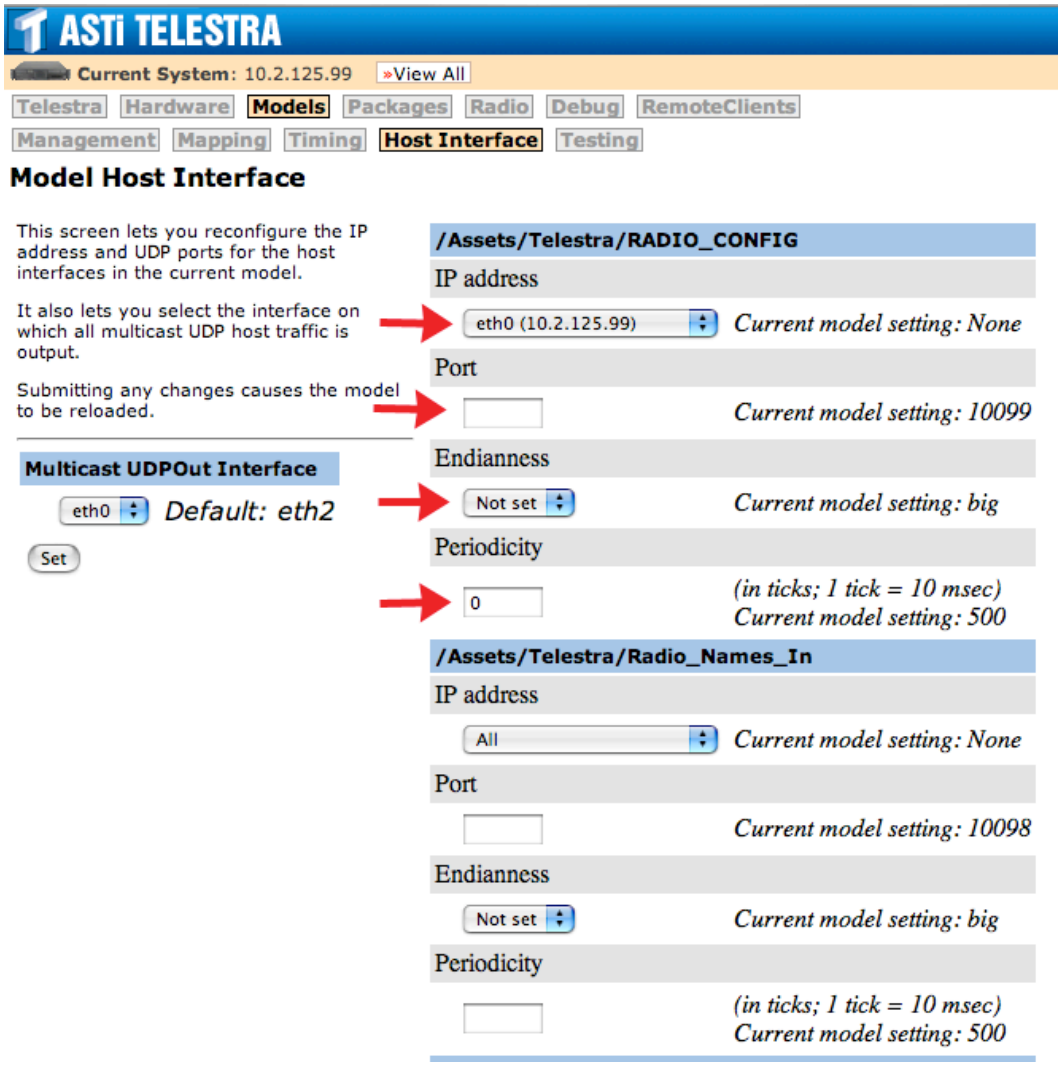


Figure 71: Model Host Interface

Models Testing

Operation and use of Models Testing facilities will be explained in a future release of this document.

DIS Overview

Distributed Interactive Simulation (DIS) is a simulation protocol standard developed jointly by industry and the military to enable interoperation of simulation and training devices over local and wide area networks.

One of the more difficult and often underestimated aspects of simulation over local and wide area networks is achieving a realistic radio communication environment. With the DIS option active the local radio and intercom modeling performed by the Telestra is extended over the local and wide area network. Communication simulation between multiple DIS compatible network devices is invisible to the user with full radio modeling across systems. All recent released versions of the DIS standard are supported and are available to the user for selection.

During DIS operation, the Telestra transmits and receives DIS standard PDUs. Since the Telestra is involved strictly with communications simulation it transmits and receives Transmitter, Signal and Receiver PDUs only.

In addition, Entity State PDUs are received to accommodate entity attach features whereby a radio modeled on the Telestra is attached to an entity on the network.

Radio Display

The RMS Radio Display screen displays all DIS radios separating Local DIS Radios and Network DIS Radios. The user can choose a specific exercise ID to filter out other radios on different exercises. This page is useful when troubleshooting to see what radios are transmitting and receiving on the network. Select the headings across the top of each list to sort the list by a specific radio feature. The radios are sorted by Object ID by default.

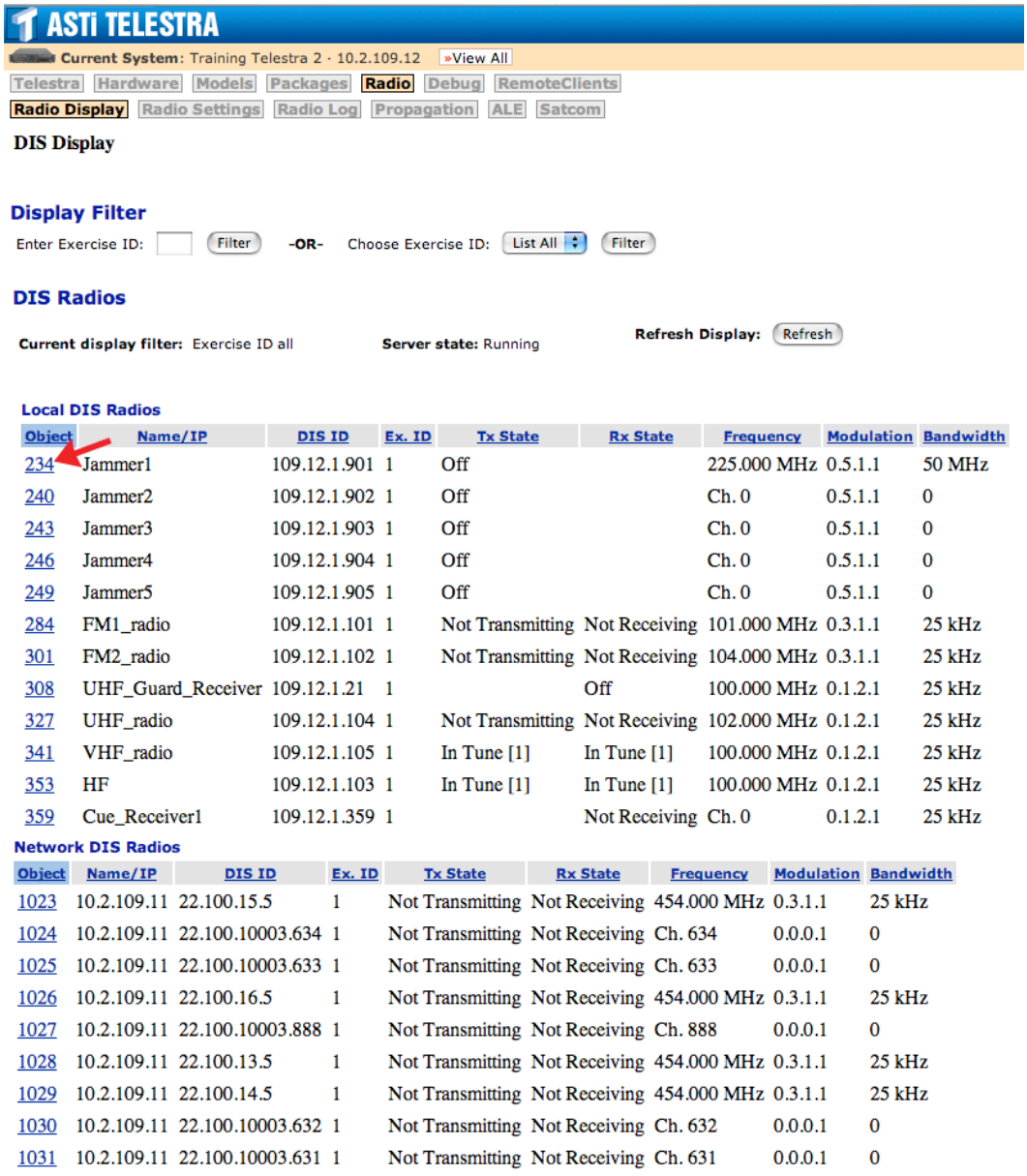


Figure 72: RMS Radio Display

Local DIS Radios

Object	Name/IP	DIS ID	Ex. ID	Tx State	Rx State	Frequency	Modulation	Bandwidth
341	VHF_radio	109.12.1.105	1	In Tune [1]	In Tune [1]	100.000 MHz	0.1.2.1	25 kHz

Each radio displays the following details:

- **Object -** Click the object number to view more details for that specific radio.
- **Name/IP** - The Radio Name as defined in MBV will be displayed for the Local DIS Radios. For Network Radios the IP address of the platform on which the radio resides will be displayed.
- **DIS IDs** are broken down into site, host, entity, and radio IDs. The four set string: **site:host:entity:radio** (for example 10:20:30:40) must be unique for each radio on the network. While there is not a steadfast rule for setting up the IDs, one common scenario is to associate the site and host IDs with physical location, the entity ID with the Telestra and then have individual radio IDs for each instance.
- **Exercise ID** - Displays the radio's exercise ID and filters incoming DIS PDUs based on the exercise ID.
- **TX State** - Displays the transmit state of the radio. Valid states are OFF, Not Transmitting, In-Tune [N] and Transmitting. Off means the radio is turned OFF in the model. Not Transmitting means that the radio is turned ON, however it is not in-tune with any other radios (Local or DIS). In-Tune tells you that the radio is In-Tune with N other radios. Transmitting is true when the radio is actively transmitting.
- **RX State** - Displays the receive state of the radio. Valid states are OFF, Not Receiving, In-Tune [N] and Receiving. Off means the radio is turned OFF in the model. Not Receiving means that the radio is turned ON, however it is not in-tune with any other radios (Local or DIS). In-Tune tells you that the radio is In-Tune with N other radios. Receiving is true when the radio is actively receiving from 1 or more radios.
- **Frequency** - Displays the radio frequency. If the frequency is below 100,000 Hz then the intercom channel number is displayed.
- **Modulation** - Displays a brief summary of the modulation state of the radio. The summary consists of 4 numbers separated by decimal points. The first number shows the spread spectrum state of the radio. The second number shows the major modulation type. The third number shows the detail modulation type. The fourth number shows the system type. All of the values here are defined by the DIS standard.
- **Bandwidth** - Displays the bandwidth of the radio signal. The bandwidth is centered around the radio frequency.

When the user clicks an object number, RMS displays specific radio details, as shown below for Object 234. The settings include transmitter, receiver, TDL, and other information.

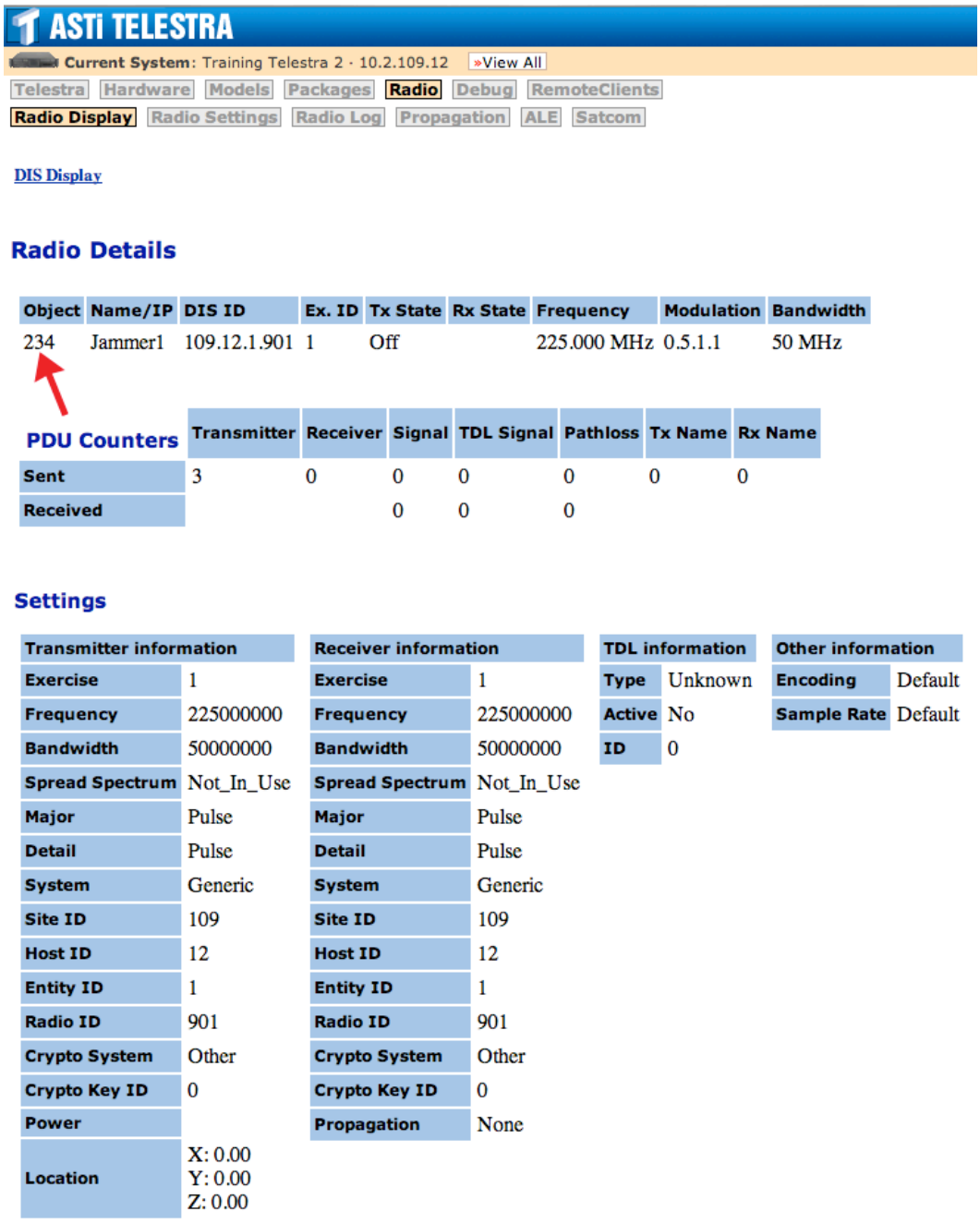
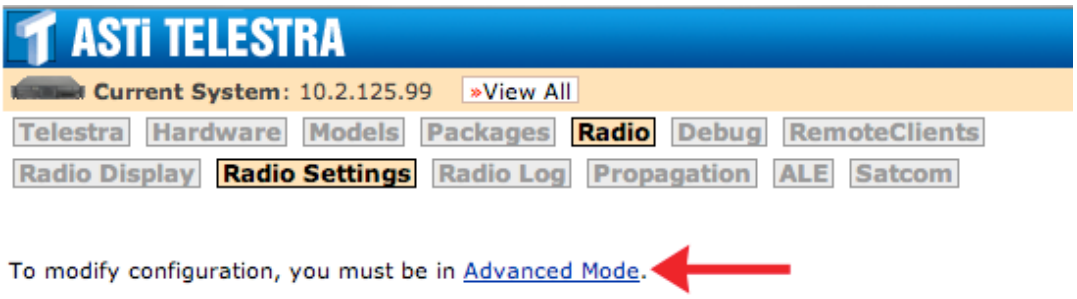


Figure 73: RMS Radio Details

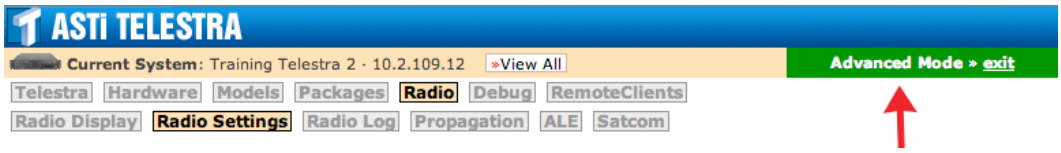
Radio Settings

The RMS Radio Settings pages are only available when the loaded model has radios. The radio settings allow the user to configure various network settings related to DIS, TDL, SATCOM, etc.

RMS must be operating in **Advanced Mode** for the user to modify radio configurations. If RMS is not operating in Advanced Mode when the user attempts to change settings, RMS will display a screen stating that configurations cannot be changed unless operating in Advanced Mode.



If RMS is operating in Advanced Mode a green tab will appear on the top right side of the RMS pages, shown below.



The version number displays the radio version. The state will display “Ready” when the model is stopped or “Running” when running. The uptime is the total model runtime.

Version	State	Uptime	Resets	Reloads	Radios
1.0-360	Ready	000:00:51:34	0	0	0

The PDU counters display all sent and received PDUs.

PDU Counters	All	Transmitter	Receiver	Signal	TDL Signal	Pathloss	Host	Control	Tx Name	Rx Name
Sent	38	0	0	0	0	0	0	38	0	0
Received	39	0	0	0	0	0	0	39	0	0

The following list describes the PDU counters in detail.

- **Transmitter**- Indicates the number of transmitter PDU's that haven been sent and received. A transmitter PDU is an informational PDU that is sent out periodically and contains information about.
  - Site:Host:Entity:Radio IDs
  - Radio frequency
  - Location
  - Tx Power
  - Exercise number
  - Modulation
  - Bandwidth
  - Crypto parameters
  - Frequency Hopping/HQ parameters
  - State (On, Off, On_Tx or Active)

  In short, Tx PDUs are a radio's (or other object) way of saying, "who, what, and where I am." Rx objects in MBV scan Tx PDUs to determine who is in range. Transmitter PDUs are sent out periodically if the radio is stationary or when the radio has changed state; that is moved, started/ended transmission, or changed parameters.
- **Receiver-** Transmits receiver state information such as the received power level. DIS receivers send out PDUs with their world position to aid in monitoring the DIS exercise. The Rx PDU says, "who I am in tune with" for each receiver, and whether or not they are actively receiving audio. This is for informational purposes only and does not make any adjustments based on the values received.
- **Signal**- Indicates the number of signal PDUs set and received. The signal PDU is a UDP packet, which contains voice information or data messages. When actively transmitting or receiving from a radio, for example, you will Rx/Tx a continuous packet flow during this time. The audio is encoded with the settings (muLaw, PCM, CVSD) in a given radio/intercom object.
- **TDL Signal**- TDL signal PDUs are simply signal PDUs that contain data instead of audio. Within the signal PDU there is a data flag to indicate when the signal PDU contains data as opposed to audio.

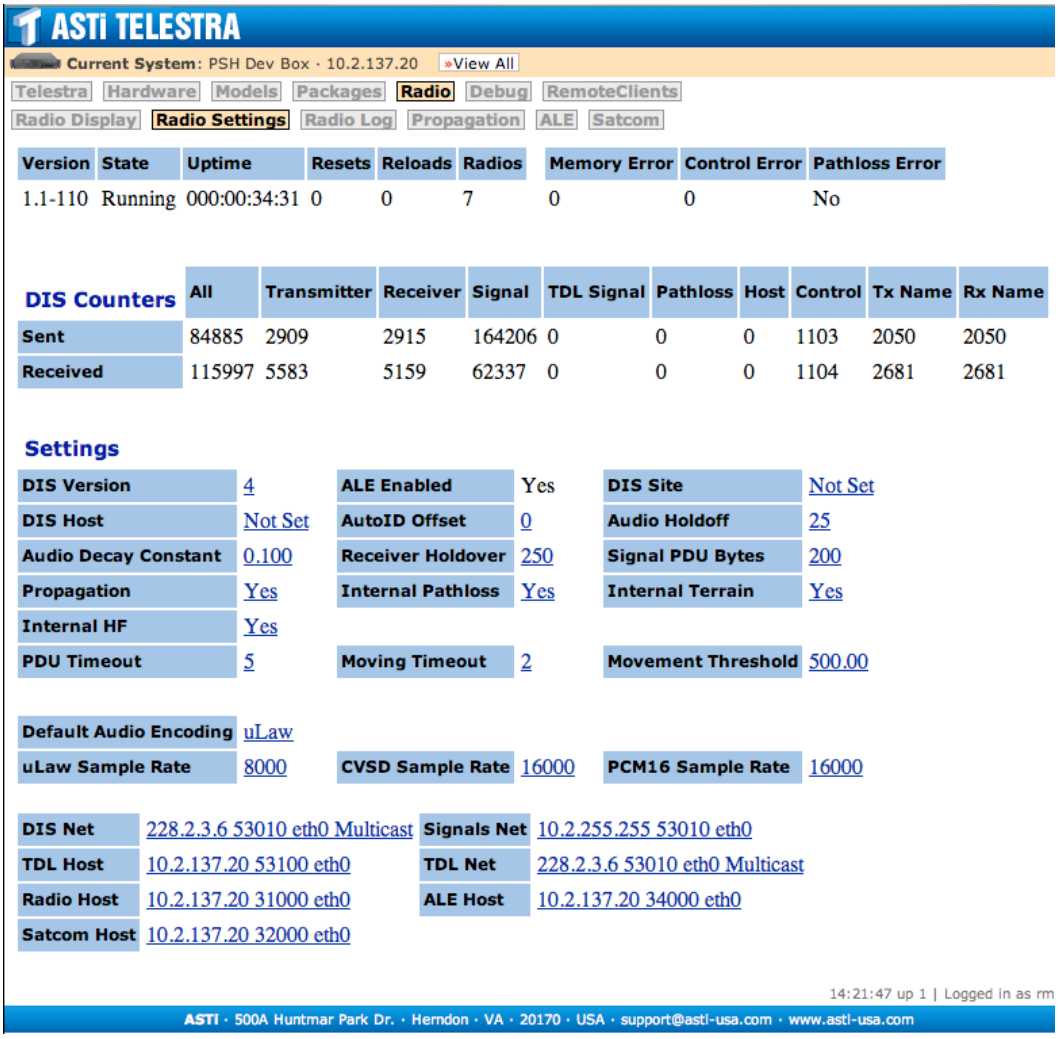


Figure 74: RMS Radio Environment Page

Radio Environment Settings

The following radio environment configurations can be modified when operating in advanced mode.

- **DIS Version**- This sets the revision level of DIS standard for inter-operability. Versions 4, 5, and 6 are currently supported.
- **DIS Host and DIS Site**- These number s are usually the last two numbers of the IP address (e.g. for IP address 192.42.172.186, the site would normally be 172 and the host 186). The site and host set here determine the site and host numbers for the DIS information from the Telestra. An object in a model can use a different site and host ID through a connection to the Entity control object.
- **Signal PDU Bytes**- Defines the PDU message size.
- **Default Audio Encoding**- Defines the default audio encoding type for all radios and network intercoms in the model.
  - **CVSD, uLaw, or PCM16 sample rate**- determines the maximum and minimum number of sample rates for a given audio encoding type. Defined as the # of samples per second.

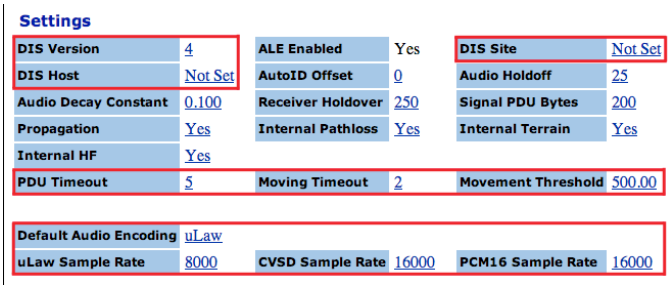


Figure 75: Radio Environment Settings

Select the PDU Timeout, Moving Timeout, or Movement Timeout to set the timeout parameters.

- **PDU Timeout**- The number of seconds that a Tx or Rx PDU packet is periodically sent out.
- **Moving Timeout**- When a transmitter or receiver moves more than a certain amount, it sends out a new transmitter (or receiver) PDU to indicate its new position. If it doesn't move in the amount of time (in seconds) specified in this field, a transmitter (or receiver) PDU is sent out anyway. The PDU Position Delta gives the amount of movement required to trigger the sending of a new transmitter or receiver PDU.
- **Movement**- When a transmitter or receiver moves by more than the amount given in this field in one frame, then a new transmitter PDU will be generated and send out. If the position change from frame to frame does not exceed this field in the time specified in the Moving field, a transmitter PDU will bee sent out anyway.

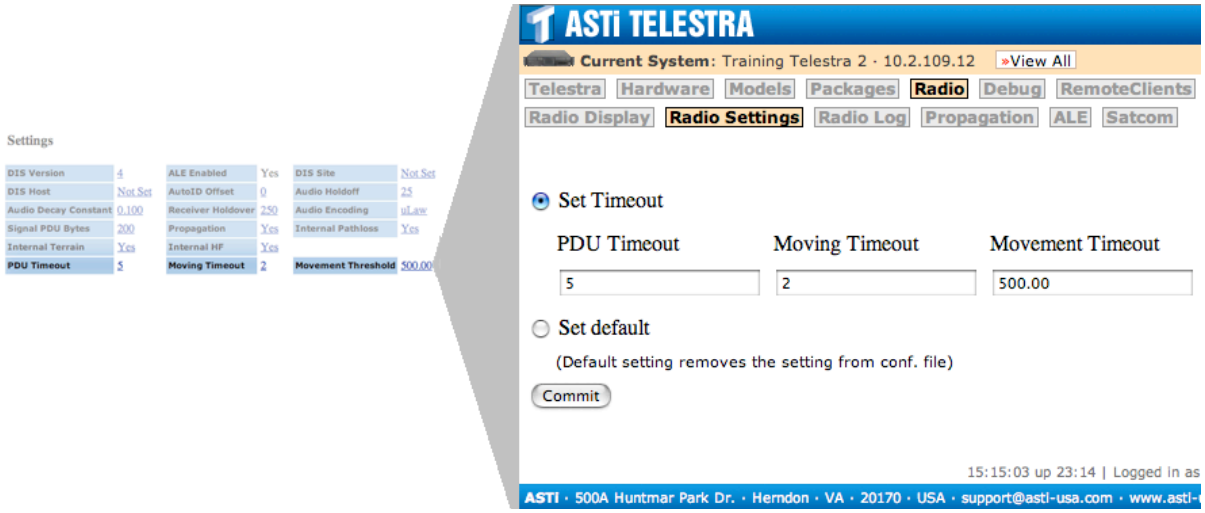


Figure 76: Setting Radio Timeouts

Select each host/net to set the IP address or network, port number and net interface.

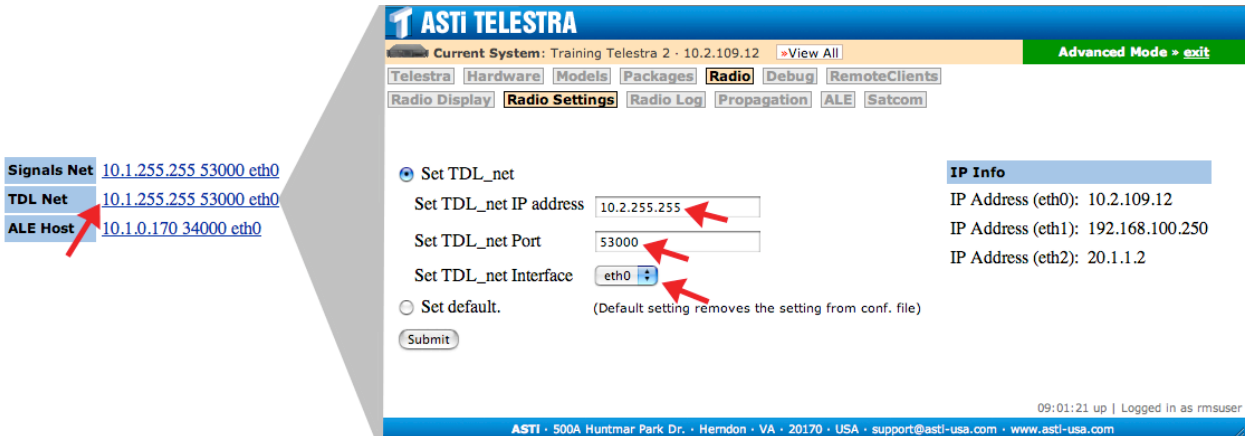


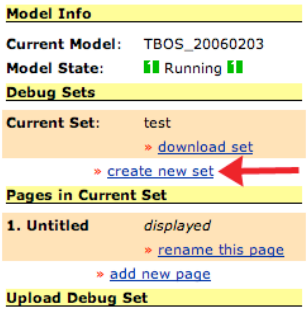
Figure 77: Radio Setting Hosts and Nets

Debugging in RMS

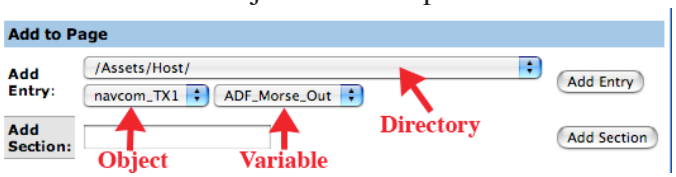
There are two ways to view/debug specific variables within a running model. The user can view model objects directly in the MBV development environment or the user can create debug sets in RMS. By creating debug sets in RMS, the user can quickly scan model inputs for debugging.

Creating Debug Sets

The user must be operating in Advanced Mode to create new sets for debugging.

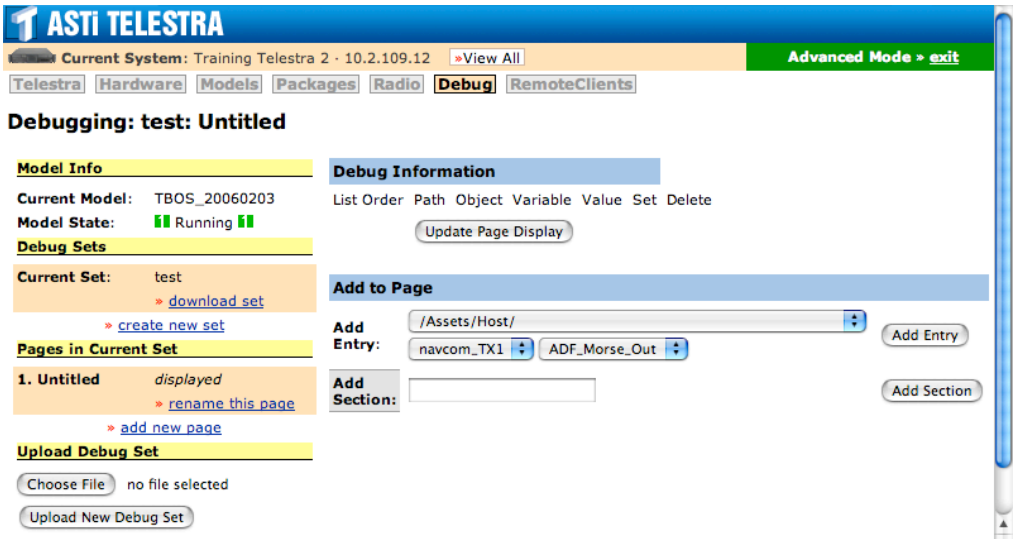


1. Select **Debug** from the main RMS menu to view the debug page.
2. Click on "**create new set**" and name the set. This will display the options for creating a new entry.
3. **Add an Entry** from the pull-down list. This list is compiled from the directories listed in your model.
4. **Add an object** from the next pull-down list. The object list is compiled of the objects used in the chosen directory.
5. Select a specific **variable** in the object from the pull-down list.



6. Select the "**Add Entry**" button to add the new entry to the list.

The user can choose to divide the debug sets by creating sections within a page and by creating separate pages. Use the list order option to organize your sets into specific orders. Exit Advanced Mode to view the set for debugging. The debug set can be downloaded and uploaded and is stored with the model.



Chapter 7: Telestra Configuration Parameters

All Telestra configuration can be performed via the RMS web-browser interface, with the exception of initial network setup.

The Telestra Configuration File is a text file that specifies the Telestra system's overall setup.

This is a system-maintained file, and should NEVER be manually edited, unless specifically instructed by ASTi.

Making changes to some of the parameters outlined here will require Telestra to restart various network services and software. Parameters in this manual requiring software restart will display this icon:

This software restart may interfere with other processes that are currently running (e.g., sound and communications model) when the restart is called. ***ASTi recommends against making changes to the Telestra Configuration while these other processes are running.***

Basic Settings

Base: Description

Class: Recommended

The RMS system allows you to enter a short description for each RMS server on the network. This will help you (and others) differentiate between machines based on something other than their IP addresses alone.

This description will be displayed in the pop-up note when a user moves their mouse over the RMS server's icon in the "RMS Servers" frame at left. ASTi recommends that you keep this setting brief and specific.

This field is not required for the RMS server to function properly.

Base: Contact Name

Class: Convenience

This is the name of the point-of-contact or administrator for a specific RMS Server.

This field is not required for the RMS server to function properly.

Base: Contact Phone

Class: Convenience

This is the telephone number of the point-of-contact or administrator for a specific RMS Server. It should include area code, telephone number and extension, if applicable.

This field is not required for the RMS server to function properly.

Base: Contact Email

Class: Convenience

This is the email address of the point-of-contact or administrator for a specific RMS Server.

It should be in the format

```
name@domainname.tld
```

... where “name” is the mail account, and “domain.tld” is the domain (e.g., “asti-usa.com”).

This field is not required for the RMS server to function properly.

Base: Installation Trainer, Installation Facility, Installation Location

Class: Recommended

These three settings are used to provide additional information about the installation at which the RMS server resides. It also relieves you of having to specify this information in the Description field.

These settings will be displayed in the pop-up note when a user moves their mouse over the RMS server’s icon in the “RMS Servers” frame at left. ASTi recommends that you keep them brief, yet specific.

These fields are not required for the RMS server to function properly.

Network Settings

Network: IP Address

Class: Required

This setting is required for network interface eth0 on the system for proper RMS server operation.

Class: Required, Conditional

For Telestra systems running in HLA mode, IP addresses for network interfaces eth1 and eth2 are also required.

This is the IP address for a network interface card on the Telestra system.

Each Telestra system will have at least one network interface, but may have more. Each plug jack on each card will have its own IP address.

Network: Gateway IP Address

Class: Conditional

Depending on the network architecture, this setting may be required for network interface eth0 on the system for proper RMS server operation. Contact your network administrator for more information.

Class: Required, Conditional

For Telestra systems running in HLA mode, gateway IP addresses for network interfaces eth1 and eth2 are also required.

The Gateway IP Address is the IP address of the network server.

The network server is the computer that can perform DNS lookups, route network packets based on IP addresses, and can also be the entry/exit point from the local-area network (LAN) to a wide-area network (WAN) like the Internet. Contact your network administrator for more information.

Network: Card Mode

This setting dictates how Telestra's Ethernet cards are configured as members of TCP/IP networks. The three options are: "fixed", "dhcp", and "off". Each Ethernet card inside Telestra can have a different mode.

Fixed: Telestra will assign the IP address and subnet mask specified in the configuration file for that Ethernet card.

DHCP: Telestra will base Ethernet card settings on information returned by the network's DHCP server, which must be present for this to work properly. If IP address and netmask settings exist in the configuration file for this card, they will be ignored.

Off: This Ethernet card will be disabled. If IP address and netmask settings exist in the configuration file for this card, they will be ignored.

Network: Subnet Mask

Class: Required

This setting is required for network interface eth0 on the system for proper RMS server operation.

Class: Required, Conditional

For Telestra systems running in HLA mode, subnet masks for network interfaces eth1 and eth2 are also required.

The subnet mask determines which network interfaces (e.g. Ethernet cards) on a TCP/IP network can communicate, based on their IP addresses. Effectively, it restricts the number of IP addresses that any one network interface can send to and receive from.

Examples:

`Device IP: 192.168.100.5 Subnet mask: 255.255.255.0`
Device can, effectively, communicate with any other device that has an IP address in range 192.168.100.0 to 192.168.100.255 (256 devices total).

`Device IP: 192.168.100.5 Subnet mask: 255.255.0.0`
Device can communicate with any other device that has an IP address in range 192.168.0.0 to 192.168.255.255 (65536 devices total).

Network: Auto-Discover Mode

Class: Required

This setting is required for proper RMS server operation.

This setting adjusts how the RMS server locates other RMS servers on the network.

There are two possible settings:

1. Multicast (system default)

   When set to “Multicast”, the RMS system also supports the specification of an Auto-Discover Address, which has its own default setting.

   In this mode, the RMS system will locate only those RMS servers on the network with matching Auto-Discover Mode and Auto-Discover Address settings.

2. Broadcast

   When set to “Broadcast”, the RMS system will automatically resolve your Broadcast address.

   In this mode, the RMS system will locate any other RMS server on the network sharing similar IP address and subnet mask settings.

Telestra RMS also supports user-specified Auto-Discover Port for Auto-Discovery in either mode.

Network: Auto-Discover Address

Class: Required, Conditional

This setting is sometimes required for proper RMS server operation.

When is it required?

Only when the system's Auto-Discover Mode is set to "Multicast".

This setting is user-configurable only if you have Auto-Discover Mode set to "Multicast", and is also referred to as the "Multicast Group Address".

1. In Multicast Auto-Discover Mode:

   If this setting is not configured, Telestra RMS will default to a Multicast Group Address of: 238.50.50.1

   The Multicast Group Address is equivalent to an IP address. Valid addresses range from 224.0.0.0 to 239.255.255.255.

2. In Broadcast Auto-Discover Mode:

   This setting is automatically configured by RMS. Attempts to change this address by the user will be ignored, and will have no effect.

Telestra RMS also supports user-specified Auto-Discover Port for use in either mode.

Network: Auto-Discover Port

Class: Convenience

This field is not required for the RMS server to function properly.

This setting specifies which port on network interface eth0 of the Telestra system to use for Auto Discovery of other Telestra RMS systems.

This setting can be used in either Auto-Discovery mode (Broadcast or Multicast).

If this setting is not configured, the Telestra system defaults to: 15000.

Valid port specification is any number in the range 1025 to 65535.

Network: Nameserver

Class: Convenience

This field is not required for the RMS server to function properly.

For use on networks utilizing the Domain Name System (DNS). Contact your network administrator to see if the network is configured to use DNS.

This is the IP address of the computer on your network that runs the DNS server.

Each network interface (Ethernet card) has a unique IP address for that network. Under DNS, that IP address is matched to a human-readable name (like "www.asti-usa.com").

NOTE: You must use the IP address of the nameserver, not its human-readable name. If your network uses DNS, you will also want to configure the RMS server's Hostname and Domain network settings to take advantage of this service.

Network: Hostname

Class: Convenience

This field is not required for the RMS server to function properly.

For use on networks utilizing the Domain Name System (DNS). Contact your network administrator to see if the network is configured to use DNS.

The machine's "hostname" is the first part of its DNS address. For example, in "www.asti-usa.com", "www" is the hostname.

Network: Domain

Class: Convenience

This field is not required for the RMS server to function properly.

For use on networks utilizing the Domain Name System (DNS). Contact your network administrator to see if the network is configured to use DNS.

The machine's "domain" is the second part of its DNS address. For example, in "www.asti-usa.com", "asti-usa.com" is the domain.

TIP: Given that your network uses DNS (and the Nameserver, Hostname and Domain settings are configured), you can access the Telestra RMS server by entering its hostname and domain in your browser's "Location" or "Address" field instead of its IP address.

Time (NTP) Server Settings

Time: Server IP Address

Some networks use an NTP (time) server to synchronize the time-of-day between separate systems. If your network features an NTP server, specify its IP address here. If your network also uses DNS, you may set the Time: Server Hostname instead of this IP address.

Time: Server Hostname

Some networks use an NTP (time) server to synchronize the time-of-day between separate systems. If your network features an NTP server—and is running DNS—specify its hostname here. If your network does not support DNS, set the Time: Server IP Address instead.

Time: Protocol Version

This setting specifies the version of the NTP protocol that the NTP server supports. Choices are: NTPv3 or NTPv4.

Contact your network administrator to find out which protocol is supported on your network.

Time: Burst Mode

NTP servers take network latency into account when synchronizing with clients (Telestra is an NTP client).

Turning burst mode “on” triggers Telestra to send 8 packets when it sends a sync. request to the server, providing a better packet sample size. The NTP server can then calculate network latency more accurately, thus supplying a more precise sync. response.

When burst mode is “off”, Telestra will send only a single packet sync. request.

Time: Minimum Poll Interval

Used with Maximum Poll Interval to specify a range of acceptable intervals when the Telestra NTP client will synchronize with the NTP server.

In the client, this translates into seconds: two to the power of this setting. The allowable range is 4 (16 s) to 17 (36.4 h) inclusive.

As an NTP server becomes more accurate and reliable over the lifetime of synchronization history, the NTP client will poll it less frequently. This setting specifies the highest frequency with which the Telestra NTP client will synchronize with the server.

Default for this setting is 6 (1 m, 4 s).

If the max. poll interval is set lower than the min. poll interval, Telestra will use system defaults.

Time: Maximum Poll Interval

Used with Minimum Poll Interval to specify a range of acceptable intervals when the Telestra NTP client will synchronize with the NTP server.

In the client, this translates into seconds: two to the power of this setting. The allowable range is 4 (16 s) to 17 (36.4 h) inclusive.

As an NTP server becomes more accurate and reliable over the lifetime of synchronization history, the NTP client will poll it less frequently. This setting specifies the longest amount of time the Telestra NTP client will wait before synchronizing with the server.

Default for this setting is 10 (17 m, 4 s).

If the max. poll interval is set lower than the min. poll interval, Telestra will use system defaults.

Satellite Communications Server Settings

Satcom: Number of Transponder Channels

This setting specifies the maximum number of full-duplex connections that the Satcom server will establish between DIS transmitters and receivers. One channel is created for each DIS transmitter that successfully connects to the satellite server.

Acceptable values are between 1 to 128 channels.

This setting is not required for proper Satcom server operation, but is recommended.

Satcom: Uplink Frequency

This setting (in Hertz), along with the Passband Width, defines the frequency range in which a transmitting radio can establish a communications channel through the satellite transponder. The Uplink Frequency defines the lower limit of this frequency range.

See the Satellite Tx/Rx Example (Chapter 11) for a full explanation.

The Uplink Frequency, along with Passband Width, Downlink Frequency, and Satellite DIS ID define basic satellite operation, and are required for proper operation.

The simulation host computer may reconfigure or override this setting.

Satcom: Passband Width

This setting (in Hertz), in conjunction with the Uplink Frequency, defines the frequency range in which a transmitting radio can establish a communications channel through the satellite transponder. The sum of the Uplink Frequency and Passband Width defines the upper limit of this frequency range.

See the Satellite Tx/Rx Example (Chapter 11) for a full explanation.

The Passband Width, along with Uplink Frequency, Downlink Frequency, and Satellite DIS ID define basic satellite operation, and are required for proper operation.

The simulation host computer may reconfigure or override this setting.

Satcom: Downlink Frequency

This setting represents the base frequency (in Hertz) that the Satcom server will use to determine the actual downlink frequency of its transmissions.

This is used in conjunction with the Uplink Frequency and Passband Width to properly handle satellite communications propagation. See the Satellite Tx/Rx Example (Chapter 11) for a full explanation.

The Downlink Frequency, along with Uplink Frequency, Passband Width, and Satellite DIS ID define basic satellite operation, and are required for proper operation.

The simulation host computer may reconfigure or override this setting.

Satcom: Modal Delay

The satellite communications server supports seven radio modes, each with an individual delay (in milliseconds). Radio communication through the satellite transponder will be delayed by the amount of time specified for the corresponding mode.

Defaults are as follows:

Mode 1: 0 ms

Mode 2: 1000 ms

Mode 3: 9000 ms

Mode 4: 0 ms

Mode 5: 1000 ms

Mode 6: 3000 ms

Mode 7: 3000 ms

The Fixed Delay (Override) parameter will override all Modal Delays. These settings are not required for proper Satcom server operation. The simulation host computer may reconfigure or override these settings.

Satcom: Fixed Delay (Override)

This setting is the override retransmission delay (in milliseconds) for the Satcom server. If configured with any non-zero number, the Fixed Delay will override individually-configured Modal Delay values. Regardless of radios' modes, all Satcom transmissions will be delayed by the amount of time specified here.

This setting is not required for proper Satcom server operation. The simulation host computer may reconfigure or override this setting.

Satcom: Tx PDU Delay

This parameter allows the user to introduce delay (microseconds) in the sending of transmit PDUs from the Satcom server.

If DACS systems are operating in "hot-mic" or "VOX" modes while using the Satcom server, some minor audio clipping may occur. If this happens, the transmission's first syllable (or some part thereof) may be in audible at the receiver. Configuring this setting can circumvent this phenomenon.

If no audio clipping is experienced, do not configure the Tx PDU Delay.

The simulation host computer may reconfigure or override this setting.

Satcom: Transponder DIS ID

This parameter specifies the base DIS identifier for the satellite transponder in the DIS environment. It should be adhere to the standard `site.host.entity.radio` DIS format.

The Satellite DIS ID, along with Uplink Frequency, Passband Width, and Downlink Frequency define basic satellite operation, and are required for proper operation.

Satcom: Debug Level

This setting determines how much information will be recorded in Telestra's server log. Debug Level one (1) records the least amount of critical information, whereas Debug Level three (3) stores many more server messages.

Debug Level one (1) or two (2) is recommended for use during actual exercises. ***Debug Level three (3) should only be used for troubleshooting purposes.***

The default Debug Level is one (1).

This setting is not required for proper Satcom server operation, but is recommended.

Satcom: World Position X, Y, Z

The world position of the satellite transponder, in meters. For future use only; Model Builder will ignore these settings, but they may be used for other applications. If these parameters are set to non-zero values, they will be included in all DIS transmit PDUs.

Satcom: DIS Network IP Address

Specify an IP address to use for DIS UDP socket creation. The IP Address specified will usually be that of a Multicast group (224.0.0.0 to 239.255.255.255), or the broadcast IP address of a class A, B or C network. It serves to specify the source(s) of DIS UDP packets.

For example, if your simulation network is a class C network where all machines on the network segment have IP addresses of 192.168.1.x, then you would specify 192.168.1.255 as the channel IP address.

Note: DIS Network Interface Eth0, Eth1, and Eth2.

On the other hand, if you enter a specific machine IP address (e.g., 192.168.1.1), then communication on that channel will be restricted to that machine only.

The DIS Network IP Address, along with the DIS Network Port, are required for proper Satcom server operation.

Satcom: DIS Network Port

For each DIS Network, specify a Port to use for DIS UDP socket creation.

Since all DIS traffic uses the same port number to communicate between entities, you should enter the same port number for the Satcom channel as that used by the Telestra systems for DIS radio communications.

The Network IP Address, along with the DIS Network Port, are required for proper Satcom server operation.

Satcom: Signals Network IP Address

Specify an IP address to use for Signals UDP socket creation. The IP Address specified will usually be that of a Multicast group (224.0.0.0 to 239.255.255.255), or the broadcast IP address of a class A, B or C network. It serves to specify the source(s) of Signals UDP packets.

For example, if your simulation network is a class C network where all machines on the network segment have IP addresses of 192.168.1.x, then you would specify 192.168.1.255 as the channel IP address.

On the other hand, if you enter a specific machine IP address (e.g., 192.168.1.1), then communication on that channel will be restricted to that machine only.

The Signals Network IP Address, along with the Signals Network Port, are required for proper Satcom server operation.

Satcom: Signals Network Port

For each Signals Network, specify a Port to use for Signals UDP socket creation.

Since all DIS traffic uses the same port number to communicate between entities, you should enter the same port number for the Satcom channel as that used by the Telestra systems for DIS radio communications.

The Network IP Address, along with the Signal Network Port, are required for proper Satcom server operation.

Chapter 8: HF Radio Propagation Server

The ASTi HF Server provides real-time, high-fidelity modeling of HF radios using the Model Builder Virtual radio environment. The HF Server computes propagation effects between virtual radios, taking into account such things as transmitter-receiver global position, season, time of day (day-night terminator), and solar activity.

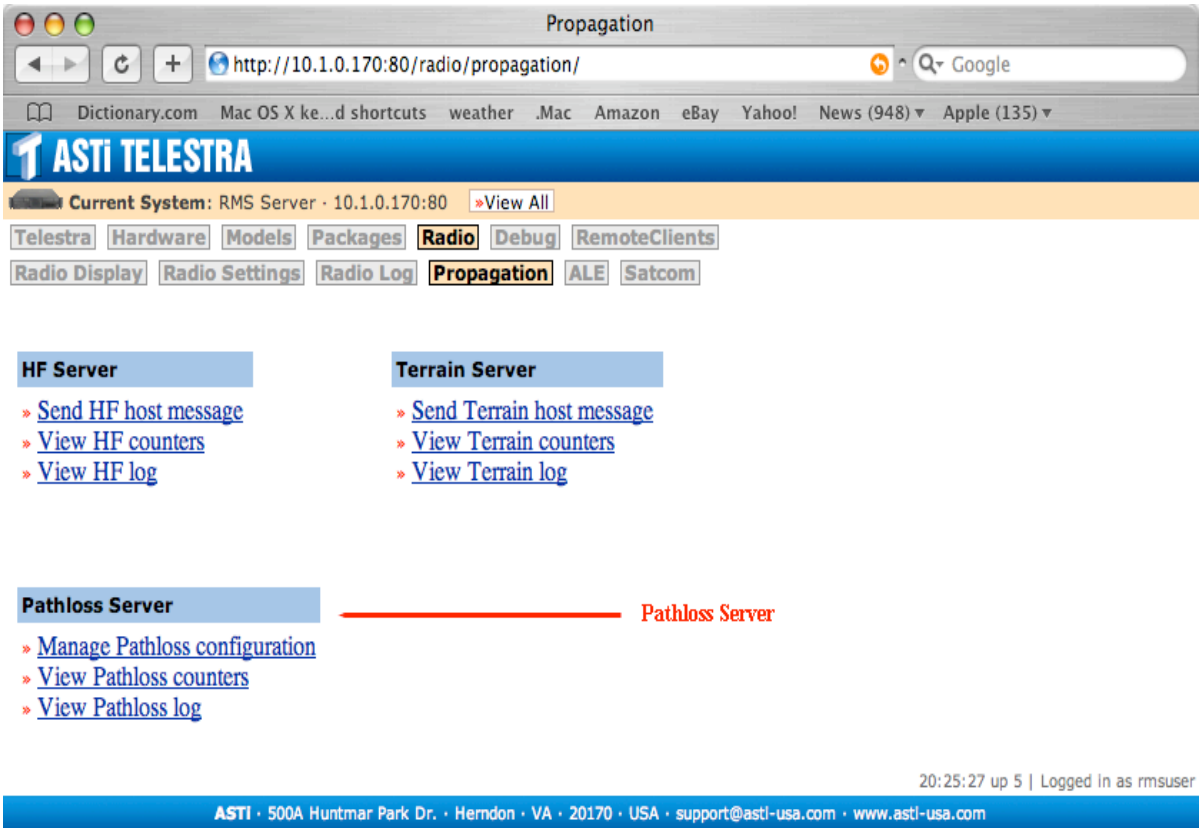


Figure 78: Radio Propagation Pathloss Server

Configuring the HF Server

To properly simulate solar activity and seasonal/circadian effects on the ionosphere-and HF radio signal propagation-the HF Server requires that the Smoothed Sunspot Number (SSN) and Time-Of-Day offset be set.

Typical values of the Smoothed Sunspot Number (SSN) range from 0 to 250, depending on past and current sunspot activity. The default value for this variable is 100.

The Time-Of-Day offset sets the simulation day of year and time of day. It is expressed as an offset, in hours, between the HF Server clock (local time in GMT) and the simulation time in GMT.

For example, if the exercise is being conducted on the East coast of the U.S., during summer (GMT +5), at the location's 8:00am (08:00 Eastern Standard Time), the HF Server's local clock would read 13:00 GMT. If the ***simulated scenario*** is taking place on the West coast of the U.S., during summer (GMT +8) at the location's 3:30pm (15:30 Pacific Standard Time), then a clock in the simulated world would read 23:30 GMT. The difference between the simulated GMT (23:30) and the real-world GMT (13:00) is the Time-Of-Day offset; namely, +10.5 hours.

Using this control, a user can force the HF Server to return results for a night-time mission, even though the exercise is taking place during the day. Likewise, seasonal effects typical of winter propagation can be used in July. The default value for the time offset is zero hours.

Note: This information is stored by the running HF Server on a per-exercise basis. Multiple, independent exercises can run simultaneously using the same HF Server, which returns exercise-specific data based on its associated environmental conditions. If the HF Server is shut down or restarted, this information must again be supplied by the simulation host computer or set via RMS. Typically, the host will initialize this data at the beginning of an exercise.

The HF Server can either be configured locally through RMS or via the host interface. Both methods give the user the ability to set the SSN, Time-of-Day Offset on a per exercise basis. For the ICD packet format required to configure the HF server via a host computer see Appendix C. Note that the HF Server listens for host packets on UDP Port 33,000 on Ethernet 0.

HF Server Utilities in RMS

To access the HF Server utilities via Telestra's RMS web-based interface, click the “Radio” option in the main Menu. Then select “Propagation”. This menu option will only be available if the HF server software is installed on the Telestra platform.

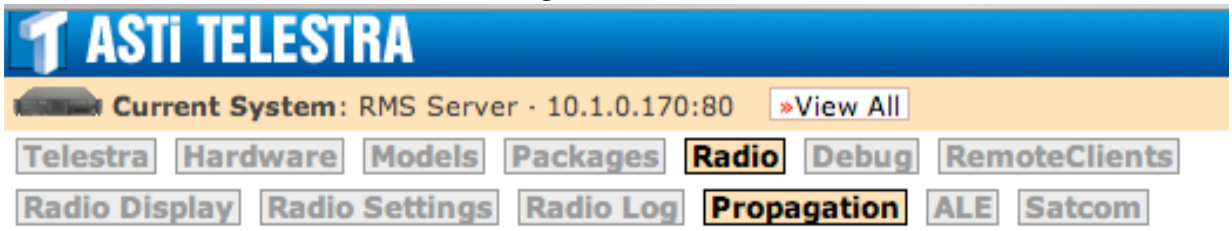


Figure 79: Radio Propagation

This is the HF Server Information page:

Figure 80: Radio Propagation Host Message

Within the HF Server there are 3 options available to the end user:

- Send HF Host Control Message
- Perform a quick poll
- Perform a complex poll

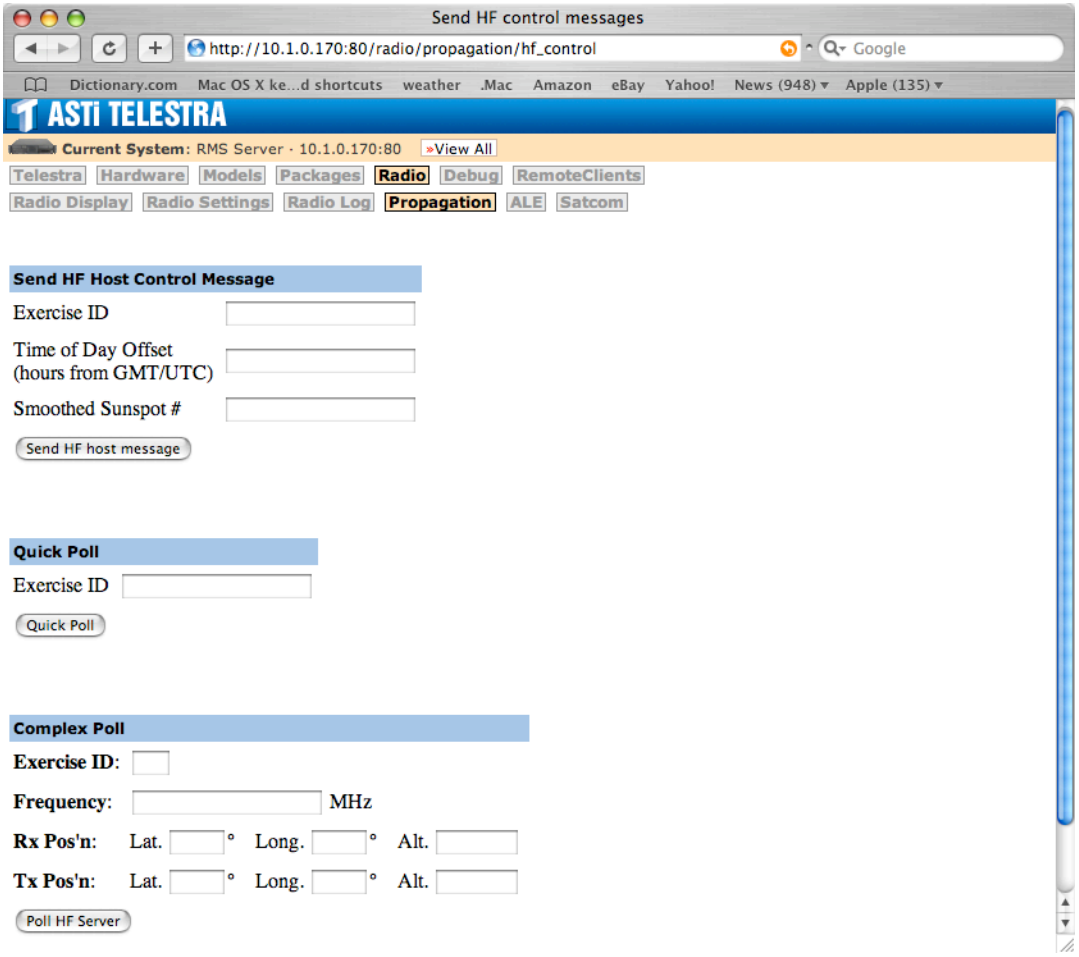


Figure 81: Send HF Host Message

1. View the HF Server Log

   To View the Telestra HF server log click the appropriate link from the HF Server Information page. The server log will contain entries from the HF Server. A sample log is shown below:

Figure 82: Radio Propagation HF Server Log

2. Perform a Quick Poll

   Enter the exercise ID in the slot provided, and click the “Quick Poll” button to perform a quick poll. This will ensure that the HF Server is operating, and will provide exercise-specific information, as set by the simulation host computer. The quick poll also returns server packet counters. An example of quick poll results is shown on the following page.

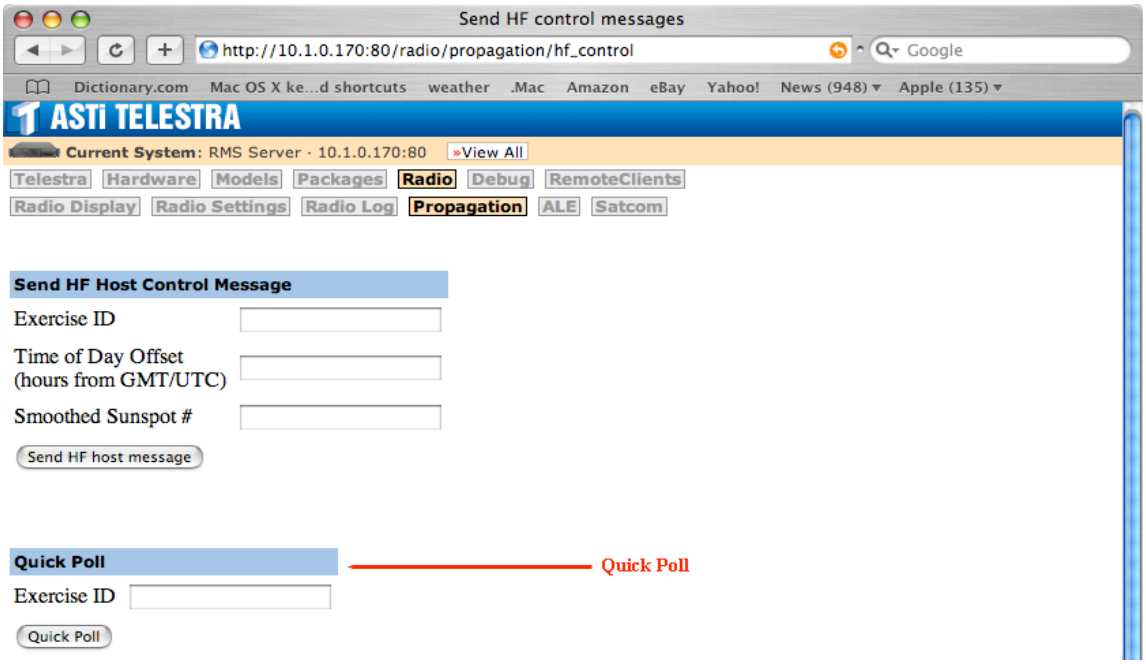


Figure 83: Radio Propagation Quick Poll

3. Perform a Complex Poll.

   Under the heading of “Complex Poll” you are able to input various parameters and query the HF Server for a total path loss value between two world positions. The complex poll form is shown below:

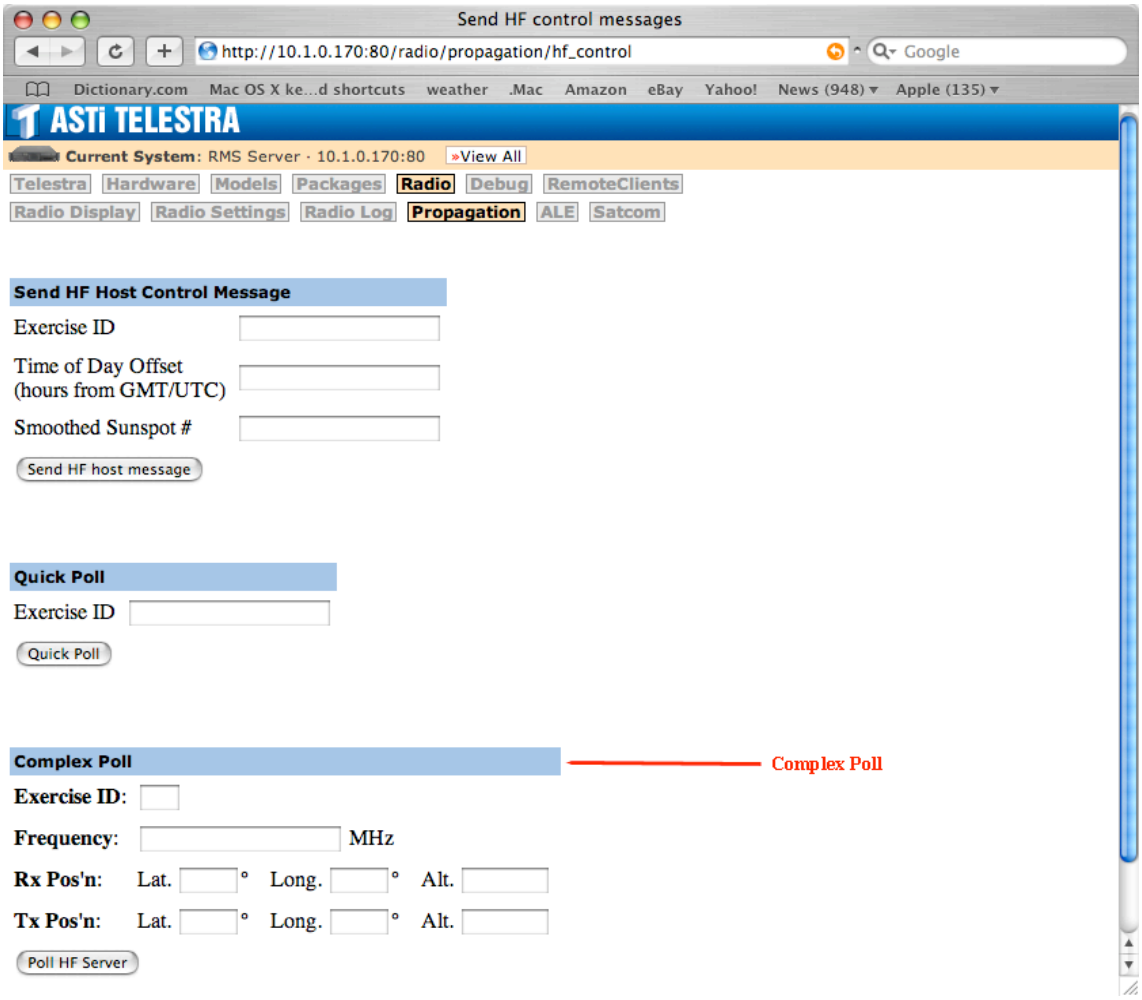


Figure 84: Radio Propagation Complex Poll

This provides the exercise ID, radio frequency in MHz, and the latitude, longitude and altitude for the transmitter and receiver radios. The altitude is specified in meters. Click the "Poll HF Server" button to instantiate the query. The complex poll returns the total path-loss in dB between the specified radios in addition to the information returned by a simple poll. An example complex poll results screen is shown here:

Complex Poll Results	
Exercise ID:	1
Total Pathloss:	82.25 dB
Time of Day Offset (hours from GMT/UTC):	0.00
Smoothed Sunspot #:	100
Frequency(MHz):	4
Transmitter Pos'n:	Lat. 12.00° Long. 12.00° Alt. 1.00 m
Receiver Pos'n:	Lat. 11.00° Long. 11.00° Alt. 1.00 m
Counters	
Msgs In:	0
Msgs Out:	0
Host Msgs In:	32
Errors:	0

Figure 85: Complex Poll Results

Basic operation is as follows:

1. The Model Builder environment determines that an HF transmitter-receiver pair are in tune.
2. Model Builder sends a DIS path loss request packet to the host network, addressed to the HF Server. Model Builder includes information about the transmitter-receiver pair, such as world positions and frequency.
3. The HF Server receives the packet, and, based on factors such as the time-of-day, current value of the Smoothed Sunspot Number (provided by the host), frequency and world positions of the transmitter and receiver, computes the expected path loss using a high-fidelity propagation algorithm.
4. The HF Server sends the path loss response packet back to the DACS, with the computed path factor inserted in the packet.
5. Model Builder receives the response packet, and applies the loss to the received power of the radio.

Note: Model Builder sends all path loss requests through the host Ethernet interface. Therefore, the HF Server should be cabled and configured as a member of the host network.

To use the HF Server, the DACS must be configured properly, as described below. Additionally, the HF Server expects certain environmental data, such as Sunspot Number and time-of-day, to be initialized by the simulation host computer. This data is stored on a per-exercise basis, and is reset to default values each time the server starts. The format for the host data is described in Appendix C.

DACS System Requirements

There are two steps involved in configuring DACS systems to use the HF Server.

- Modify the Model Builder configuration file (usually “default.cfg”) to include the statements detailed below.
- Configure the radio modes within Model Builder for the radios that will use the HF Server.

It is important to note that, to the Model Builder software, the HF Server operates in the same fashion as a terrain database server. In both applications, Model Builder queries an external server for path loss information; Model Builder uses the same configuration mechanism for both. Further, the tools provided by Model Builder for debugging and viewing terrain server operation can also be used for the HF Server.

Model Builder Application Configuration File

By default*, this file is located at

C:\mbuilder\user\models\default.cfg

and will hereafter be referred to as “default.cfg” for clarity.

**Although users can force the Model Builder software to load different Model Builder Application Configuration Files (all of which end in the “.cfg” file extension), that procedure will not be covered here, and all of the changes presented here in reference to “default.cfg” also apply.*

The commands required to enable a DACS to access the HF Server are listed below. Note that Model Builder “default.cfg” commands and arguments are not case-sensitive. All of these commands are required to enable HF Server use by DACS systems.

`Ethernet:local_ip = xxx.xxx.xxx.xxx`

This statement sets the IP address of the DACS' Host Ethernet card. If there is more than one network card in the DACS, the HF Server should share the network with the DACS' Host Ethernet.

IMPORTANT: If you are using RMS to manage this DACS, the host IP address should be set in the “config.sys” file, rather than “default.cfg”.

`terrain = on`

This command activates the terrain/HF option. This configures the DACS to use an external terrain or HF server to compute path loss between in-tune radios in the Model Builder environment.

`terrain:broadcast_ip = xxx.xxx.xxx.xxx`

This command sets the IP address of the HF Server (the Telestra system). Requests for path loss factors will be sent to the IP address specified here. Remember, requests are sent out (and responses are received) on the DACS' host interface.

`terrain:rate_divider = xx`

This statement controls the maximum rate at which requests will be sent out, as a fraction of the master model rate. For example, if the model rate is 50 Hz, and rate_divider is set to 10, then the maximum rate at which the DACS will send requests to the HF Server is 5 Hz. See the Model Builder documentation (DOC-01-MB-RM-4) for more information about the master model rate.

`terrain:request = Off|LOS|OTH|All`

This command controls the conditions under which the DACS will send requests for path loss values. If this value is set to “Off”, no requests will be sent. If it is set to “LOS”, then requests will be sent out for in-tune radio pairs, for which the receiving radio is in “Line-Of-Sight” mode. See DOC-01-MB-RM-4 for more information about “Line-Of-Sight” radio mode.

If set to “OTH”, requests will be sent out for radios in “Over-The-Horizon” mode. ***This is the proper setting to choose when using the HF Server.***

Setting this value to “All”, will cause Model Builder to send requests for all in-tune transmitter receiver pairs, regardless of whether they are in “Line-Of-Sight” or “Over-The-Horizon” mode.

`terrain:pathloss = Off|LOS|OTH|All`

This statement controls the conditions under which Model Builder will apply its own internal loss calculation to the received power of a radio. For “Line-Of-Sight” radios, Model Builder Visual computes free-space loss, fresnel diffraction effects, and occulting by the smooth ellipsoidal earth for in-tune transmitter/receiver pairs. MBV uses the WGS-84 coordinate system for all world positions by default. This flag will control whether or not an internally-computed loss will be applied to a given type of radio.

For example, if this is set to “Off”, Model Builder will not apply any internally-computed losses to any radios.

If this flag is set to “LOS”, then internally computed losses will only be applied to “Line-Of-Sight” radios. ***This is the recommended setting for use with the HF Server.*** The HF Server computes values for transmission loss using its own, high-fidelity algorithm, which includes free-space loss. Since the HF Server typically uses radios in “Over-The-Horizon” mode, Model Builder ***should not*** apply internally-computed losses to OTH radios (the HF Server handles that), but ***should be configured*** to apply internally-computed losses to LOS radios, as set here.

Selecting “OTH” causes Model Builder to compute it's own loss factor to “Over-The-Horizon” mode radios (unnecessary). Likewise, selecting “All” will cause Model Builder to apply internally computed losses to all radio types (also unnecessary).

Configuring Radios within Model Builder

Configuring radios within Model Builder to use the HF Server is straightforward. Model Builder allows configuration of radios to either “Line-Of-Sight” or “Over-The-Horizon” radio mode. When set to “Over-The-Horizon”, this single parameter identifies the radio transceiver as an HF radio.

Other radio parameters such as Transmit Power, Antenna Gain, modulation type, etc. can be set based on data from the simulated radio's specification.

A sample Model Builder screen capture is shown below, with a radio configured to use the HF server (highlighted).

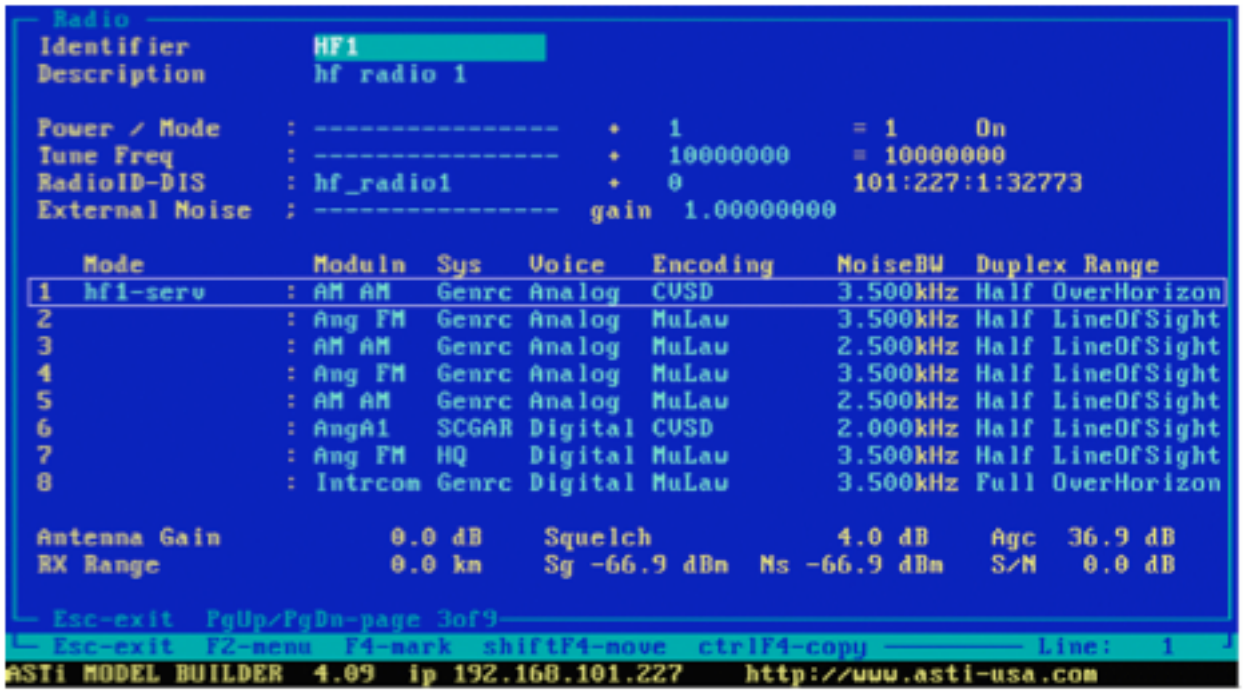


Figure 86: Page 3 of 9 of Model Builder's Radio Object

Chapter 9: ALE Server

The ASTi ALE Server is used in conjunction with the ASTi HF Radio Propagation Server detailed in Chapter 8 to realistically simulate the functionality of modern HF Automatic Link Establishment radios. The ALE Server allows a host computer to initiate the server with lists of radios IDs, callsigns, Net IDs and scan frequencies, and perform basic simulated ALE functions, such as soundings and calls. The ALE Server will typically perform a propagation analysis, and return a list of radio IDs, callsigns, Net IDs and realistic Link Quality Assessment (LQA) numbers, which depend on radio and environmental factors such as transmitter/receiver frequency and world position, season, time-of-day (day-night terminator), and solar activity.

The host computer can then use the LQA values to configure communications between various radios in a way that is consistent with the particular ALE function or system it is simulating.

Communication between the host computer and the ALE Server occurs through a series of UDP "messages" sent between the host to the ALE Server. Further configuration of communications by the host (i.e., any action taken by the host based on the LQA numbers returned from the ALE Server) is performed independent of the ALE Server, in the normal host-Telestra fashion. This includes such things as setting up Tactical Data Links based on all-call results from the ALE server.

Basic Theory of Operation

The basic operation of the ALE Server is as follows:

1. The host computer initializes the ALE Server by sending it a number of Initialize/Set Scan List (type=1) messages. These messages allow the host to do two things:

   a. Set the frequency scan list for a DIS radios. This part of the message consists of a DIS ID (Site: Host: Entity ID: Radio ID), DIS Exercise ID, and a list of scan frequencies.

   b. Set the Radio mode. The radio mode can be one of three values (later on you can also remove a radio):

      i. Non-ALE: Indicates that the radio is not involved in any ALE activity (i.e., it is communicating in the normal fashion).

      ii. ALE Scanning: The radio is currently in scanning mode, scanning through its scan list.

      iii. ALE TX: Radio is initiating an ALE TX event.

   Details of the message format are shown in Appendix B, but the message primarily consists of the DIS ID of a radio (Site: Host: Entity ID: Radio ID), DIS exercise ID, a list of frequencies the radio can scan on, and the Radio Mode. This message can be sent at any time, in order to update the scan list for a radio, or to change the radio mode. The ALE Server stores the scan list and mode for each valid DIS radio.

2. When appropriate, the host sends the ALE Server an ALE TX Initiate type message. This message is equivalent to an "ALL CALL" event, and identifies the radio initiating the call, and the frequency of the call.

3. The ALE Server scans through the list of valid DIS radios, and identifies the radios which meet these three criteria:

   a. The radios scan list includes the call frequency.

   b. The radio is currently in ALE Scanning mode.

   c. The radio is on the same DIS exercise ID as the calling radio.

4. For those radios that meet the above three criteria, the ALE Server makes requests to the HF Server to compute an estimate of the Link Quality Assessment number. The LQA number is based on signal-to-noise ratio and Path Loss Factor (PLF) at the receiving radio, and is a number between 0 and 255.

5. The ALE Server responds to the host by sending an ALE TX Response Message. This message consists of a list of the DIS IDs of valid receivers, and the computed LQA number for those radios.

6. The host takes appropriate actions based on the LQA numbers received from the ALE Server. This can include initiating HF communications between the Calling Radio and valid receivers.

When using this simple ALL CALL type sequence, the above procedure does not use the Radio callsign feature, which allows the user to assign callsign(s) to a Radio ID. This allows for the additional functionality of calling Radios based on callsign. The Basic Theory of Operation still holds true. However, ASTi has added a few more host messages into the mix to account for the callsigns of Radios. Additionally the Net Call feature can also be used and is described later in this chapter.

Callsign Theory of Operation

The callsign operation of the ALE Server is as follows:

1. The host computer initializes the ALE Server by sending it a number of ALE Radio Tactical ID Setup messages (Type 6). These messages allow the host to:

   a. Set up to 32 callsigns for an individual Radio ID (Site: Host: Entity ID: Radio ID). Each Radio requires its own setup message if you wish to be able to call the Radio based on callsign.

2. When appropriate, the host sends the ALE Server an ALE TX Initiate Callsign (type 7) message. This message identifies the radio (by callsign) initiating the call and the called Radio. Lets call them Radio A (calling Radio) and Radio B (called Radio).

3. The ALE Server scans through the list of valid radio callsigns and looks for Radio A and Radio B.

4. For the Radio A and B above the ALE Server makes requests to the HF Server to compute an estimate of the Link Quality Assessment number. The LQA number is based on signal-to-noise ratio at the receiving radio, and is a number between 0 and 255. This will be done for all common frequencies among Radio A and Radio B. In other words if Radio A has 5 scan frequencies and Radio B has 10 scan frequencies and among them 3 are unique the HF Server will respond with 3 LQA numbers.

5. The ALE Server responds to the host by sending an ALE TX Radio Callsign Response Message (Type 9). This message consists of the callsign and Radio ID of the calling and called Radio. The best LQA value is returned along with the corresponding frequency.

6. The host takes appropriate actions based on the LQA and frequency provided by the ALE Server.

Net ID Call Theory of Operation

The Net ID group feature allows you to associate a group of radios with a particular Net ID. You can then simply call the Net ID group and get one response that includes information from every radio that is part of that Net ID group. An individual radio may be part of one or more groups. Additionally, you can only call a Net ID group if the calling radio is part of the Net ID group.

The Net ID Call operation of the ALE Server is as follows:

1. The host computer initializes the ALE Server by sending it a number of ALE Net ID Setup messages (Type 10). These messages allow the host to:

   a. Configure up to 32 Radios in a Net ID Group. The Net ID is given a name and associated with up to 32 Radio IDs. The Radio IDs used in this message are the callsign IDs, so for you to be able to use the Net ID feature you must also implement the callsign feature. The Net ID group is also associated with a particular exercise group.

2. When appropriate, the host sends the ALE Server an ALE Net Call (type 11) message. This message identifies the radio (by callsign) initiating the call (lets call this Radio A) and the called Net ID or Group of Radios. This Net ID group of Radios was setup in step 1.

3. The ALE Server scans through the Net ID group of radios and first verifies that the calling radio (Radio A) is part of that group. For a radio to call other radios in a net ID group, that radio MUST also be part of the group.

4. The ALE Server makes requests to the HF server to compute an estimate of the Link Quality Assessment number. The LQA number is based on signal-to-noise ratio at the receiving radio, and is a number between 0 and 255. This will be done at the best frequency available on the calling radio (Radio A). In short for each radio that is part of the Net ID group the ALE server will request an LQA between that radio and Radio A. A table of LQA values and their corresponding Radio IDs is generated. This list is then sent back to the host as shown in step 5 below.

5. The ALE Server responds to the host by sending an ALE Net Response Message (Type 12). This message consists of the calling Radio (Radio A), Net ID of the called group along with the frequency yielding the best LQA values. Then each Radio in the group is listed along with their corresponding LQA.

6. The host then takes appropriate actions based on the Radio, LQA and frequency provided by the ALE Server.

System Configuration

Configure the HF Server, as detailed in Chapter 8. The IP address of the ALE server is identical to that of the HF Server. The host should initialize the HF Server with appropriate environmental data, as described in Chapter 8.

Note that since the ALE Server is not interacting directly with the DACS, changes to the DACS configuration are not required to use the ALE Server. However, if you want to use the HF Server for HF propagation in conjunction with ALE functionality, the DACS must be configured as described in Chapter 8.

Before going into the details of configuring the ALE Server it is important to note the limitations of the server and to be bound by those limits. These limits are hardcoded and cannot be adjusted. As you will see however the limits are rather high and should meet all user requirements. They include:

- MAX_SERVERS=16: If your setup includes more than 1 ALE Server (Telestra) we have the ability to synchronize between servers. This is done using the ALE Server Sync Type Message (discussed later). The maximum number of servers you can synchronize is 16.
- MAX_LINKS=100: The ALE Server is limited to supporting 100 DIS Radios.
- MAX_ALE_FREQ=100: Each Radio has a scan list of frequencies. That list cannot exceed 100 frequencies.
- MAX_TAC_IDS=32: Each Radio can support up to 32 different callsigns. So, 1 Radio ID can be associated with up to 32 call signs. Each Radio MUST have a unique callsign(s). i.e. Different Radios cannot have the same callsign.
- TAC_ID_LEN=24: Each callsign has a maximum length of 24 characters and must be unique among all ALE Radios on the network. To remove a radios callsign(s) you simply set the value to 0.
- MAX_NET_IDS=32: Each Net ID (Group of Radios) can be associated with up to 32 Radios based on callsign ID.

ALE Statistics in RMS

To access the ALE Statistics in RMS select **Radio** -> **ALE** via the Telestra's RMS web-based interface. You will then see all of the ALE counters.

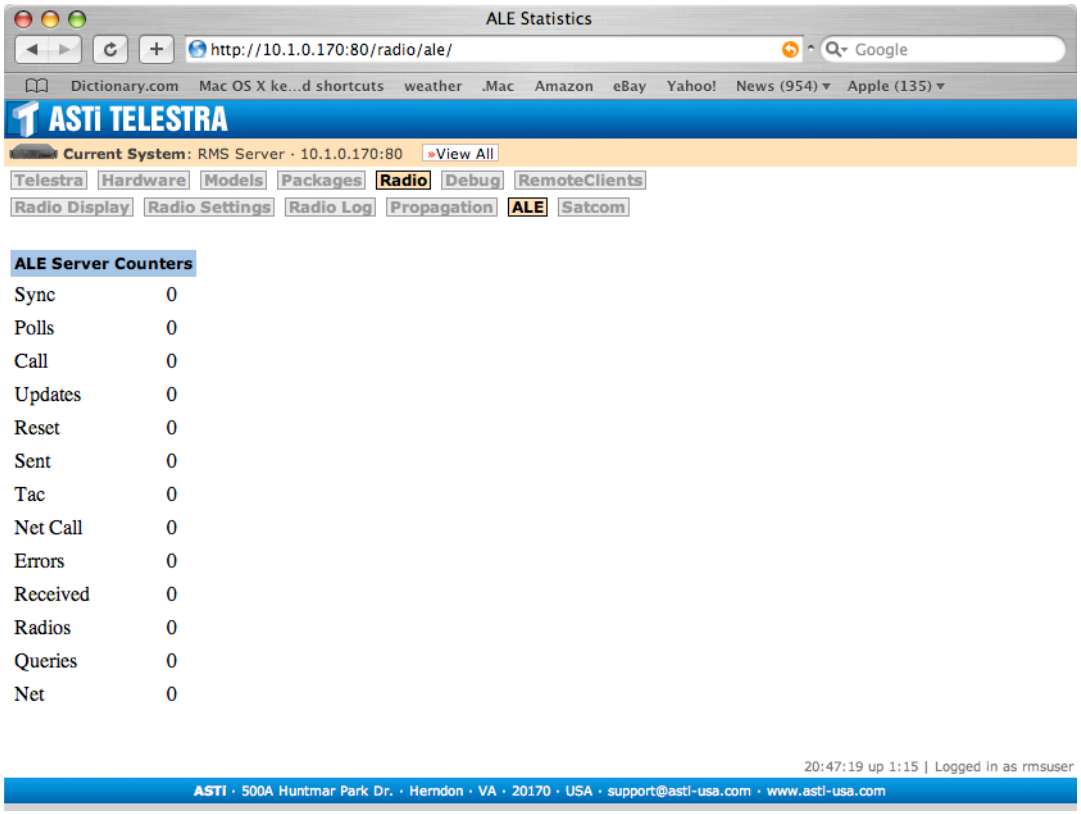


Figure 87: ALE Statistics in RMS

Each ALE Server Counter represents a unique message(s) received from or sent from the ALE Server. The details of the above messages are shown below. For a description of the particular message type please refer to the ALE Server ICD in Appendix B.

- Sync - Updated each time a server sync message (type 5) is received from the host.
- Polls - Updated each time you refresh the screen through RMS.
- Call - Updated each time an ALE Call Message (type 7) is received from the host.
- Updates - Updated each time update is received from PDU Server.
- Reset - Updated each time an ALE Reset Message (type 13) is received from the host.
- Sent - Updated each time an ALE Response Message (Type 4, 9 and 12) is sent to the host from the ALE Server.
- TAC - Updated each time an ALE TAC Message (Type 6) is received from the host.
- Net Call - Updated each time an ALE Net Call Message (Type 11) is received from the host.
- Errors - Updated each time an ALE Response message (Types 4, 9 and 12) contains an error.

- Received - Updated each time an ALE message (any type) is received from the host.
- Radios - Updated each time radio is received from the host.
- Queries - Updated each time a Query message (Types 2, 7 and 11) is received from the host.
- Net - Updated each time an ALE Net message (Type 10) is received from the host.

Chapter 10: HLA Software & Operation

HLA Introduction

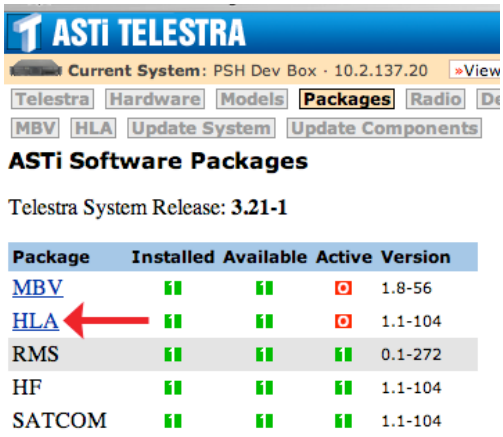
Unlike many other HLA solutions, ASTi's Telestra HLA implementation was developed from the ground up to fully exploit the flexibility and interoperability envisioned under DMSO's High Level Architecture (HLA 1.3) standard. Multiple RTI support, established and published Radio SOM, agile FOM capabilities, backchannel communications options, and debug tools offer users a well supported HLA environment. In addition, ASTi's Telestra platform takes advantage of high performance, industrial, off-the-shelf technology to provide increased HLA performance and reliability. The HLA software is highly flexible with capabilities to support HLA operation for radio and communications models.

However, with this flexibility comes additional complexity. The first thing to remember about HLA is that it is an architecture and not a standard. Unlike DIS where the formatting of the transmitter and signal PDUs is fixed, HLA gives the user the flexibility to define the structure of each object and interaction on the network. The downside of this flexibility is that the implementation is rarely (if ever) a plug and play system. For example, when you look at the objects and interactions related to audio, you will see there are numerous approaches to the problem. There are too many complex components such as the RTI version, RID file, FED file, convert file, etc that all affect the final on-wire data structure to assume that setup of an HLA compliant trainer is as simple as its DIS counterpart.

Overview HLA in RMS

The RMS Packages page features HLA as a software package. Click on the "**HLA**" link to view the RMS HLA pages. These pages allow the user to configure, manage and view the status and log of the HLA environment. RMS organizes the HLA environment into four (4) main sections.

- Management
- Configuration
- Status
- Log File



For more detail on HLA in RMS see the "**HLA Setup Tutorial**" in this chapter.

Overview of HLA in MBV

Changes at the component level in Model Builder Visual (MBV) are restricted to the Radio Entity component. Within the Radio Entity component there is a primitive called Network. There are 3 available network options:

- DIS
- HLA
- Backchannel

For radios that require HLA network capability the user should select the HLA option. Every radio (or TX/RX/Network Intercom) that is tied to this radio entity component will become an HLA radio and be a part of the HLA network. Backchannel can be used when you are not required to send audio through the RTI. It is recommended that a model contain one or more backchannel network intercoms for coordination. This provides an available communications channel even if the RTI is down.

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 Radio Entity name used by the component to define its location and the radio component name. These names are the user-created names entered as part of the MBV development environment. Therefore, assuming we have an entity control component 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 consists of two separate objects which are created on the RTI. These are transmitter and receiver objects, the names assigned will end in "`.tx`" and "`.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 Telestra systems.

A new optional object naming feature has also been added. This allows for the federate name to be included in the Radio Object Name. The main benefit of this feature is that a user can reuse the same exact model on all of their platforms without having to rename the radios or world position objects. Continuing on the example above lets say that Telestra A is setup with federate name Alpha and Telestra B is setup with federate name Beta. With this feature enabled the object names would become:

```
Alpha.Aircraft_Posn.Cockpit_UHF1.rx and .tx

Beta..Aircraft_Posn.Cockpit_UHF1.rx and .tx
```

IMPORTANT: Radio object names cannot use the string "HLA" as the initial part of the name. This is per the HLA Interface Specification. In other words, a name of

"HLA_Aircraft_Posn.cockpit_UHF1.tx"

is ILLEGAL and violates the standard. Additionally it may create issues with the RTI.

The “Radio Entity” component used for entity attach now functions in a different way. The user enters the HLA name of the required attach entity in the name field of the Radio Entity component in MBV. The system then interrogates the RTI and extracts the required position information. It is no longer required to setup site/host/entity numbers. The network intercom component is currently represented as a Radio object on the HLA network.

A method of dynamically attaching radios to an entity across the network is available. ASTi SOM version 3.2 supports dynamic entity attach. Please refer to ASTi Application Note 52: “Entity Attachment over HLA” (http://www.asti-usa.com/) for more information on this feature.

Important: Entity Attach is not yet supported on the 3.x series software. Contact ASTi for availability.

Overview of HLA and XML-RPC

The Telestra HLA environment can be setup in two main ways, either through RMS or via XML-RPC. This document covers the details of how to setup the HLA environment using RMS. It also covers the details and definitions of the various parameters that are required for HLA to work. If you are setting up the Telestra HLA environment via XML-RPC it is HIGHLY recommended that you read through this document. The details of XML-RPC including how it works, and what methods you need, etc. are shown in the "XML-RPC Tutorial."

Overview of RTI and RID Files

In computing, run-time infrastructure (RTI) is a middleware that is required when implementing the High Level Architecture. RTI is the fundamental component of HLA. It provides a set of software services that are necessary to support federates to coordinate their operations and data exchange during a runtime execution. Each RTI has an associated RTI Initialization Data (RID) file that is used to setup RTI specific initialization parameters.

ASTi's Telestra platform has been tested and supports several versions of the MaK, VTC and DMSO RTIs. ASTi is involved with an ever growing number of HLA based communications simulation for a variety of programs throughout the US and internationally.

The RTI versions currently tested and supported vary based on the Telestra software release. For details on the specific RTI versions currently supported please see Appendix A Telestra Software Compatibility.

Overview of Federation and Convert Files

The audio communications interface to the HLA environment is defined through a number of configuration files on the Telestra, mainly the Federation (FED) file and the convert (.conf) file. The FED file is used to supply the RTI with all necessary federation execution details during the creation of a new Federation. The FED file also defines the potential routing spaces, objects, and interactions to be used during the federation. The ASTi HLA radio environment class names and hierarchies are read from a configuration file, and not compiled into the code, allowing agility in switching from one FOM to another. This configuration file is known as the convert file and resides on the Telestra. The purpose of the convert file is:

- to provide the names of the object class attributes and interaction classes to which the Telestra federate subscribes
- to direct the Telestra federate on where to locate specific data within received attribute updates and interactions
- to set the default values of incoming optional attributes, parameters, or complex components[1]

This allows for the ASTi SOM to be included in any FOM (Fed file) and is selected simply by choosing the appropriate convert file. One of the most important lessons learned from our experience with HLA is that SOM and FOM design is not just a matter of deciding what units to use, issues of efficiency, reliability, and coherence of data are all factors whose importance was discovered during the FOM design phase.

[1] For example, the NASMP convert file aides in setting default values of FALSE for booleans, NULL for strings and 0 for all other variable types.

Overview of Backchannel Settings

The Telestra system includes an Ethernet interface to the High Level Architecture (HLA) network. Data received and transmitted at this interface is normally handled by the local Run-Time Infrastructure (RTI) component that interacts with the Telestra HLA federate software. This includes real time audio data exchanged between two radios across the HLA network. Telestra's interaction with the HLA network is therefore directly related to the performance of the RTI component. In short, without the RTI, HLA communication is not possible.

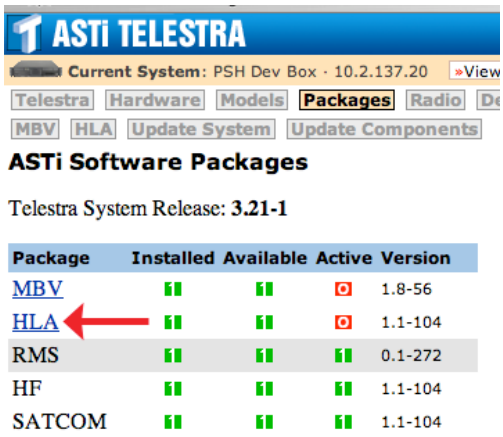
The Telestra backchannel feature provides non-HLA communication channels by routing transmitter, receiver, and audio data directly over the network, bypassing the RTI. This capability provides a communication path when the RTI is not running or in the event that the RTI has crashed. For example, intercom channels used for federation control and coordination prior to a training exercise might be best implemented using backchannels. The Telestra backchannels may also be used while the RTI is running. In this scenario, the backchannels provide an alternate path for voice streams that do not need to be HLA compliant. This relieves RTI loading by reducing the number of voice streams the RTI must handle.

There are 4 parameters for the Backchannel Settings:

- **Backchannel Net** - This is the multicast network that is used to send the transmitter and receiver information for a backchannel radio or network intercom. The default is 230.30.1.0 (allows for backwards compatibility with the DACS). The exercise ID of the Radio Entity component will change the last octet of the multicast network. So if the Radio Entity object was on exercise #12 the Backchannel Multicast group would be 230.30.1.12. Note: This entry requires a valid multicast network.
- **Backchannel Signals Net** - This is the multicast network that is used to send the audio for a backchannel radio or network intercom. The default is 230.30.2.0 (allows for backwards compatibility with the DACS). The exercise ID of the Radio Entity component in MBV will change the last octet of the multicast network. So if the Radio Entity object was on exercise #12 the Backchannel Multicast group would be 230.30.2.12. Note: This entry requires a valid multicast network.
- **Port Number** - UDP port for the Backchannel Net and Backchannel Signals Net. Default is 54000 (allows for backwards compatibility with the DACS)
- **Interface** - Allows the user to define what Ethernet interface to use on the Telestra. Generally this is set to the same interface as the HLA network (this set through the RID file). The default is eth0.

HLA Setup Tutorial

Telestra HLA Communications Environment setup, configuration, and management is handled through the RMS web interface, under "**Packages**". To access the HLA pages, click either the "**HLA**" tab in the menu bar, or on the "**HLA**" link in the table of installed software packages.



IMPORTANT: Changes to all HLA Configuration settings will require a reload of Telestra's radio environment.

When you opt to commit to changes, all Federates will resign from any/all joined Federations, and the software will restart. All Federates must then be told to rejoin their respective Federation(s) through RMS.

WARNING: ASTi does not recommend changing your HLA Configuration during actual HLA exercises. Additionally it is recommended that you resign from a federation prior to any changes.

Step 1: Getting Started

The HLA RTI is not pre-installed on the Telestra system prior to shipping.

In order to access the HLA section of RMS, the Telestra must have an HLA-enabled Options File. The HLA-enabled Telestra will be represented in the RMS Packages page. Contact ASTi at support@asti-usa.com for more information about obtaining Telestra Options files.

1. Click the "**Packages**" option in the RMS Menu bar.

   Under the packages page in RMS you see:

   - HLA Installed
   - HLA Available
   - HLA Active

   HLA Installed is true (green 1) when the HLA software package is installed on the Telestra. **HLA Available** is true when the options file has HLA turned on. Note that if this is false (red 0) then either the package name isn't mapped to the right option or the option does not exist inside the file. **HLA Active** is true if HLA is enabled in RMS.

2. Click the "**HLA**" link in the ASTi Software Packages table.This will display the HLA Configuration screen.

3. Click on "**Management**" to get started.

Step 2: RTI Management

There are two main sections of the HLA management page: 1) RTI Management, and 2) Federation File Management.

1. Installing an RTI on the Telestra system is a simple process. First, under the "**RTI - Upload & Install**" section of the page, click the "**Choose File**" button.

   Your operating system will then display a dialog box where you can locate the RTI file on your local computer (where your web browser is running). RTI files usually end in one of the following file extensions:

   - .tar.gz
   - .tgz
   - .sh

   ASTi's HLA Communications Environment supports RTIs downloaded from DMSO's (http://www.dmso.mil/), MÄK Technologies (http://www.mak.com/), and VTC (http://www.virtc.com/) web sites. Download the compatible version of RTI for the corresponding Telestra release, as specified in Appendix A of this document.

2. After you've located the file, click the "**Upload & Install RTI File**" button. Once the file upload is complete, the Telestra will unpack and install the RTI files in the appropriate location.

3. A message will appear in RMS stating the RTI file was successfully uploaded and installed.

4. Next you must select the RTI from the pull-down menu and click "**Activate RTI**" on the configuration page to begin using it. (For more details on the RTI continue with this tutorial.)

   IMPORTANT: The upload process must not be interrupted. Some RTI files can be several megabytes in size, and RMS may appear unresponsive while the file is being transferred from your computer over the network to the Telestra machine. This is normal for any file transfer of this size. Users must wait for the confirmation screen to appear.

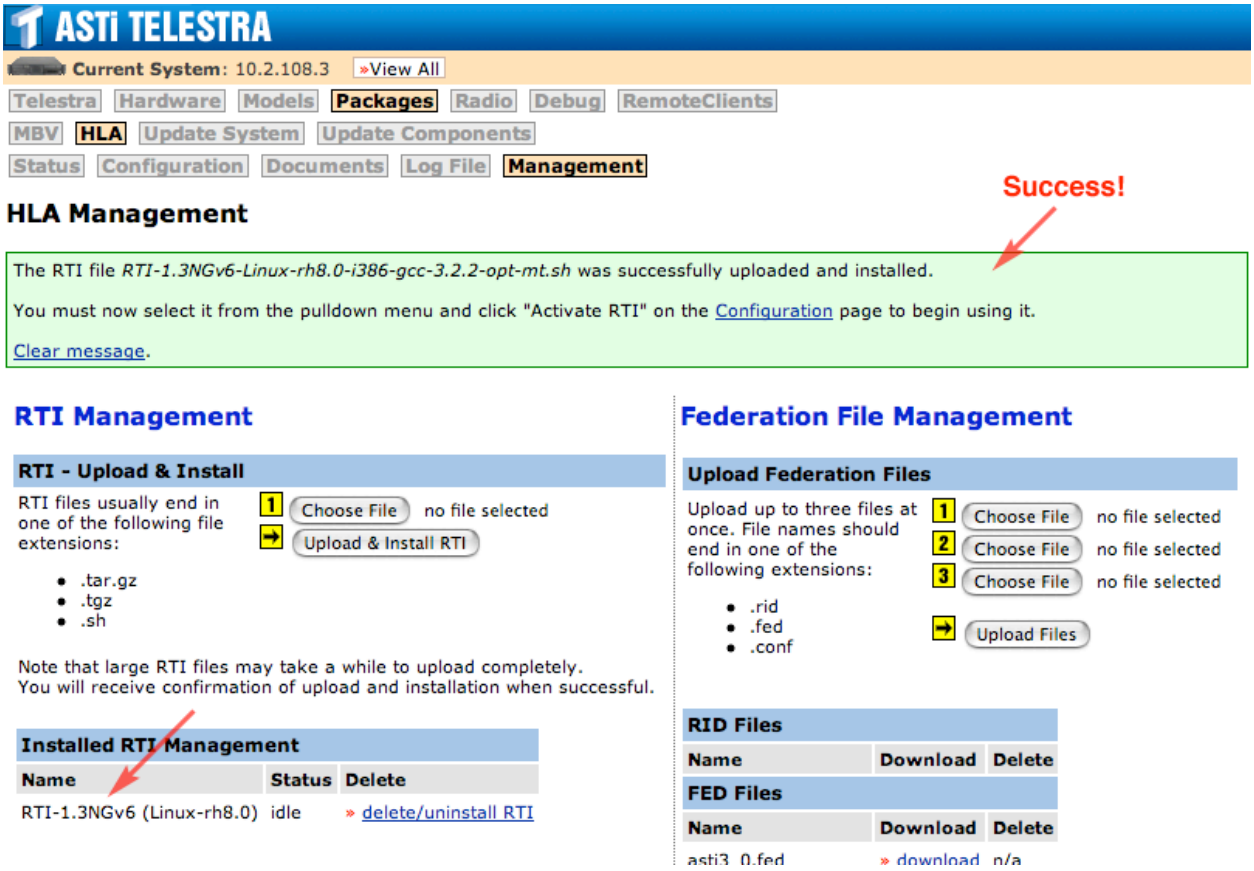


Figure 88: Confirmation of Successful RTI Installation

5. The name of the newly-installed RTI file is now listed in the table under the "**Installed RTI Management**" section of this page. Multiple RTIs can be installed on the same Telestra, and all of them will be displayed in this section.

Step 3: Federation File Management

A default set of ASTi-created FED and convert files are included with the standard software installation. These files will already be listed in their appropriate sub-sections under the Federation File Management section. Note that each of these pre-installed HLA files can be downloaded, but none of them may be deleted from the system.

Before you can configure individual Federates, the necessary RID, FED and convert files must first be transferred to the Telestra system. The Federation File Management section is where the user populates the Telestra file system with RID, FED and convert files that later must be assigned to individual Federates. FED and convert files share a directory on the Telestra (`/usr/etc/asti/fed`), whereas RID files have their own directory (`/usr/local/asti/fed`).

1. To install custom RID, FED and convert files, use the form in the "**Upload Federation Files**" section of the page. You can upload up to three files at once, and the files do not have to be selected in any particular order.
2. Click any of the "**Choose File**" buttons in the form to locate the files on your local computer.
3. Then, click the "**Upload Files**" button to transfer them to the Telestra system. RMS will automatically place the files in their proper locations, based on their file extensions. If you upload a file with an improper extension, it will not be copied to the system.

4. After upload, the newly-installed files will appear alongside the pre-installed files. Note that any files you install on the Telestra can be downloaded or deleted from the machine at any time.

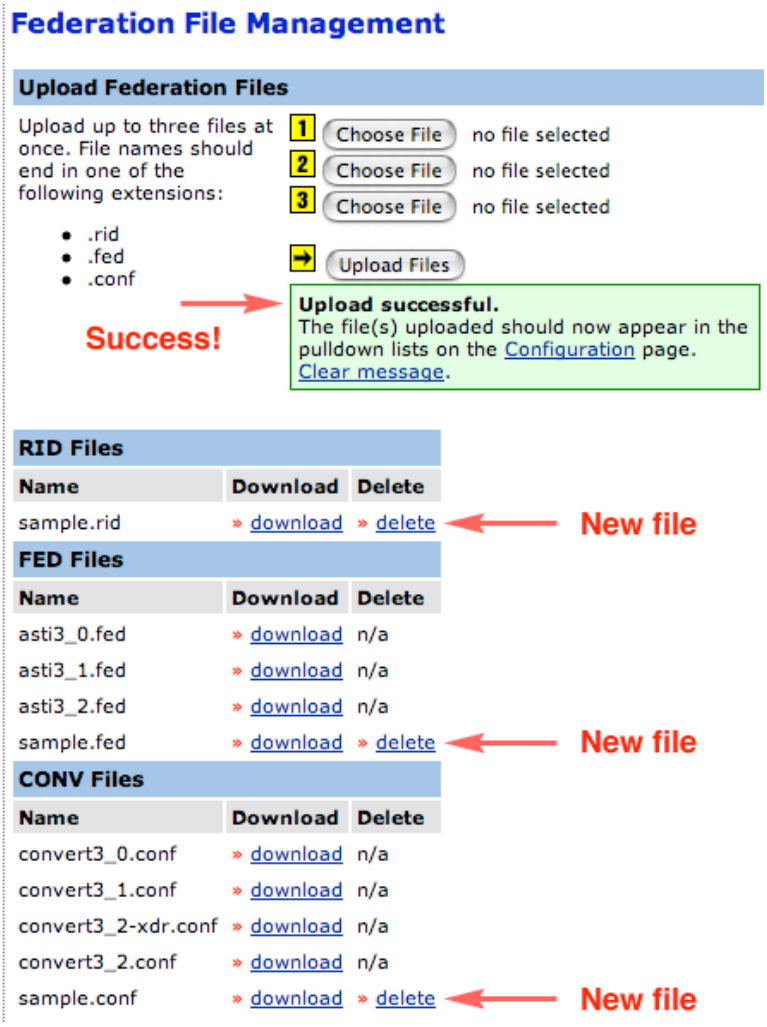


Figure 89: Successful Installation of HLA Files

The user can view all the RID, FED, CONV files currently uploaded on the telestra under "**Federation File Management**." The user also has the ability to delete and download the RID, FED and convert files.

Note that you cannot delete the default ASTi SOM 3.0, 3.1 and 3.2 versions of the FED and convert files. These are pre-installed on the system.

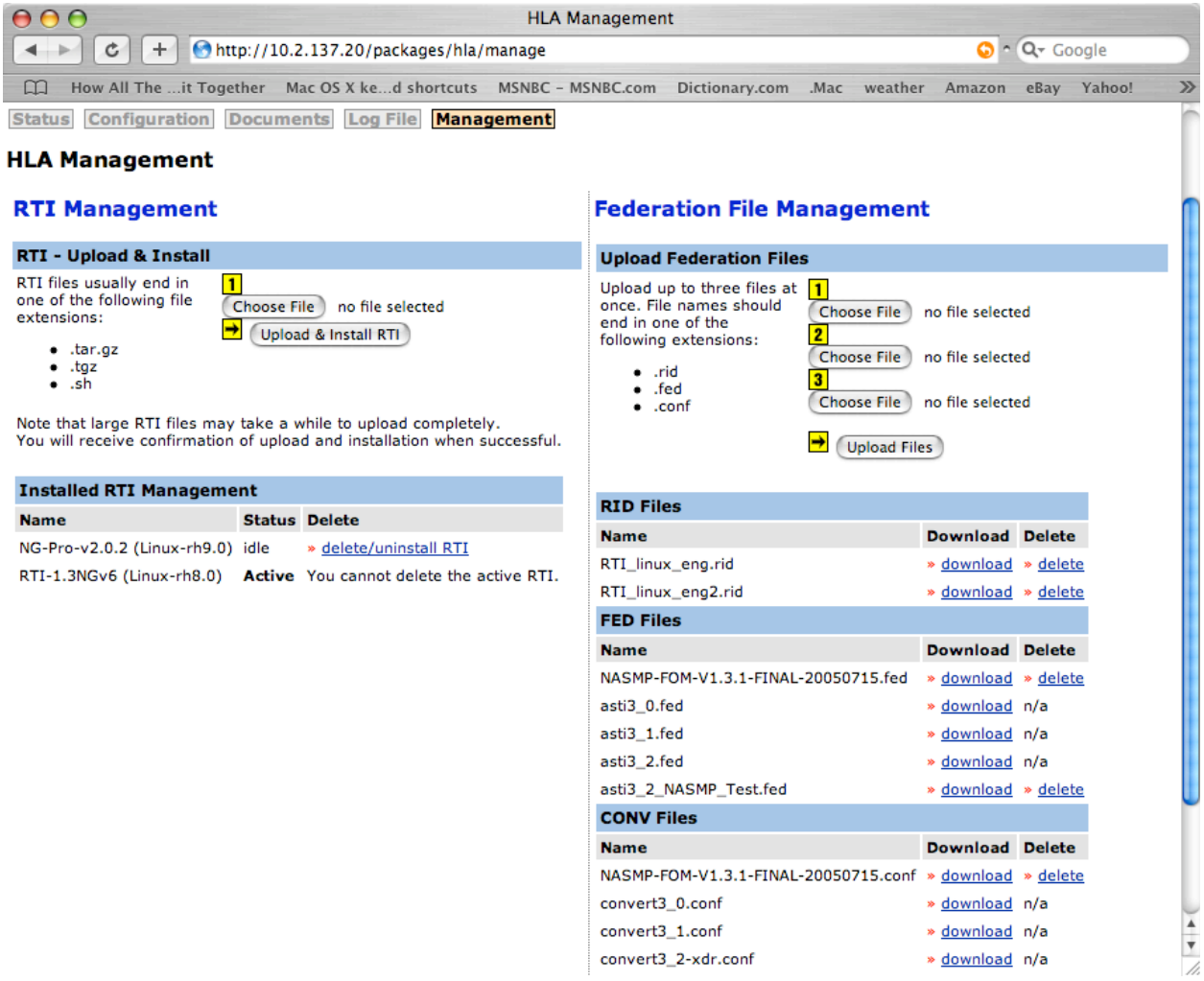


Figure 90: HLA Management

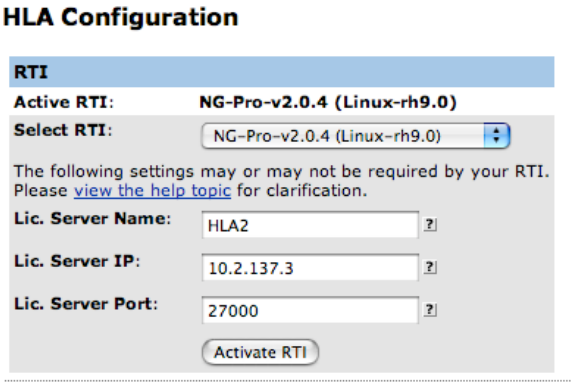
Once the RTI and desired Federation files are installed on the system, the next step is to properly configure the HLA environment for operation.

Step 4: HLA Configuration

There are four main sections of the HLA Configuration page: RTI, Federation Settings, Back-channel Settings, and Debug Level. Each of these sections has its own configuration form.

After uploading and installing the various RTI, RID, FED, and convert files in HLA Management, the user must click the "Configuration" tab to configure the RTI and Federation files uploaded in the previous step. All of the HLA configuration settings will modify a file called radio.conf. This file resides in /usr/local/asti/etc. This radio.conf file contains all of the necessary HLA settings for the radio environment to function correctly.

1. First select an RTI file from the pull down list. When using an RTI from Mäk or VTC, you must specify where on the network the License Server exists, and which port to use. You must specify either the License Server Name or its IP address; supplying both pieces of information is not required, but adds the benefit of having a local route listed in the Telestra system's "/etc/hosts" file. If you are using a Mäk or VTC RTI, the License Server Port number is also required.

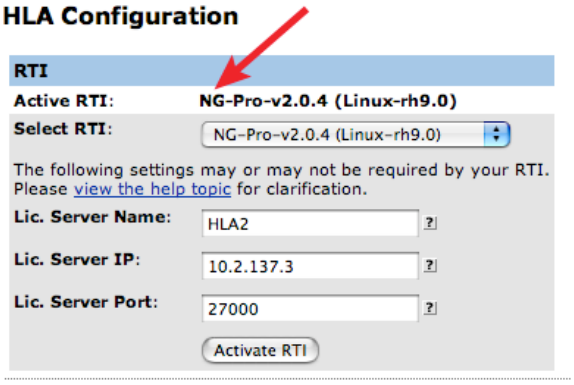


   HLA operation will not work if these settings are not configured for these types of RTIs. Note that if you wish to use DNS to resolve the hostname of the license server you should only enter the License Server Name. However, you must also configure the Telestra system's DNS nameserver in Telestra > Networking > General Networking.

   Note: Selecting "use no RTI" in the pull-down will turn off HLA operation altogether.

2. Click the "**Activate RTI**" to reload the system and activate the RTI. RMS will then display a status page stating that the RTI is being activated, and that various software must be restarted in the background, which will take around 30 seconds.

3. After software restart, the HLA Configuration page will be displayed, showing your newly-activated RTI.



Note: The examples shown in the figures above use a DMSO-based RTI, which does not require a license server. If these settings are required for your RTI, they will be displayed inside their respective text field in the form.

Any change to the active RTI or license server settings will require another 30-second software restart.

4. Under the **Federation Settings** heading you will setup the following:
   - **Federation Name** - This is the name of the exercise federation that the Telestra will be joining.
   - **Number of Federates** - This defaults to 1 and cannot be changed.
   - **Federate Name** - This is the name of the federate as seen by the federation. Each Telestra appears as a federate in the federation. The federate name will default to ASTi_hostname_1, where hostname is the Telestra hostname. If this federate name is not desired enter the required federate name.
   - **RID File** - Select the RID file required for the RTI to operate. Note that this file was uploaded from the Management page in RMS.
   - **FED File** - Select the FED file required for the exercise. Note that this file was uploaded from the Management page in RMS. Also any of the ASTi SOM FED files can be used.
   - **Convert File** - Select the convert file required for the exercise. Note that this file was uploaded from the RMS Management page if required. The default ASTi convert file can be used with the corresponding default ASTi FED file. For use of any other convert files please contact ASTi support.

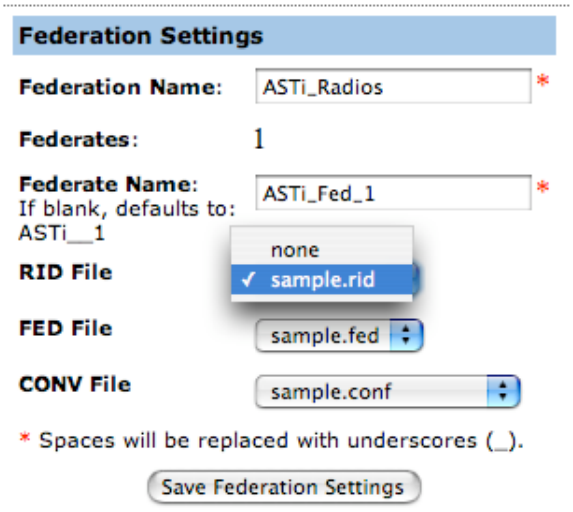
   Note: At this time, Telestra 3.0 MBV software supports a single Federate. Support for multiple Federates may be added in the future.

5. Use the text fields in the "**Federation Settings**" section of the page to specify your Federation and Federate names.

   Note that any spaces entered for these names will automatically be converted to underscores (_).

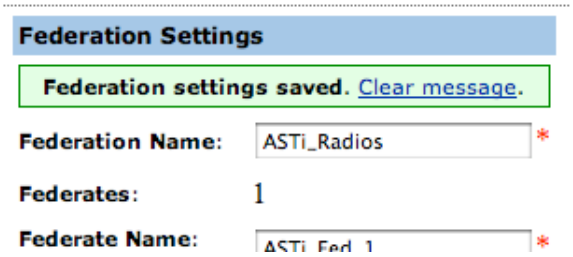
6. For each of the RID, FED and Convert files, the corresponding pull-down menu will list all the files of that type available on the Telestra.

   Note that an RID file is not required for HLA operation, but both a FED and a Convert file must be selected for HLA to operate properly. If an RID file is not selected, the federate will run with the default RTI settings (this is vendor specific).



7. Once you are satisfied with the settings, click the "**Save Federation Settings**" button. A small confirmation message will then appear below the "**Federation Settings**" section heading.

   A warning message will appear at the top of any HLA-related page alerting you that there are pending changes to the Telestra's radio environment.



This alert indicates that changes have been made to various Telestra configuration files, but have not been applied by reloading. To apply the new settings, click the "**Reload Radio Environment**" button.

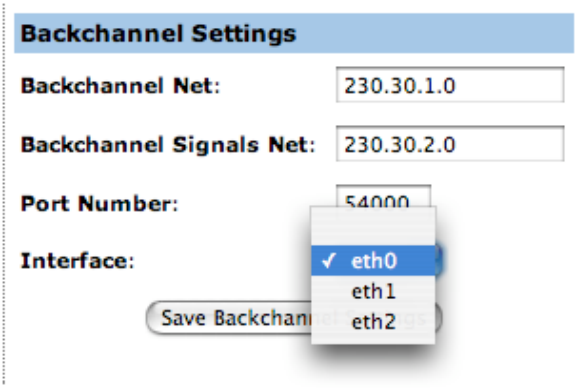
Configure all the Federation and Backchannel settings (if needed) before reloading the radio environment. This will save you the extra step of having to reload the radio environment multiple times.

8. Next the user must set the Backchannel settings including the Backchannel Net, Backchannel Signals Net, port number, and interface.

   For more information on Backchannels see the Backchannels Setting Overview located in the beginning of this chapter.

9. To preserve backward compatibility with ASTi's 2-series Telestra (DACS management) HLA software, the backchannel is split between two nets:

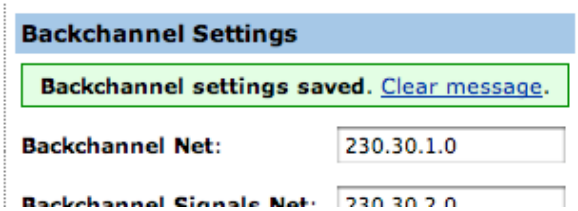
   - One carrying the TX/RX PDUs (named "**Backchannel Net**" in the form)
   - One carrying the signal PDUs. (named "**Backchannel Signals Net**").



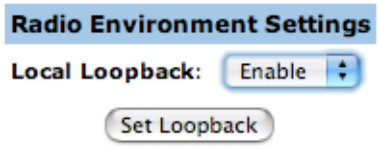
   Each of these nets must be assigned a valid multicast IP address in the range 224.0.0.0 to 240.0.0.0. The system defaults for these nets are 230.30.1.0 for the TX/RX PDU net, and 230.30.2.0 for the signals PDU net.

10. You must also specify the backchannel port number (default is 54000), which is shared by both nets, and the Telestra Ethernet interface over which the backchannel communications will be transported (default is eth0).

11. Click the "**Save Backchannel Settings**" button when done. Again, a small confirmation message will appear under the "**Backchannel Settings**" section heading, and you will be alerted to pending changes in the radio environment, as above.



12. In the Radio Environment Settings, set the Local Loopback. The default setting is 'Enable.'



The Local Loopback setting defines whether or not the radio environment should listen to radio information (i.e. TX, RX and encoded audio information) on the local loopback address. The purpose of this feature is to enable or disable local radio in-tune logic. In almost all applications you will want to have this set to 'Enable.' **When set to 'Disable', radios that are local and in-tune will not be able to communicate with each other.** This may be a desirable feature in a gateway type application, for most other applications this will not be desirable.

Important: The value of the setting above is written to /usr/local/asti/radio.conf with the following syntax:

'Local_loopback 0' means Disable

'Local_loopback 1' means Enable

By default there will not be an entry in the radio.conf file. i.e. There is a null entry. This will result in Local Loopback being enabled. However, due to RMS being unable to resolve a '0' or '1' as there is no entry in the radio.conf file. RMS presents the pull-down menu with neither of the options explicitly selected in the form. As a result the Local Loopback option simply displays 'Disable' in the list which can be misleading.

The Radio Configuration file is created when any of the settings on the HLA Configuration page are modified or changed. Below is a sample radio.conf file. This file is automatically generated by RMS based on the selected settings.

Backchannel_net 230.30.1.0:54000:0

Backchannel_signal_net 230.20.2.0:54000:0

HLA_conv_path /usr/local/asti/fed/convert3_2.conf

HLA_debug 1

HLA_enable 1

HLA_fed_path /usr/local/asti/fed/asti3_2.fed

HLA_federate_name PSH_Federate

HLA_federates 1

HLA_federation Federation1

HLA_license_server_name HLA2

HLA_license_server_port 27000

HLA_rid_path /usr/local/asti/rid/RTI_linux_eng.rid

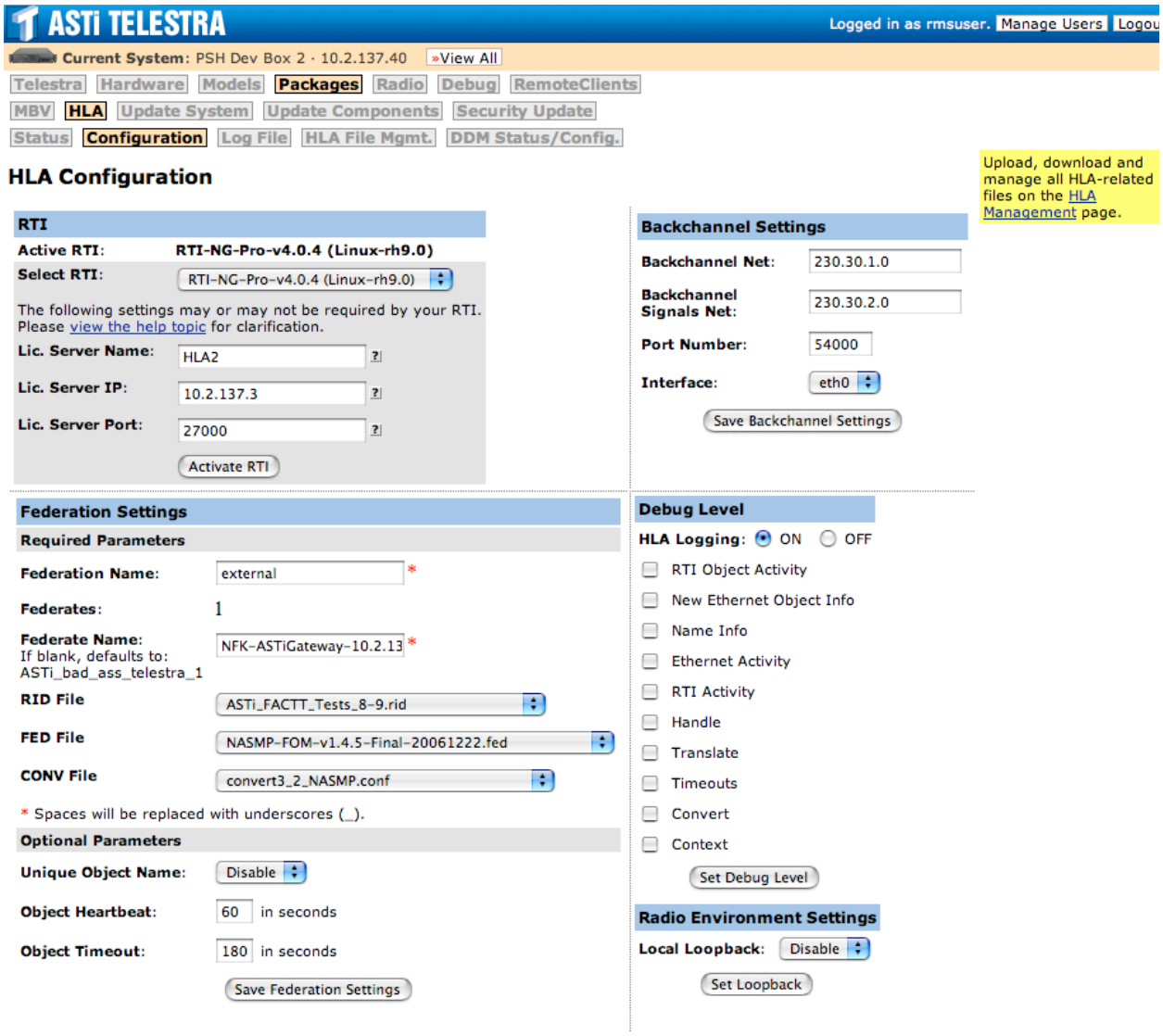


Figure 91: HLA Configuration

Step 5: Optional HLA Configuration Settings

The following HLA Settings are optional and may be required depending on the model and RTI settings.

a) Unique Object Name - Disabled by default. When enabled the federate name will be prepended to the Radio Object Name. By default the Radios are named as follows:

```
<Radio_Entity_Name>.<Radio_Name>.tx and .rx
```

When this feature is enabled the Radio Names will appear as:

```
<Federate_Name>.<Radio_Entity_Name>.<Radio_Name>.tx and .rx
```

This feature ensures that the network object names are unique. It also allows a user to load the same model on two or more platforms without having to make any naming modifications.

b) Object Heartbeat and Object Timeout are disabled by default (i.e. They are set to 0). To enable enter a value in seconds. If using the object heartbeat feature you MUST define the timeout.

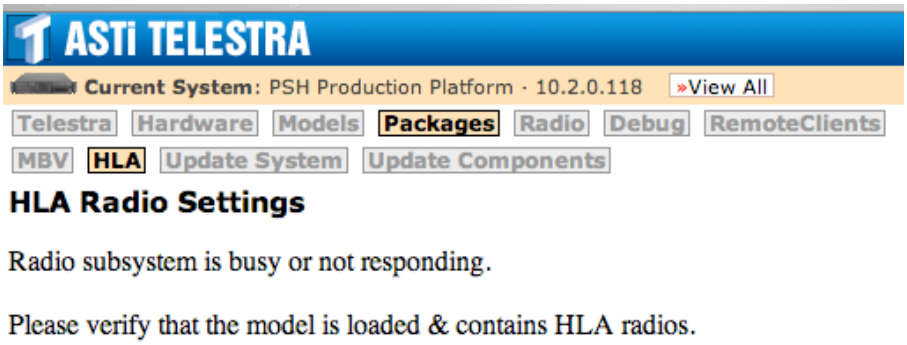
Object Heartbeat - Defines the time in seconds that the Radio Objects will be updated. Traditionally in HLA, object updates are only performed once and on a state change; however, with this feature enabled a user can cause the attribute updates to be sent out periodically. This is particularly useful when in connectionless mode. A common setting should be used across the network to avoid issues.

Object Timeout - Used in conjunction with Object Heartbeat. This is the timeout period that will cause a federate to drop discovered remote Transmitter and Receiver objects. The value defined is in seconds. The recommended value should be two to three times the value defined in the Object Heartbeat setting.

Step 6: HLA Status

The HLA Status page displays the HLA Radio Environment status, statistics, counters, objects and join/resign status. For the status page to work a model must be loaded and it must contain at least one HLA Radio.If this is not true, then you will get a '**Radio subsystem is busy or not responding**' message.

Verify that the model contains HLA radios or Network Intercoms and then reload or load the model for the first time. Once loaded you can then access the HLA Status page. The HLA Status page is broken into 6 main sections:



- **HLA Radios** - The HLA radios list will give you a listing of all of the HLA radios in the model. For this list to show network HLA radios (i.e. Non-local HLA Radios) you must be joined to the defined federation. For details on an individual radio click on the object number.
- **HLA Settings and Counters** - This section shows the overall state of the radio environment, version number, Federation and Federate Names as well as some general statistics. Under the 'State' heading is the 'Join/Resign' button. Once all of the HLA Settings are configured (Step 3) and the model is loaded, you are then able to join and resign the federation from this link. See Step 7 for the details.
- **HLA Counters** - The HLA Counters show the sent and received attribute updates, audio interaction and TDL interactions statistics.
  - **Attribute Updates** report 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.

- **DIS Counters** - The DIS Counters show the sent and received transmitter, receiver, signal, bytes and all statistics. As this is an HLA configuration the DIS statistics are not required. They have been included for debug purposes only. In the radio environment DIS is transformed to HLA. The DIS counters may be useful for debugging, otherwise they can be ignored.
- **HLA Objects** - The HLA Objects counters show the number of local and RTI transmitters, receivers and entities. The attached entity counter will display if any of the radios are attached. 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.
- **HLA Settings** - These settings are retrieved from the radio environment itself and are compared to the settings found in the radio configuration file. After the HLA configuration has been changed and the radio environment reloaded these two settings will show the same value. If however the radio.conf file has one setting and the radio environment has a different setting a flag will display in this table. If you are stuck in this state try reloading the radio environment through RMS. If this option is not available try reloading the model.

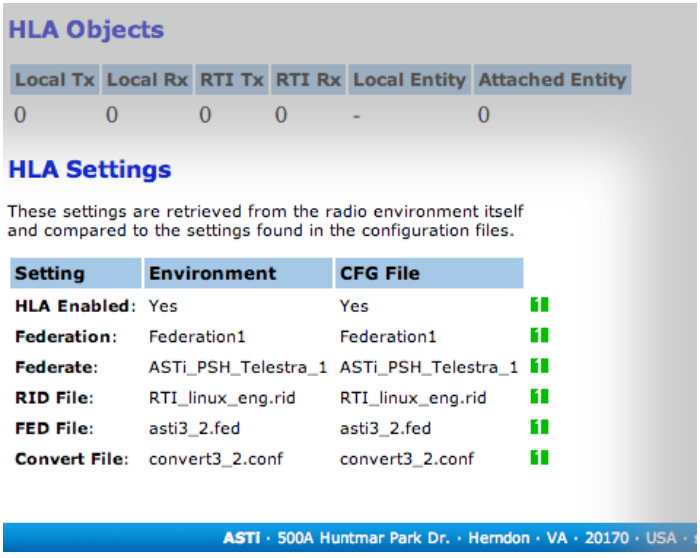


Figure 92: Figure 70: HLA Status Settings

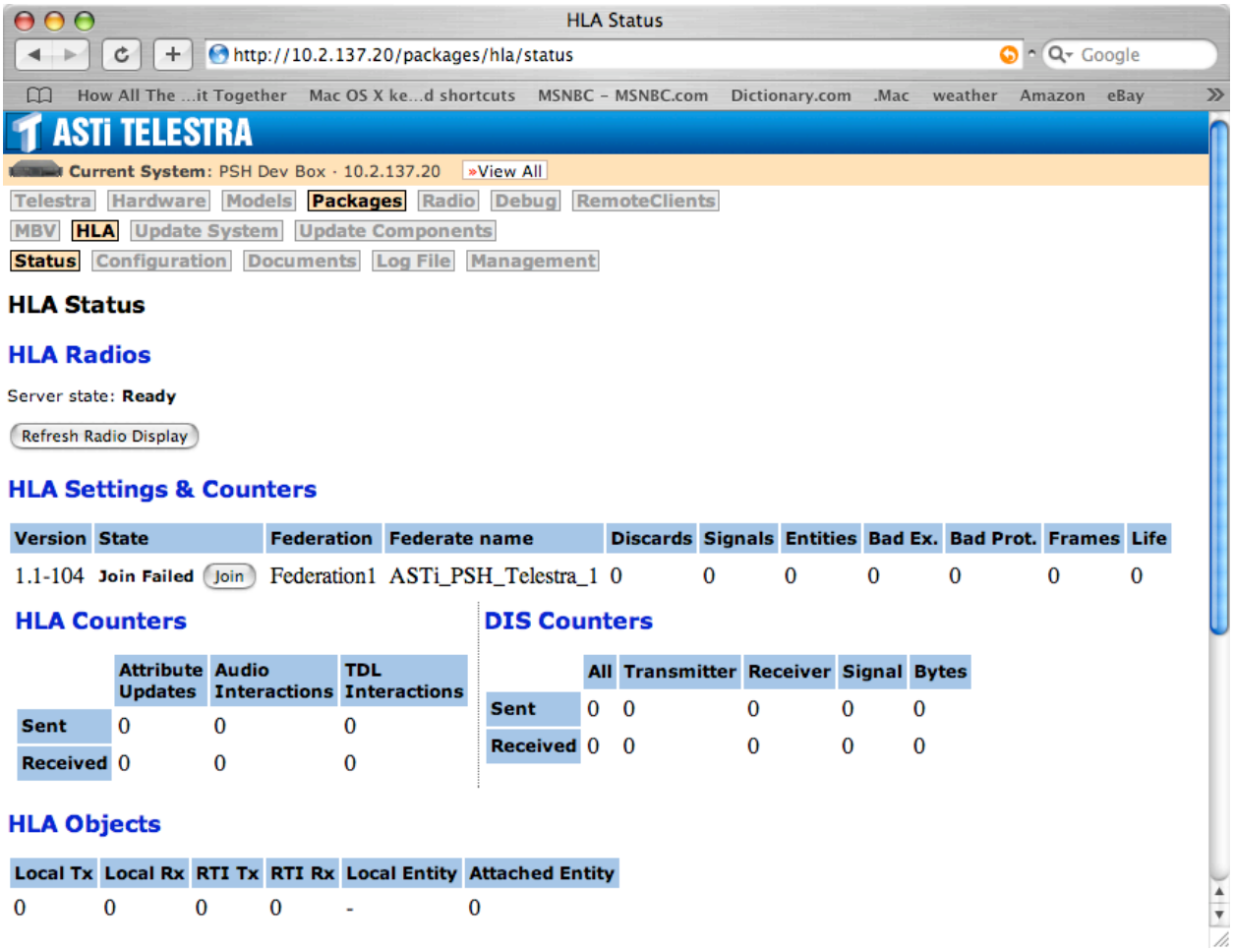
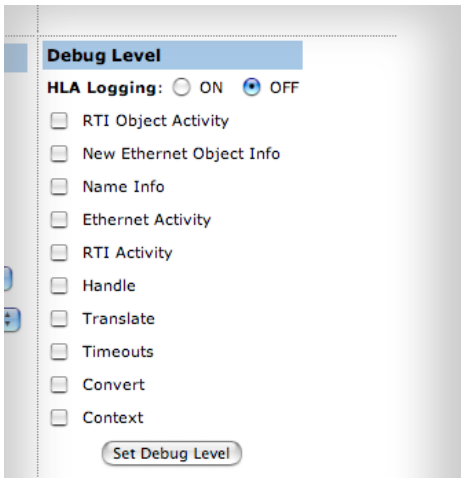


Figure 93: HLA Status

Step 7: HLA Debugging and Log

Telestra's HLA software can be configured to record a number of different messages, warnings, and errors to the system log for debugging purposes. The user configures the types of messages it records through RMS.



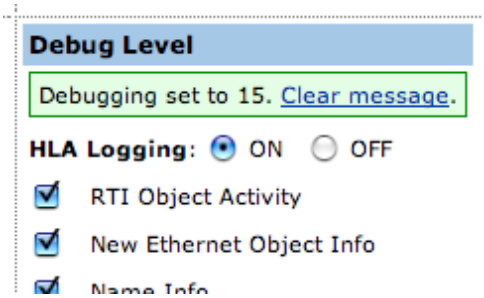
Debug messages are printed to the file:

`/var/log/hla.messages and /var/log/messages`.

The HLA messages log will show all HLA related messages including all HLA activity as well as audio environment activity. The HLA log file is also available for online viewing under the Log File tab.

1. To enable HLA logging select **HLA Logging** to **ON**. This will turn on basic HLA logging.
2. For additional debug and logging capabilities select one of the ten (10) options available. Use caution when doing this, as selecting multiple debug options can cause a massive amount of logging to occur. In general, the log should be turned on when debugging HLA issues. Otherwise the recommended setting is OFF.
3. Click the "**Set Debug Level**" to save the changes and start logging.
4. Again, a small confirmation message will appear under the "**Debug Level**" section heading.

   You can ignore the number displayed in this confirmation message, as it is simply the bitmask value which controls the message logger's activity.



RMS will automatically enable the debug bit mask in the radio.conf file based on what you select in the RMS Debug Level Selection window. This selection will write the radio configuration file with a debug mask level. If you are setting this through RMS, this is transparent to the end user. However, if you manually set this or set it through XML-RPC you need to know the mask settings.

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

Table 4: Remote Control Debug Levels

For example, to log “Name Info”, you would set the debug level to 9, which is 8 (Name Info) plus 1 (turn logging on). Setting the debug level to 8 would not work, because it represents 8 (Name Info) plus 0 (logging off).

If you wanted to log “RTI Object Activity”, “New Ethernet Object Info”, “Ethernet Activity”, and “RTI Activity”, but ***NOT*** “Name Info”, you would set the debug level to 55 (32 + 16 + 4 + 2 + 1).

To log every possible message (not recommended), you would set the debug level to 2047 (1024 + 512 + 256 + 128 + 64 + 32 + 16 + 8 + 4 + 2 + 1).

The HLA Log File logs all actions which is useful when debugging.

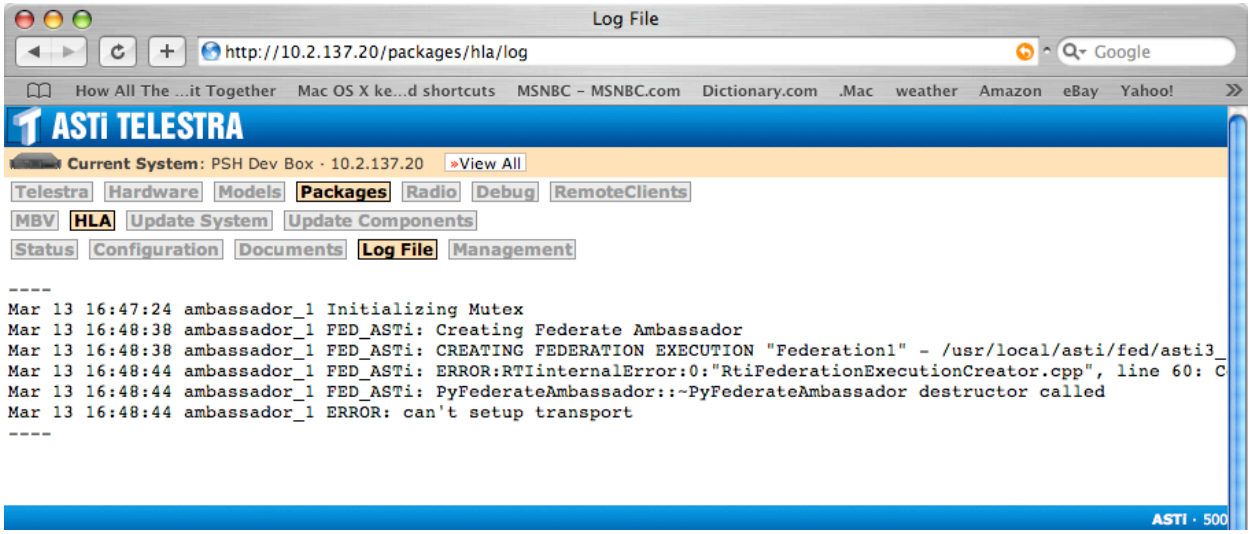


Figure 94: HLA Log File

Step 8: Testing the HLA Software

The HLA software that runs on the Telestra is an HLA federate. This federate software, when combined with the Telestra 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, an HLA-enabled Telestra will start the Telestra federate application as a background process. A particular federate may be accessed through RMS, which is described later in this chapter.

The RTI Executive Software: The DMSO RTI (or other specific RTI) requires running the "`rtiexec`" application somewhere on the HLA network. In the normal mode, the `rtiexec` will be running on another computer system resident on the HLA network. However, to allow local-only testing or stand-alone tests, it is possible to run the `rtiexec` on the Telestra platform. This `rtiexec` will service every system on the network. ***Please note that this is not a supported mode of operation and should be used only for testing. Running the RTI exec locally can severely affect the performance of the Telestra.***

Prior to starting the `rtiexec`, the RTI must be installed, and the proper RTI library path must be specified in RMS' HLA Configuration section.

1. Once the Telestra has been configured to use the RTI, log into the system as "**`root`**", go to the main RTI directory (in `/opt/rti`). Different RTIs will create different directory structures. In general, there is a config and bin subdirectory within a specific RTIs main directory.
2. Enter the following commands to start the rtiexec:

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

3. The rtiexec should indicate successful initialization.
4. To stop the RTI, type CTRL+C.

Please refer to the vendor specific RTI Reference Manual for more information on the `rtiexec` application. The RTI software is not provided by ASTi.

Joining the Federation: This section assumes that the RTI exec is running and the RTI and Telestra federate software are properly installed on two Telestra systems.

This example will use the DMSO RTI (1.3NGv6) and, for the purposes of this scenario, the `rtiexec` process will run on one of the two Telestras. 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 Telestras.

1. Start the RTI exec, as described above.
2. On each machine, navigate to the RMS HLA Status page and under HLA settings and counters you will see '**Ready**' and '**Join**'.
3. Click '**Join**' to join the federation.

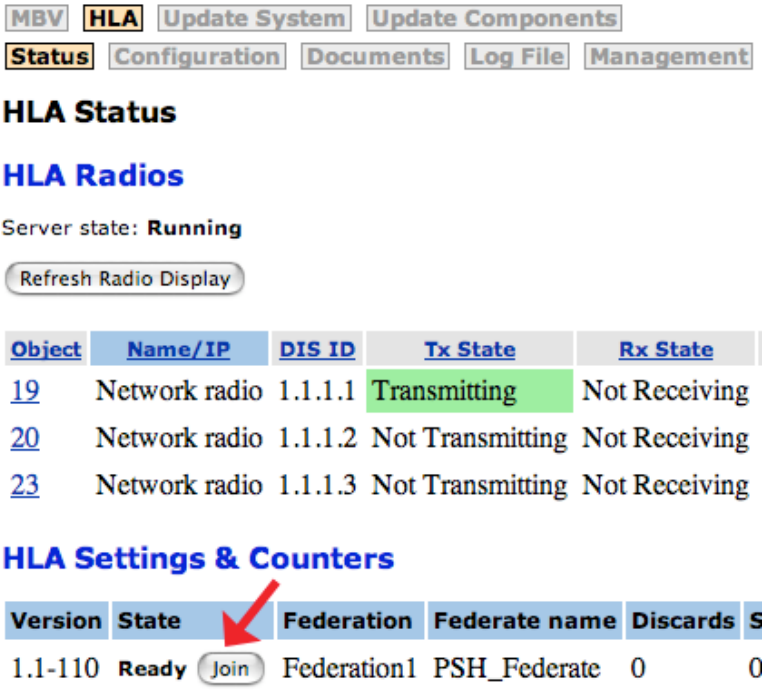


Figure 95: HLA Ready to Join Federation

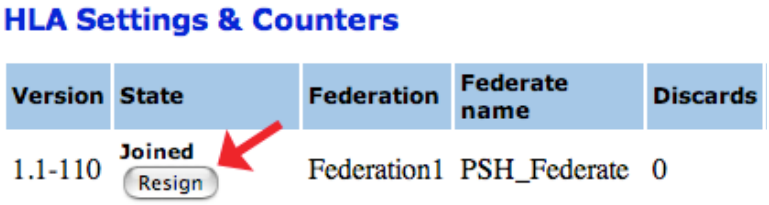


Figure 96: HLA Joined to Federation

4. The `rtiexec` should then indicate successful federate initialization.
5. To resign from the federation, select '**resign**' on the HLA status page.

Debugging Join Issues

If the join process fails check the following:

- Check the **RTI Known Issues** list (Vendor specific)
- Verify the FED/Convert files. Revert to ASTi SOM and convert file for interim testing. For example try loading the following default FED and Convert files:
  - asti3_2.fed
  - convert3_2.conf
- Verify the RTIEXEC is running. Do you see the federate attempting to join? Are there any error messages? Contact RTI Vendor for other debug ideas.
- Verify the RID file settings are correct and match the RTIEXEC endpoints. Contact RTI vendor to verify RID file settings.
- Verify the license server is running. Can you ping license server hostname from the Telestra? Is DNS required/setup if you are using the hostname.
- Examine at the HLA Logs for guidance.
- Verify that you installed the right Red Hat version of the RTI, see Appendix A for details.

Summary

There are 4 main components required before the Telestra federate can join an HLA Federation.

1. RTI Executive must be up and running on the HLA Network. This is vendor specific and should only be run on the Telestra for testing purposes. Running the rtiexec on the Telestra is not a supported mode of operation.
2. HLA compatible MBV model must be loaded and running.
3. RTI, RID File, Fed file and Convert files have been uploaded and installed.
4. Telestra Federate has been configured through RMS. This includes the RTI settings, Federation settings, Debug Level and Backchannel settings if applicable.

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 Configuration file or from a command-line input). It reads 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.

DDM Status and Configuration

Introduction

The High Level Architecture (HLA) interface specification is divided into various service groups; two of those groups are Declaration Management (DM) and Data Distribution Management (DDM). Declaration Management has been the traditional mechanism for providing object exchange information during runtime. i.e. publish, unpublish, subscribe, unsubscribe object class attributes, etc. However, there are fundamental limitations within DM with regards to data management. In short, there is no mechanism for federates to restrict the routing of data over a WAN and as a consequence excessive bandwidth can be utilized on the WAN. DDM ends this problem.

DDM allows a federate to segregate and limit the flow of data to and from Telestras using regions. i.e. publish with region, register object with region, send interaction with region, etc. There are many different DDM schemas such as Class Partitioning, Static Grid Partitioning, MC02 Strategy, etc. In some cases, the RTI handles all of the DDM functions and no code changes are required. With these schemes only the FED and RID files dictate the on-wire behavior. These mechanisms are only mentioned as background information. ASTi has not currently tested these DDM mechanisms, as they are not a requirement at this point in time.

Currently ASTi supports the following DDM Implementation:

Millennium Challenge 2002 (MC02) as defined within NG Pro 4.0.x RTI

No other DDM implementations are currently supported and/or documented. Please contact ASTi if such a requirement exists.

In order to support the MC02 DDM Strategy, additional HLA configuration parameters are required. These parameters are configured through RMS as shown later in this section.

What is MC02 DDM?

The RTI Data Distribution Management services provide the framework for flexibility and scalability within a Federation. Facilitating a reasonable DDM scheme over a distributed training environment not only reduces the amount of network bandwidth used over federation network infrastructure, but also reduces the processing strain and memory usage required of each federate. This is because DDM uses a concept called partitioning to separate interest streams within the federation, such that each federate only subscribes to the things that are of interest. On the transmitting side, each federate only publishes to the proper interest streams. Therefore, any interest streams that a receiver or subscriber does not explicitly request do not get sent to that federate.

The concept of partitioning relies on the assertion that not every federate needs to know the state of the entire synthetic battle space. Federates are often only interested in unique subsets of the objects and interactions being published over the federation.

The RTI provides a second set of services for partitioning and filtering data, called Declaration Management (DM). Declaration Management uses class subscriptions to allow each federate to tell the RTI what they are interested in. Multicast filtering, which is used with DDM, cannot be used to support this approach. The RTI specification requires that all the attributes of a class always be published to the same space. This requirement becomes problematic when the FOM in question is hierarchical in nature (i.e. having a class structure where subclasses inherit attributes or parameters from parent classes). For this reason, and since the IEEE 1516 specification got rid of the concept of routing spaces altogether, one approach is to use DDM with a single routing space, called “HyperSpace”. This single routing space is segmented by using multiple dimensions (see definitions in next section), the first of which is used as an enumerated value that essentially breaks up the single routing space into mini-routing spaces, or “application spaces”. Each segment is then tied to a multicast group(s), which is used by each federate for publication and subscription to the interest stream associated with that segment. It should also be noted that this approach makes it easier to upgrade to 1516 RTI implementations in the future, since “no routing spaces” is essentially equivalent to one routing space.

An important note here is that ASTi did not develop the MC02 DDM Strategy, simply stated we have added software support for MC02 DDM Strategy. Therefore, the end user is expected to be familiar with the basic MC02 DDM concepts. Please refer to the appropriate federation document for more information, this is not provided by ASTi.

DDM Terms and Definitions

This section attempts to provide definitions for various terms often used when discussing DDM and related concepts.

Routing Space

A routing space is a collection of dimensions. These spaces are defined in the Federation Execution Data (FED) file, and provide the basis for DDM addressing. Each object attribute and interaction in the FED file is associated with one of these routing spaces, which are used for both publishing and subscribing. Note that only one routing space is used by the MC02 strategy. Also note that the terms “routing space” and “application space” (see below) can sometimes be easily confused. Remember that “routing space” usually refers to an RTI routing space in use (in our case, HyperSpace), while “application space” refers to a federation-supplied subspace.

Region

A region is also known as a subspace of a routing space, and is represented as a collection of extents. The region is the key to the DDM addressing concept and is used for both publishing and subscribing to object attribute updates and interactions.

Application Space

An extension of the RTI routing space concept, application spaces allow federation developers to create their own “internal” routing spaces, based on the needs of the applications within a federation. Within MC02 strategy, an application space can also be thought of as a subspace of an RTI routing space, and is associated with a list of object classes. MC02 straighter will only use one RTI routing space, therefore it is necessary to use one dimension in this space to create subspaces or application spaces.

Update Region

An update region should be specified for sending attribute updates and interactions across the federation. This is done through the service 'registerObjectInstanceWithRegion' to direct the RTI to send attribute updates through a region. In the same way, ‘sendInteractionWithRegion’ is used to direct the RTI to send an interaction through a region. It is useful to think of a region as an “interest stream”.

Subscription Region

Subscription regions are used in the same way as update regions. The RTI DDM services 'subscribeObjectClassAttributesWithRegion' and 'subscribeInteractionClassWithRegion' should be used when subscribing to object attributes and interactions, respectively. It is useful to think of a region as an “interest stream”.

Available DDM Settings in RMS

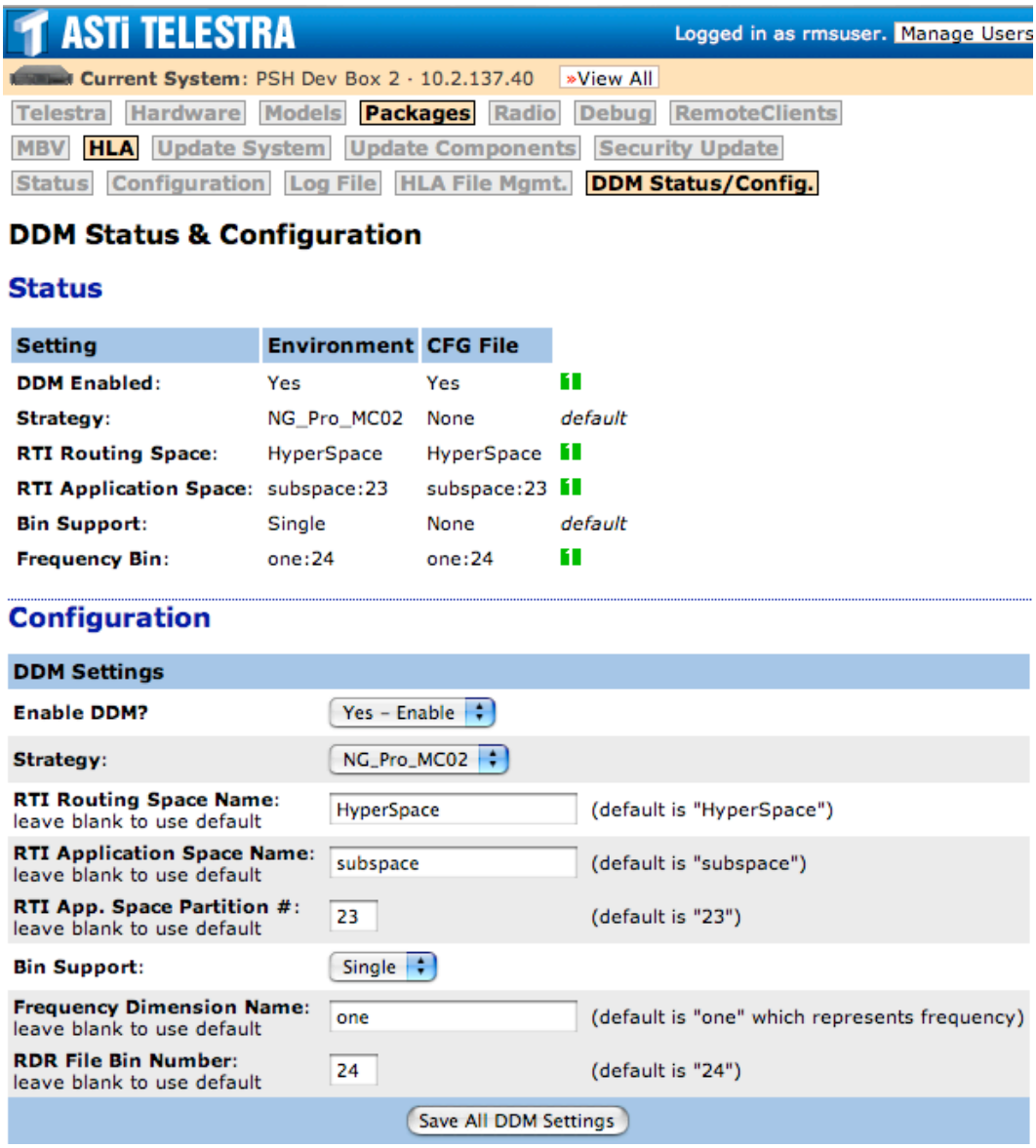


Figure 97: RMS HLA DDM Page

Enable DDM

Default = No

To Enable DDM select Yes

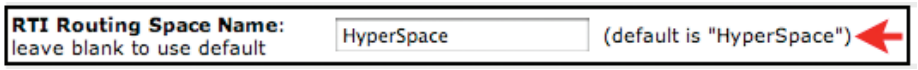
Strategy

Default = NG_Pro_MC02

Select the required DDM Strategy from the list:

NG_Pro_MC02 = NG Pro 4.0.X Millennium Challenge 2002

RTI Routing Space Name

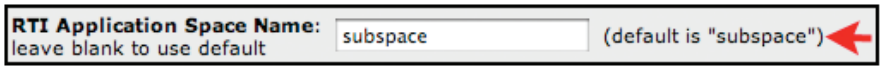


Default = HyperSpace

Valid Entry = <ASCII TEXT>

This setting defines the RunTime Infrastructure Routing Space. This setting MUST match the current RID file and FED files to function correctly. See the Sample RID and FED files later in this section.

RTI Application Space Name

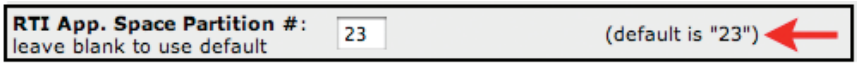


Default = subspace

Valid Entry = <ASCII TEXT>

This setting defines the first dimension within the RTI Routing Space. Specifically, it defines the application space name. As discussed in a later section, this is broken into 200 partitions, only one of which will be used for Radio Communications, see the partition number below. This setting MUST match the current RID file and FED files to function correctly. See the Sample RID and FED files later in this section.

RTI Application Space Partition



Default = 23

Valid Range = 0 - 199

This setting defines the application space partition number that the Telestra will use in conjunction with the RTI. This defines the particular partition number for use with radio communications. This setting must match the current RID file to function correctly. See the Sample RID files later in this section.

Bin Support

Default = Single

This setting defines the number of supported bins within the RDR file. Currently, the only available option is single. If you look at the RID file you will see that dimension 'one' has 25 associated bins. You will select one of those bins later in the configuration.

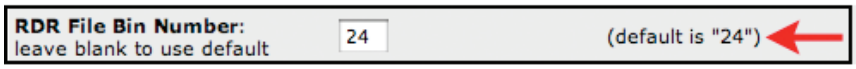
Frequency Dimension Name

Default = one

Valid Entry = <ASCII TEXT>

This setting defines the second dimension within the RTI Routing Space. Specifically, it defines a dimension of one. The definition of this dimension will vary depending on the particular subspace. For the Telestra, a dimension of one is mapping to the RF Spectrum. This setting MUST match the current RID file and FED files to function correctly. See the Sample RID and FED files later in this section.

RDR File Bin Number



Default = 24

Valid Range = 0-24

This setting defines the bin to use within the frequency dimension (i.e. 'one'). Currently, we only provide support for a single bin. This bin is fixed and currently defaults to 24; however, it is configurable in the range 0 - 24. This setting is not defined in the RID or FED files. To determine what bin to use, refer to the non-ASTi supplied RDR file.

Note: All the files that follow ARE NOT ASTi provided files. The files were obtained either through the RTI vendor and/or the HLA Federation POC. Below is a snapshot of the relevant DDM sections of the RID, FED, and RDR files. Consult the RID, FED or RDR documentation for details on these files.

Sample RID File for use with DDM

Note: Entire RID file IS NOT shown; only the relevant sub-sections are shown. Consult RTI Documentation for details.

```
(DataDistribution
  (StrategyToUse MC02)

(SpaceOptions
      (HyperSpace
       (DimensionOptions
         (subspace (NumPartitions 1))
         (one (NumPartitions 1))
         (two (NumPartitions 1))

(NumberOfSubspacePartitions 200

    (default 1)

        (0  (ap_space1              (dimension1   1)   (dimension2   1)))
……

        (23  (radio_space              (dimension1   25)   (dimension2   1)))
```


Sample FED File for use with DDM

Note: Entire FED file IS NOT shown; only relevant subsections are shown. Consult Federation Agreement Documentation for details.

```
(FED
(Federation Federation123)
(FEDversion v1.3)
 (spaces
 (space HyperSpace
    (dimension subspace)
    (dimension one)
    (dimension two)

(class CommunicationSystem
 (class RadioReceiver
     (attribute HostObjectIdentifier best_effort receive HyperSpace)
……

 (class RadioTransmitter
     (attribute AntennaPatternData best_effort receive HyperSpace)
     (attribute Encryption best_effort receive HyperSpace)
…….

(class RadioTransmission best_effort receive HyperSpace
     (parameter StreamTag)
……
```

Sample RDR File for use with DDM

Note: Entire RDR file IS NOT shown; only relevant sub-sections are shown. Consult RTI/ RDR Documentation for details.

RDR File

```
"RADIO_DIMENSIONS" {
   “partition”        ;; use the partitioned scheme
   (scale 1000000.0)   ;; all values below are Mhz
   (values
     ;; 26 values divide the range into 25 bins, numbered 0 through 24...

      0.0    ;;    0hz  >= bin0  <   15Mhz    ;; IWEG/DCE
……..
    6000.0    ;;    6Ghz  >= bin24 <    8Ghz    ;; ASTI Radio Communications
```


Chapter 11: Satellite Communications

ASTi's Telestra Satcom Server software, in combination with ASTi simulated radio objects, extends the simulated radio environment to include the effects of voice communications over satellite link. The Satcom server software is highly flexible with capabilities to support radio and communications models either running locally in the Telestra MBV environment or over the network on other networked Telestra platforms. Satellite communication effects include:

- End-to-end voice delays of up to 65 seconds for each link
- Support for up to 255 simultaneous links
- Able to serve satellite effects to multiple ASTi radio models working in multiple exercises
- Many satellite systems can be simultaneously modeled, each with realistic characteristic effects. Simulated modes include: 5 KHz Dedicated, 25 KHz Dedicated, 5 KHz DASA, 25 KHz DC DASA, 5 KHz DAMA, 25 KHz AC DAMA, 25 KHz DC DAMA
- Separate uplink and downlink frequencies are modeled, providing the ability to simulate half- or full-duplex communication channels.
- The Satcom Server supports existing ASTi radio simulation features, such as crypto effects.

Operation is straightforward:

- The Telestra Satcom Server communicates via DIS PDUs.
- The Satcom Server monitors the network for PDUs associated with satellite radio transmission. The Satcom Server only processes radio transmissions that fall within its configured range of uplink frequencies.
- The Satcom Server decodes ASTi satellite transmitter PDUs to determine their associated satellite mode (DAMA, DASA, etc.).
- The Satcom Server then delays the stream of voice packets by a time factor appropriate to the satellite mode and re-transmits the packets on a specified downlink frequency for reception by MBV satellite radios.
- Once configured, system operation is completely transparent to the user.

Telestra Satcom Server also features an integrated host computer interface, allowing satellite simulation parameters (delay time, uplink/downlink frequencies, etc.) to be varied in real-time by the simulation host computer.

Satcom Server Utilities in RMS

To access Satcom Server utilities via Telestra's RMS web-based interface, click the Radio>Satcom>Configuration option in the RMS menu. This menu option will only display information if the Satcom server software is installed on the Telestra platform.

Telestra's RMS interface provides a simple and intuitive web-based configuration utility for setting up the network and satellite simulation. Configuration options include:

- Satellite settings including number of Transponder Channels, uplink and downlink frequencies, and world positions.
- Satcom server settings including debug levels and delay times.
- Satcom network settings including DIS Network IDs and IP Network Addresses.

Users must save the Satcom Configuration to apply to the Satcom Server.

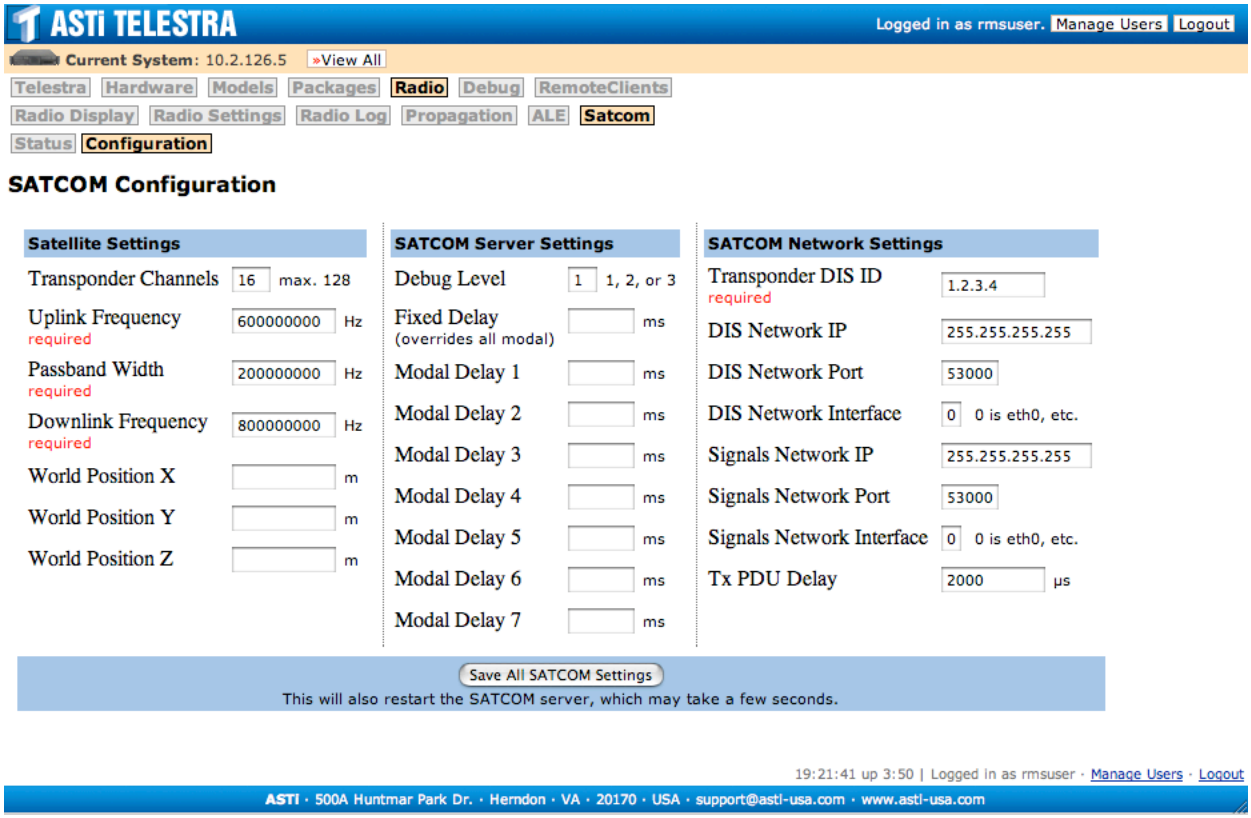


Figure 98: Radio Satcom Configuration

Satcom Status displays stats, PDU counters and settings. The environment and configuration file information such as DIS ID includes uplink frequency, passband width, downlink frequency, active transponder channels, fixed and modal delay, and Tx/Rx world position information. This information is monitored in real time allowing the user to see the configured settings and the current runtime settings.

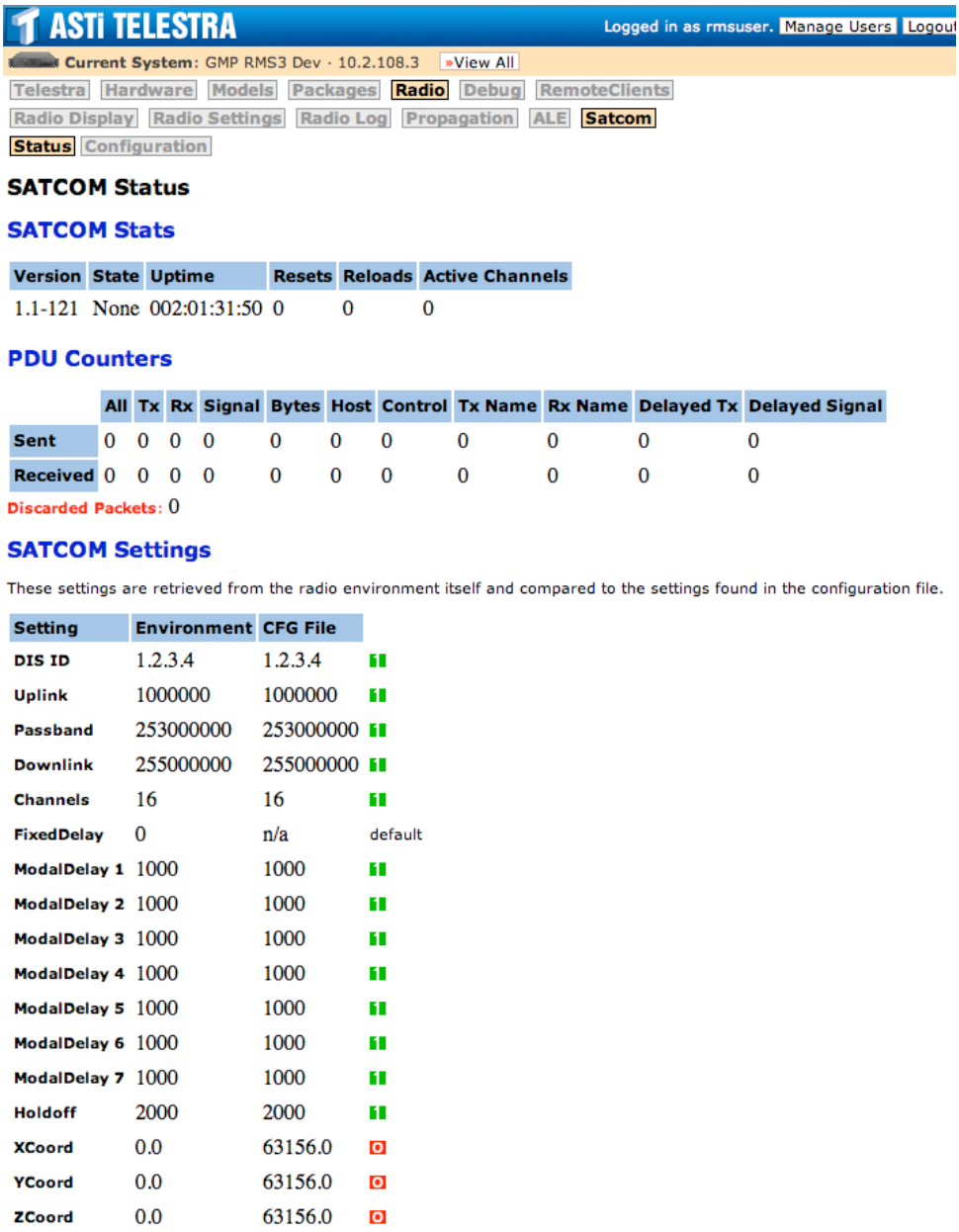


Figure 99: Radio Satcom Status

Theory of Operation

Functional system components include:

1. **Uplink Transmitter**– An ASTi simulated radio, configured to operate as a satellite transmitter.
2. **Satcom Server**– A Telestra uplink receiver, simulated satellite effects (voice delay), and downlink transmitter.
3. **Downlink Receiver**– An ASTi simulated radio, configured to operate as a satellite receiver.

Refer to the following functional flow diagram and accompanying description:

- Numbers reference the steps in the following description.
- Solid lines signify the voice communication route.
- Dashed lines signify the control and configuration routes.
- For clarity, only one end-to-end link is described. The Satcom Server can process up to 255 simultaneous links.

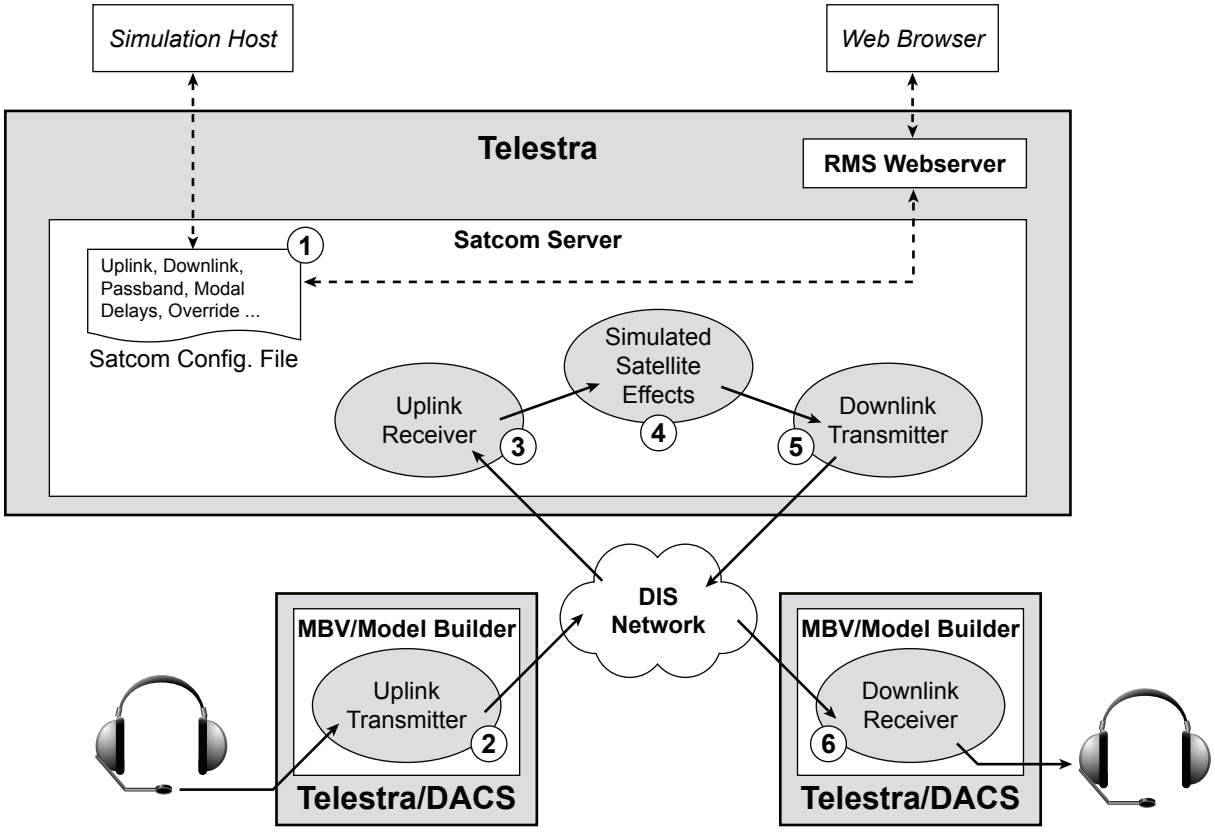


Figure 100: ASTi Simulated Satellite Communications System Functional Flow Diagram

Satcom Server Configuration

1. Each end-to-end satcom link is realized over a pair of unique uplink and downlink frequencies, through a single DIS port. The Telestra Satcom Server incorporates a **Configuration File** that is used to set the operating parameters that define the link, including:
   - DIS network address and port number, uplink frequency, downlink frequency, pass band width and a series of modal delays (time delay values associated with specific satellite modes).
   - There are two methods for changing configuration file settings:

     a. ASTi's RMS includes a Satcom Server configuration page that the user can access using a web browser.

     b. Telestra also includes a host Ethernet interface through which control parameters can be dynamically transported from a simulation host computer to the Satcom Server configuration file.
   - RMS provides monitor pages to show the user both the initial (default or user entered) and current (host driven) configuration settings.

Voice Communications via the Satcom Server

2. Voice communications originate from a simulated **Uplink Transmitter**, running on a DACS or Telestra platform.
   - An ASTi simulated radio object is configured to operate as an uplink transmitter in a specific simulated satellite mode (DAMA, DASA, dedicated, etc.)
   - The uplink transmitter is tuned to a transmit frequency that falls within the Satcom Server's uplink receiver passband range. Each satellite link must be tuned to a unique uplink frequency.
   - Microphone voice signals are routed to the uplink radio and controls are set to key the radio for transmission.
   - DIS transmitter and signal PDUs are transmitted onto the network, on a specific DIS port number.
   - Transmitter PDUs contain data fields identifying the uplink frequency and satellite mode.
3. The Satcom Server monitors the DIS network for transmitter and signal PDUs and accepts PDUs received on a specific port.
   - The **Uplink Receiver** then filters PDUs based on: satellite mode and frequency.
   - PDUs containing a valid satellite mode and in-band tuned frequency are processed.
4. The Satcom Server applies **Simulated Satellite Effects** to the processed voice stream, based on the identified satellite mode.
   - The stream of signal PDUs is buffered in system memory for the amount of time corresponding to the satellite mode (the modal delay set in the configuration file).

5. The Satcom Server automatically instantiates a **Downlink Transmitter**.
   - The transmitter's downlink frequency is set to a value calculated by the Satcom Server.

     a. The calculated value is based on: the tuned frequency of the originating uplink transmitter and the configured Satcom Server uplink and downlink frequencies.

     b. Note that the tuned frequency of the Satcom Server transmitter is unique to this link, because the unique uplink transmitter frequency is factored into its value.
   - Delayed signal PDUs are routed to the downlink transmitter.
   - Transmitter and signal PDUs are routed to the network on the specified DIS port.
6. The Telestra platforms monitor the specific DIS port for transmitter and signal PDUs from the Satcom Server.
   - The platform accepts PDUs received on a specific DIS port.
   - An ASTi simulated radio object is configured to operate as a **Downlink Receiver** in the specific simulated satellite mode.
   - The downlink receiver is tuned to a frequency that matches the Satcom Server's downlink transmission.
   - The stream of associated signal PDUs are received, decoded and routed to audio monitor points (speakers and headphones).

System Requirements & Configuration

Telestra

Telestra platforms with the Satcom Server must be running Telestra software version 3.28 or later.

DIS enabled Telestra with Satcom Server communications requires the following settings:

- IP Broadcast Address: the Telestra broadcast (or multicast address) must match one of the Satcom Server's DIS network IP addresses (configured via RMS).
- DIS Port Number: the DACS DIS port numbers (transmit and receive) must match the Satcom Server's DIS network port number (configured via RMS) for the corresponding DIS Network IP address.
- DIS: DIS must be enabled.

DACS

DACS systems for use with the Satcom Server must be running Model Builder software version 4.09a or later, and be configured to use RMS.

Standard RMS configuration commands are required in the "config.sys" and "default.cfg" files in order for the DACS to communicate with RMS.

Additionally, communication with the Satcom Server requires these "default.cfg" settings:

- IP Broadcast Address: the DACS broadcast (or multicast address) must match one of the Satcom Server's DIS network IP addresses (configured via RMS).
- DIS Port Number: the DACS DIS port numbers (transmit and receive) must match the Satcom Server's DIS network port number (configured via RMS) for the corresponding DIS Network IP address.
- DIS: DIS must be enabled.

Refer to the Model Builder Reference Manual for guidance on configuration file commands.

Default SATCOM Modes

Satcom Mode Description	Radio Mode[1]	Radio Tx PDU Mod'n Type[2] Major: Detail	Satcom Server Modal Delay #[3]	Satcom Server Default Delay[4] (ms)
5 KHz Dedicated (No Delay)	ST 5k	8:1	1	0
5 KHz DASA	ST DAS5	8:2	2	1000
5 KHz DAMA	ST DAM5	8:3	3	9000
25 KHz Dedicated (no Delay)	ST 25k	8:4	4	0
25 KHz DC DASA	ST DAS2	8:5	5	1000
25 KHz AC DAMA	ST AC25	8:6	6	3000
25 KHz DC DAMA	ST DC25	8:7	7	3000

Table 5: ASTi Satellite Simulation Modes Summary

[1] Network radio object, satellite radio modes. The modes are configured in the major modulation type field of the radio object.

[2] The major modulation and detail fields in the radio transmitter PDU describe the satellite mode.

[3] Each Satcom Server modal delay corresponds to a specific radio mode. For example: given this configuration, the Satcom Server will apply a 1000ms time delay to all PDUs it receives that have major:detail modulation fields of 8:5 (25 KHz DC DASA mode).

[4] Default values of the Satcom Server modal delay times are shown. These initial values can be changed using the RMS configuration utility. They can also be changed in realtime operation using the host interface.

Satellite Tx/Rx Example

Values are shown in MHz for clarity; Satcom settings should be in Hz. For the purposes of this example, assume the following settings:

- Uplink Frequency = 300.000 MHz
- Passband Width = 0.500 MHz
- Downlink Frequency = 200.000 MHz

Based on the Uplink Frequency and the Passband Width, the Satcom Server will accept transmissions from any DIS radio transmitting at any frequency between 300.000 and 300.500 MHz, inclusive.

The difference between the Tx radio's actual transmission frequency and the Satcom Uplink Frequency is then added to the Satcom Downlink Frequency when the signal is rebroadcast to the final receiver.

If a Tx radio transmits at 300.100 MHz:

1. The Tx Frequency falls between 300.000 and 300.500 MHz, so the satellite will accept the transmission.
2. The appropriate delay (modal or fixed-override) will be applied.
3. The difference between the Tx Frequency and the Uplink Frequency (0.100 MHz) is then added to the Downlink Frequency to obtain the actual retransmission frequency of 200.100 MHz.
4. The receiving radio, tuned to 200.100 MHz will then receive the satellite's rebroadcast.

Chapter 12: Procedural Warnings

General Guidelines

Making changes to the Telestra Configuration file may require network services and software to be restarted. The software restart may interrupt other processes currently running on Telestra. ASTi recommends against making any changes to the configuration that requires a software restart while these other processes are running.

Uploading Files

Installing your Options File via RMS requires you to upload the file to the RMS server.

Selecting files for upload from shared network volumes (over Samba, NFS or Windows' Network Neighborhood) may produce unexpected results. If RMS indicates that an error has occurred after uploading a file in this manner, try copying the file to your local PC from the remote system, and select the local copy for file upload.

Also, depending on the computer and web browser that you are using to access RMS, when you click on the "Choose File" button to upload a file, you may seemingly be unable to locate the desired file on your computer. This happens because the RMS system uses unique file extensions.

Telestra: Cold Start Versus Upgrade

A Telestra Cold Start is always preferable to an upgrade. An upgrade is much quicker and easier than a Telestra Cold Start; however, the downside is the added risk of potential issues. Although ASTi continues to minimize issues during software testing, we recommend you Cold Start when you have that option over upgrading.

Using Windows95/98/2000/ME/NT with either Netscape or Internet Explorer

In the dialog box that pops up after clicking the "Choose File" button, locate the pull-down menu labeled "Files of type". This may default to "HTML Files (*.htm,*.html)". Click on the pull-down menu, and select "All Files (*.*)". This will allow you to access every kind of file on your computer.

Using Linux systems (with KDE or Gnome) running Netscape

In the dialog box that pops up after clicking the "Choose File" button, locate the "Filter" section. If it has a wildcard (*) with a file extension (e.g., "/home/me/*.html") anywhere in that field, you should remove the "*.html" (or "*.whatever"). This will allow you to access every kind of file on your local file system. If you're running Mozilla, look for the "Files of type" menu, and make changes as described in the Windows section above.

Using MacOS with either Netscape or Internet Explorer

Users should be able to access any file on their system without making any changes to the pop-up dialog box.

Appendix A: Telestra Software Compatibility

Telestra Software Version	Hardware Platform	Min. RAM	ASTi Linux Kernel	Available Software Packages
	Δ†	1 GB*	2.4.30	1, 2, 3, 4, 5, 6
3.20-1#	Δ†	1 GB*	2.4.30	1, 2, 3, 4, 5
3.19-1#	Δ†	1 GB*	2.4.30	1, 2, 3, 4
3.18-1# through 3.16-1#	Δ	1 GB*	2.4.30	1, 2, 3, 4
3.15-1#	Δ	1 GB*	2.4.22	1, 2, 3, 4
3.14-1# through 3.11-1#	Δ	1 GB*	2.4.22	1, 2, 3
3.10-1# & 3.9-1#	Δ	1 GB	2.4.22	1, 2
3.8-1 through 3.0-2	Δ	1 GB	2.4.22	1, 2

* All systems supporting diskless, need 2 GB minimum.

† All systems with 945g chipset. Identified in system BIOS as NT94510J.86A.xxxx.xxxx.xxxx.xxxx

Δ All systems with 865g chipset. Identified in system BIOS as BF86510A.86A.xxxx.Pxx.

Ability to verify contents of Telestra Software CD

1 Model Builder Visual and Remote Management System 3

2 Network Time Protocol (NTP)

3 Automatic Link Establishment (ALE)

4 Diskless Operation

5 Supports CVSD

6 Supports Security Software Upgrade

Identifying your System

Depending on the system requirements there are various hard drive options installed in the Telestra. To identify your hard drive look for a part number on your system on the bottom of the carrier.

For Telestras with the **Parallel IDE** hard drive the part number on the bottom of the carrier is **DE75i-CA100/B**. The ASTi part number on top is **HD3-TL-A-R**. This part number will only appear on the drive if it is ordered as a spare drive, i.e. This label is not installed on full systems when they are initially shipped.

For Telestras with the **SATA (Serial ATA)** hard drive the part number on the bottom of the carrier is **S20J102**. The ASTi part number installed on the top of the carrier is **HD3-TL3-A-R**.

HLA RTIs Compatibility

ASTi's HLA software is compatible with applications and libraries created with either GCC version 3.0 or GCC 3.2 compiler, and supports a number of different RTIs, as listed below. The user should choose the proper RTI based on the requirements (and GCC compatibilities) of their operating system(s) or other HLA-related software.

Telestra 2.x Series Supported HLA RTIs

The following RTIs are supported in the Telestra 2.x series.

- DMSO 1.3NGv6†#
- MÄK 1.3.7†
- MÄK 2.0†
- MÄK 2.0.1†
- MÄK 2.02#
- MÄK 2.03#
- VTC NG-Pro 2.0.2†#
- MÄK 2.4 RH version 9.0, GCC 3.2.2 (note 1)
- MÄK 2.4.2 RH version 9.0, GCC 3.2.2 (note 1)

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

† These RTIs are available in versions compatible with the GCC 3.0.x compiler. More information is available on an individual basis from RTI vendors.

These RTIs are available in versions compatible with the GCC 3.2.x compiler. More information is available on an individual basis from RTI vendors.

Warning: The above RTIs were tested and certified under the Telestra 2.x series. Support for the Telestra 2.x series RTIs is available because the initial Telestra 3.x series HLA baseline code is based on the 2.x series. However, the 2.x series have not been tested specifically on the 3.x series therefore there is some risk associated with these RTIs. It should be noted, that no set of tests are able to verify all aspects of operation. RTI operation, RID file settings, network operation and conditions, simulation software, and use of HLA in a network environment form a set of complex variables which must be tested together in their target environment under operational conditions.

From experience, each HLA program has its own set of unique issues and problems dependent on the equipment, software and simulation deployed. Therefore ASTi cannot guarantee there is zero risk of any issues arising with the currently supported set to RTIs.

Note: All RTIs must be compatible with Linux Red Hat 8.0 or 9.0 and GCC 3.2.2 complier.

Note 1: Customer fielded and tested. ASTi has not performed any testing related to this RTI.

Telestra 3.x Series Supported HLA RTIs

Telestra Software Version	Supported RTIs
3.20-1	1, 2, 3

The following RTIs are supported in the Telestra 3.x series.

[1] DMSO 1.3NGv6 Red Hat 8.0 OS, gcc 3.2.2 complier

[2] VTC NG Pro 2.0.2 Red Hat 9.0 OS, gcc 3.2.2 complier

[3] VTC NG Pro 2.0.4 Red Hat 9.0 OS, gcc 3.2.2 complier

Warning: It should be noted, that no set of tests are able to verify all aspects of operation. RTI operation, RID file settings, network operation and conditions, simulation software, and use of HLA in a network environment form a set of complex variables which must be tested together in their target environment under operational conditions.

From experience, each HLA program has its own set of unique issues and problems dependent on the equipment, software and simulation deployed. Therefore ASTi cannot guarantee there is zero risk of any issues arising with the currently supported set of RTIs.

Appendix B: ALE Server ICD

Introduction

This appendix provides the specification for the software interface between the ALE Server and the host computer. The ALE Server is provided with certain configuration data, on a per Exercise basis, via an Ethernet packet. The host software provides the input data to the ALE Server in the format specified in this ICD.

Data is provided to the ALE Server via an Ethernet connection between the host computer and the ALE Server. This connection does not need to be dedicated but may be part of the Local Area Network infrastructure. Packets are standard IEEE 802.3 format using a UDP level protocol. The ALE Server is setup to receive host configuration packets on UDP Port # 34000 by default. To change this see Chapter 9 - ALE Server Utilities in RMS.

Typically, this interface would be used in the beginning of an exercise to initialize the ALE Server parameters. Once the parameters for a particular exercise have been set, they will remain constant until the host sends another packet to overwrite them. Note that the ALE Server stores data on a per exercise data, so that multiple simultaneous independent exercises can be run, with different parameter values. Note that two radios cannot have identical DIS IDs (host:site:entity:radioID) or callsigns across exercise numbers.

Before going into the specific packet type the user must understand the ALE Mode of a radio. When a radio registers with the ALE Server it must be assigned a mode. The mode identifies the radio state in terms of ALE status. There are 4 ALE modes:

Name	Mode	Description
NON_ALE	0	The Radio is not an ALE Radio.
SCANNING	1	The Radio is in scanning mode based on the frequency list provided.
XMIT	2	The Radio is currently transmitting and should not be considered to be available for an ALE call message.
REMOVE	3	Setting the mode of an ALE Radio to 3 will remove it from the ALE database. The Radio would then have to be re-initialed if it wished to come back into the ALE pool.

Table 5: ALE Modes

ALE Error codes are included in all ALE Server response messages. The error code number will give the end user an indication to what could be the problem. For ALE there are a total of 13 error codes. Radio A refers to the calling radio and radio B refers to the called radio. Below are all of the error codes and their meaning:

#	Error Type	What it Means?
0	No Error	Everything is fine.
1	No Frequency	The Radio you called did not register the frequency you are requesting with the ALE server. In other words you called a radio on a frequency that is not in its scan list.
2	No Path	The Radio you are calling has an LQA value of 0. This is most likely due to the fact that the ALE server has not received the world position information from the DIS network.
3	No ALE	The Radio you called is not an ALE Radio.
4	Not Scanning	The Radio you called is not in scanning mode. Most likely the Radio is transmitting.
5	Exercise Mismatch	The Radio you called is in a different exercise.
6	Incomplete	The message you sent the ALE Server was incomplete.
7	No Radio A Call	Radio A's callsign is not in the ALE database.
8	No Radio B Call	Radio B's callsign is not in the ALE database.
9	No Radio A ID	Radio A's ID (S:H:E:R) is not in the ALE database.
10	No Radio B ID	Radio B's ID (S:H:E:R) is not in the ALE database,
11	No Radio A Record	Radio A's ID is in the ALE database, however the database has no knowledge of the freq, scanlist, etc. Most likely caused by an incomplete message being sent to the ALE server.
12	No Radio B Record	Radio B's ID is in the ALE database, however the database has no knowledge of the freq, scanlist, etc. Most likely caused by an incomplete message being sent to the ALE server.
13	No Links	The count of radios that can be linked to the specified radio is 0.
14	No Net	The specified network is not found in the ALE database.
15	Not Net Member	The radio specified is not a member of specified network.
16	Server Busy	The ALE server received a duplicate request while the original request was being processed.
17	Invalid Call	Two callsigns are the same in the received type 7 message.

Table 6: ALE Error Codes

Input Control Data Types

In_Bool

Boolean parameter. Data word is a single bit wide only - no other bits are checked within a word. Specific bit location is specified in the Bit field in the table below.

In_Uint

Unsigned Integer parameter. Data word can be 1, 2 or 4 bytes wide, as specified by the Start and End fields in the table below. All data is in network-byte order.

In_Float

Floating point input. Data word is in IEEE floating point format and is 4 bytes wide.

In_Array

Input Array of unsigned bytes. 24 bytes wide.

Output Control Data Types

Out_Bool

Boolean parameter. Data word is a single bit wide only - no other bits are checked within a word. Specific bit location is specified in the Bit field in the table below.

Out_Uint

Unsigned Integer parameter. Data word can be 1 or 2 bytes wide, as specified by the Start and End fields in the table below. All data is in network-byte order.

Out_Float

Floating point input. Data word is in IEEE floating point format and is 4 bytes wide.

Out_Array

Output Array of unsigned bytes. 24 bytes wide.

ALE is implemented using UDP messages that are sent back and fourth between the host and ALE server. There are several message types. Each message type is assigned a unique number and is shown in the messages below. The message type determines the function of the message, i.e. ALE TX Init, Init/Set Scan, etc.

ALE packets can be categorized into three types:

- Initialization messages (Host to ALE Server)
- Query messages (Host to ALE Server)
- Response messages (ALE Server to Host)

Below the messages are broken up into Host-to-ALE Server and ALE Server-to-Host. Note that Type 0 and 3 messages were omitted on purpose as they are used by ASTi only for internal testing.

Host to ALE Server Messages
Initialize/Set Scan List Message (Type=1)

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_Type	In_Uint	Message type index, set to 1 for frequency/initialization messages.	4	7		
DIS_site_id	In_Uint	Radio DIS Site ID	8	9		
DIS_host_id	In_Uint	Radio DIS Host ID	10	11		
DIS_entity_id	In_Uint	Radio DIS Entity ID	12	13		
DIS_radio_id	In_Uint	DIS Radio ID	14	15		
Exercise_id	In_Uint	DIS Exercise ID	16	19		
Radio_mode	In_Uint	Radio mode, 0=non-ALE, 1=ALE scanning, 2=ALE transmit	20	23		
Scan_freq_count	In_Uint	Number of scan frequencies to set	24	27		
Scan_freq[0]	In_Uint	First scan frequency in scan list, in Hz	28	31		
Scan_freq[1]	In_Uint	Second scan frequency in scan list, in Hz	32	35		
...	In_Uint	...	...	...		
Scan_freq [scan_freq_count-1]	In_Uint	Last scan frequency in scan list, in Hz	...	...		

Table 7: ALE Server ICD: Initialize/Set Scan List

ALE TX Initiate (ALL CALL) Message (Type=2)

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 2 for an ALE Tx initiate message	4	7		
DIS_site_id	In_Uint	Radio DIS Site ID	8	9		
DIS_host_id	In_Uint	Radio DIS Host ID	10	11		
DIS_entity_id	In_Uint	Radio DIS Entity ID	12	13		
DIS_radio_id	In_Uint	DIS Radio ID	14	15		
Exercise_id	In_Uint	DIS Exercise ID	16	19		
Transmit_freq	In_Uint	Call frequency, in Hz	20	23		

Table 8: ALE Server ICD: ALE Tx Initiate (ALL CALL)

ALE Server Sync Message (Type=5)

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 5 for a server sync message	4	7		
Sync_Type	In_Uint	Must be set to zero	8	15		
Future Use	In_Uint	Future Use	16	19		
Sync_flag	In_Uint	Turn On/Off sync	20	20		
Count	In_Uint	Number of servers	21	21		
Pad	In_Uint	Byte alignment	22	23		
Server_ip(1)	In_Uint	First server IP addresses	24	27		
Server_jp(2)	In_Uint	Second Server IP Address	28	31		
Server_jp(N)	In_Uint	Nth Server IP Address				

Table 9: ALE Server ICD: ALE Server Sync Message

CAUTION: The Type 5 message length must be exact with regards to the server count configured. For example:

5. If the count field is 1 the Data Message Length will be exactly 28 bytes long.
6. If the count field is 3 the Data Message Length will be exactly 36 bytes long.

ALE Radio Tactical ID Setup Message (Type=6)

Allows you to associate up to 32 callsigns per radio. This message is only required when you are trying to implement the callsign feature of ALE. A unique packet is required for each radio you wish to give a callsign(s). Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 6 for ALE tactical ID Setup message	4	7		
Exercise_id	In_Uint	DIS Exercise ID	8	11		
DIS_site_id	In_Uint	Radio DIS Site ID	12	13		
DIS_host_id	In_Uint	Radio DIS Host ID	14	15		
DIS_entity_id	In_Uint	Radio DIS Entity ID	16	17		
DIS_radio_id	In_Uint	DIS Radio ID	18	19		
Callsign_count	In_Uint	Number of CallSigns for radio	20	23		
ALE_callsign[0]	In_Array	1st Radio callsign	24	47		
ALE_callsign[1]	In_Array	2nd Radio callsign	48	71		
...	In_Array	...	...	...		
ALE_callsign[31]	In_Array	32nd Radio callsign	...	...		

Table 10: ALE Server ICD: ALE Radio Tactical ID Message

ALE TX Initiate (Callsign) Message (Type=7)

Allows you to call a radio based on callsign. Dependant on a type 6 message. Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 7 for ALE radio call message using callsign	4	7		
Exercise_id	In_Uint	DIS Exercise ID	8	11		
ALE_Callsign_TX	In_Array	Radio A (Calling Radio) callsign	12	35		
ALE_Callsign_RX	In_Array	Radio B (Called Radio) callsign	36	59		

Table 11: ALE Server ICD: ALE TX Initiate Message

ALE Mode Change Message (Type=8)

Allows you to change the ALE mode of a radio. Radio must already be configured in ALE database via Initialize/Set message (Type=1). Note the packet structure is the same as a type 1 message, except the packet is only 24 bytes long. Also you can use an ALE Radio mode of 3 to remove a radio for the ALE database, Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 8 for ALE mode change message	4	7		
DIS_site_id	In_Uint	Radio DIS Site ID	8	9		
DIS_host_id	In_Uint	Radio DIS Host ID	10	11		
DIS_entity_id	In_Uint	Radio DIS Entity ID	12	13		
DIS_radio_id	In_Uint	DIS Radio ID	14	15		
Exercise_id	In_Uint	DIS Exercise ID	16	19		
Radio_mode	In_Uint	Radio Mode, 0=non-ALE, 1=ALE-scanning, 2=ALE-transmit, 3=Remove	20	23		

Table 12: ALE Server ICD: ALE Mode Change Message

ALE Net ID Setup Message (Type=10)

Allows you to associate up to 32 callsigns (radios) to a net ID group. This message is only required when you are trying to implement the net call feature of ALE. To implement the Net Call feature you must have first setup the radio callsigns. Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 10 for ALE Net Setup message	4	7		
Exercise_id	In_Uint	DIS Exercise ID	8	11		
Net_Group_Name	In_Array	Name of the Net ID, i.e. The name you want to give to the Net ID you are associating with the group of radios that follow.	12	35		
Net_count	In_Uint	Number of Radios in the net group	36	39		
ALE_callsign[0]	In_Array	1st Radio callsign	40	63		
ALE_callsign[1]	In_Array	2nd Radio callsign	64	87		
....	In_Array	...	...	...		
ALE_callsign[31]	In_Array	32nd Radio callsign	...	...		

Table 13: ALE Server ICD: ALE Net ID Setup Message

ALE Net Call TX Initiate Message (Type=11)

Allows you to call a group of radios based on Net ID of the group. Dependant on a type 10 message. Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 11 for ALE net call TX Initiate	4	7		
Exercise_id	In_Uint	DIS Exercise ID	8	11		
ALE_Callsign_TX	In_Array	Radio A (Calling Radio) callsign	12	35		
ALE_Net_ID	In_Array	Net ID of the group you wish to call. Radio A must be associated with this group	36	59		

Table 14: ALE Server ICD: Net Call TX Initiate Message

ALE Reset Message (Type=13)

The ALE Reset Message allows you to reset various flags in the ALE Server. For most systems this is not required, however the functionality is there if such a requirement arises.

The DB flag, if non-zero, will cause the server to flush its database of ALE radio information. This is useful in testing so that you know that you're starting with an empty database prior to sending all the usual initialization data. This can also be useful any time you want to reset the server and start over.

The IP flag, if non-zero, will cause the server to flush its synchronization data, i.e. The IP addresses of other servers.

The SNR flag, if non-zero, allows the BASE and MAX values used for the scaling calculation to be changed. The ALE server scales all propagation calculation SNR results to a number from 0-255. The lowest and highest acceptable SNR values are the BASE and MAX SNR dBm values respectively. By default, acceptable SNR is -15 to +25. SNR values that fall below the BASE are interpreted as 0. SNR values that are above the MAX are interpreted as 255.

The RX flag, if non-zero, allows the noise and bandwidth values of the standard receiver to be changed. The ALE server uses a standard receiver to compute all SNR values. This receiver has a default internal noise value of -100 dBm and a default bandwidth of 25 kHz. The RX flag, if non-zero, allows the noise and bandwidth values of the standard receiver to be changed.

Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_type	In_Uint	Message type index, set to 13 for ALE Reset message	4	7		
Reset_DB_flag	In_Boot	Reset Database Flag	8	8		
Reset_IP_flag	In_Boot	Reset IP Flag	9	9		
Reset_SNR_flag	In_Boot	Reset SNR Flag	10	10		
Reset_RX_flag	In_Boot	Reset RX Flag	11	11		
Base_SNR	In_float	Base SNR	12	15		
Max_SNR	In_float	Max SNR	16	19		
Rx_Noise	In_float	RX Noise	20	23		
Rx_Bandwidth	In_float	Rx Bandwidth	24	27		

Table 15: ALE Server ICD: ALE Reset Message

ALE Server to Host Messages
ALE TX Response Message (Type=4, from ALE Server to Host)

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_Type	Out_Uint	Message type index, set to 4 for an ALE Tx response message.	4	7		
DIS_site_id	Out_Uint	Calling Radio DIS Site ID	8	9		
DIS_host_id	Out_Uint	Calling Radio DIS Host ID	10	11		
DIS_entity_id	Out_Uint	Calling Radio DIS Entity ID	12	13		
DIS_radio_id	Out_Uint	Calling DIS Radio ID	14	15		
Exercise_id	Out_Uint	Calling Exercise ID	16	19		
Transmit_freq	Out_Uint	Call frequency, in Hz	20	23		
ALE_ErrorCode	Out_Uint	ALE Error Code (see error code list for details)	24	27		
Count_call	Out_Uint	Total number of Valid Radios Responding to call	28	31		
DIS_site_id[0]	Out_Uint	1st Responding Radio DIS Site ID	32	33		
DIS_host_id[0]	Out_Uint	1st Responding Radio DIS Host ID	34	35		
DIS_entity_id[0]	Out_Uint	1st Responding Radio DIS Entity ID	36	37		
DIS_radio_id	Out_Uint	1st Responding DIS Radio ID	38	39		
LQA[0]	Out_Uint	LQA for 1st Responding Radio	40	40		
Pad	Out_Uint	Byte alignment	41	43		
DIS_site_id[1]	Out_Uint	2nd Responding Radio DIS Site ID	44	45		
DIS_host_id[1]	Out_Uint	2nd Responding Radio DIS Host ID	46	47		
DIS_entity_id[1]	Out_Uint	2nd Responding Radio DIS Entity ID	48	49		
DIS_radio_id[1]	Out_Uint	2nd Responding DIS Radio ID	50	51		
LQA[1]	Out_Uint	LQA for 2nd Responding Radio	52	52		
Pad	Out_Uint	Byte Alignment	53	55		
...	Out_Uint	...	...	...		
DIS_site_id [count_call-1]	Out_Uint	Last Responding Radio DIS Site ID	...	...		
DIS_host_id [count_call-1]	Out_Uint	Last Responding Radio DIS Host ID	...	...		
DIS_entity_id [count_call-1]	Out_Uint	Last Responding Radio DIS Entity ID	...	...		
DIS_radio_id [count_call-1]	Out_Uint	Last Responding DIS Radio ID	...	...		
LQA [count_call-1]	Out_Uint	LQA for Last Responding Radio	...	...		

Table 16: ALE Server ICD: ALE TX Response

ALE TX Radio Callsign Response Message (Type 9)

In a response message sent from the ALE Server to the host in response to a type 7 message from the host. Message responds with the callsign of the 2 radios in questions along with the S:H:E:R IDs. The best LQA value is returned along with the corresponding frequency. Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_Type	Out_Uint	Message type index, set to 9 for an ALE TX Radio Callsign response message.	4	7		
Exercise_id	Out_Uint	Calling Exercise ID	8	11		
ALE_Callsign_TX	Out_Array	Calling Radio (Radio A) callsign	12	35		
ALE_Callsign_RX	Out_Array	Calling Radio (Radio B) callsign	36	59		
ALE_ErrorCode	Out_Uint	ALE Error Code (see error code list for details)	60	63		
DIS_site_id_A	Out_Uint	Calling Radio DIS Site ID	64	65		
DIS_host_id_A	Out_Uint	Calling Radio DIS Host ID	66	67		
DIS_entity_id_A	Out_Uint	Calling Radio DIS Entity ID	68	69		
DIS_radio_id_A	Out_Uint	Calling DIS Radio ID	70	71		
DIS_site_id_B	Out_Uint	Called Radio DIS Site ID	72	73		
DIS_host_id_B	Out_Uint	Called Radio DIS Host ID	74	75		
DIS_entity_id_B	Out_Uint	Called Radio DIS Entity ID	76	77		
DIS_radio_id_B	Out_Uint	Called DIS Radio ID	78	79		
Frequency	Out_Uint	Frequency for corresponding LQA	80	83		
LQA[	Out_Uint	LQA for Radio Link	84	84		

Table 17: ALE Server ICD: ALE TX Callsign Response Message

ALE Net Call Response Message (Type 12)

Is a response message sent from the ALE Server to the host in response to a type 11 message from the host. Message responds with the callsign of all the radios in the net group along with the S:H:E:R IDs. The LQA values are returned along with the corresponding frequency. If multiple frequencies are available on each radio then the frequency that yields the best LQA is returned. Packet structure is as follows:

For all messages, bytes 0 through 3 should be set to zero.

Variable	Type	Description	Start	End	Bit	Default
Message_Type	Out_Uint	Message type index, set to 12 for an ALE Net Call response message.	4	7		
Exercise_id	Out_Uint	Calling Exercise ID	8	11		
ALE_Callsign_TX	Out_Array	Calling Radio (Radio A) callsign	12	35		
ALE_Net_ID	Out_Array	Calling Net ID Group	36	59		
ALE_ErrorCode	Out_Uint	ALE Error Code (see error code list for details)	60	63		
Transmit_freq	Out_Uint	Best Frequency common to Radio A and the group, in Hz	64	67		
DIS_site_id_A	Out_Uint	Calling Radio DIS Site ID (radio A)	68	69		
DIS_host_id_A	Out_Uint	Calling Radio DIS Host ID (radio A)	70	71		
DIS_entity_id_A	Out_Uint	Calling Radio DIS Entity ID (radio A)	72	73		
DIS_radio_id_A	Out_Uint	Calling DIS Radio ID (radio A)	74	75		
Count_Call	Out_Uint	Total number of Valid Radios Responding to call	76	79		
DIS_site_id_B	Out_Uint	Called Radio DIS Site ID	80	81		
DIS_host_id_B	Out_Uint	Called Radio DIS Host ID	82	83		
DIS_entity_id_B	Out_Uint	Called Radio DIS Entity ID	84	85		
DIS_radio_id_B	Out_Uint	Called DIS Radio ID	86	87		
ALE_Callsign_B	Out_Array	Called Radio (Radio B) callsign	88	111		
LQA[	Out_Uint	LQA for Radio A-B Link	112	112		
Pad	Out_Uint	Byte Alignment	113	115		
DIS_site_id_C	Out_Uint	Called Radio DIS Site ID	116	117		
.....	.....	Up to 32 Net IDs				

Table 18: ALE Server ICD: ALE Net Call Response Image

Appendix C: HF Server ICD

This appendix provides the specification for the software interface between the HF Server and the simulation host computer. The HF Server is provided with certain configuration data, on a per-exercise basis, via an Ethernet packet. The host software provides the input data to the HF Server in the format specified in this ICD.

Data is provided to the HF Server via an Ethernet connection between the host computer and the HF Server. This connection need not be dedicated, but may be part of the Local Area Network infrastructure. Packets are standard IEEE 802.3 format using a UDP-level protocol. The HF Server is set up to receive host configuration packets on UDP Port # 33000 by default.

Typically, this interface would be used in the beginning of an exercise to initialize the HF Server parameters. Once the parameters for a particular exercise have been set, they will remain constant until the host sends another packet to overwrite them. Note that the HF Server stores exercise-specific data. Multiple, independent exercises can run simultaneously using the same HF Server.

Input Control Data Types

In_Bool

Boolean parameter. Data word is a single bit wide only - no other bits are checked within a word. Specific bit location is specified in the Bit field in Table 18.

In_Uint

Unsigned Integer parameter. Data word can be of variable length, as specified by the Start and End fields in Table 18. All data is in network-byte order.

In_Float

Floating point input. Data word is in IEEE floating point format and is 4 bytes wide.

Variable	Type	Description	Port #	Start	End	Bit	Default
Set_SSN_flag	In_Boot	True to set current value of Smoothed Sunspot Number	33000	11	11	0	
Set_OFFS_flag	In_Boot	True to set current value of OFFSET*	33000	11	11	1	
Exercise ID	In_Uint	Exercise ID to set parameters (1 to 255)	33000	15	15		
SSN	In_Uint	Current value of Smoothed Sunspot Number (0-250 typically)	33000	16	17		100
OFFSET	In_Float	Current value of OFFSET* (in hours)	33000	18	21		0.0

Table 19: HF Server ICD

* OFFSET is the time difference, in hours, between the clock on the HF Server (system time in GMT) and simulation time, expressed in GMT. This can be a negative number.

Note: HF ICD Messages must be exactly 21 bytes long.

Appendix D: Satellite Communications Server ICD

This document provides the specification for the software interface between the Satcom Server and the host computer. The Satcom Server is provided with certain configuration data via an Ethernet packet. The host software provides the input data to the Satcom Server in the format specified in this ICD.

Data are provided to the Satcom Server via an Ethernet connection between the host computer and the Satcom Server. This connection need not be dedicated but may be part of the Local Area Network infrastructure. Packets are standard IEEE 802.3 format using a UDP level protocol.

The Satcom Server is setup to receive host configuration packets on UDP Port 32000.

Typically, this interface would be used in the beginning of an exercise to initialize the Satcom Server parameters. Once the parameters for a particular exercise have been set, they will remain constant until the host sends another packet to overwrite them.

Input Control Data Types

In_Bool. Boolean parameter. Data word is a single bit wide only – no other bits are checked within a word. Specific bit location is specified in the Bit field in the table.

In_Uint. Unsigned Integer parameter. Data word can be of variable length, as specified by the Start and End fields in the table. All data is in network-byte order.

Variable	Type	Description	Port #	Start	End	Bit	Default
host_packet_flag	In_Bool	True to indicate packet originates from simulation host computer	32000	16	16	0	
ulink_freq	In_Uint64	Uplink frequency, in Hz	32000	20	27		
dlink_freq	In_Uint64	Downlink frequency, in Hz	32000	28	35		
passband	In_Uint64	Transponder passband width, in Hz	32000	36	43		
holdoff	In_Uint32	Delay in sending Tx PDUs, in μsec.	32000	44	47		
delay_mode_1	In_Uint32	Radio Mode 1 delay, in msec.	32000	48	51		0
delay_mode_2	In_Uint32	Radio Mode 2 delay, in msec.	32000	52	55		1000
delay_mode_3	In_Uint32	Radio Mode 3 delay, in msec.	32000	56	59		9000
delay_mode_4	In_Uint32	Radio Mode 4 delay, in msec.	32000	60	63		0
delay_mode_5	In_Uint32	Radio Mode 5 delay, in msec.	32000	64	67		1000
delay_mode_6	In_Uint32	Radio Mode 6 delay, in msec.	32000	68	71		3000
delay_mode_7	In_Uint32	Radio Mode 7 delay, in msec.	32000	72	75		3000
fixed_delay	In_Uint32	Override delay, in msec (non-zero overrides all model delays)	32000	76	79		

Appendix E: Old Release Notes

(04/03/08) Telestra Software Version 3.36-1

- Removed "View All" and reorganized RemoteClient page in RMS due to removal of auto-discovery daemon.
- HLA updates including HLA RTI file upload issue.

(11/19/07) Telestra Software Version 3.34-1 & 3.35-1

- Fixed two issues with diskless systems.
- Security change to prevent root login via X on Secure Telestra.
- Fixed MBV scope “winking out” bug.
- Fixed “packet too small” errors; small packets are now accepted and padded with zeroes instead of being dropped.
- Fixed ip-tables firewall support.
- Fixed byteswapping of HaveQuick SyncTimeOffset.

(8/3/07) Telestra Software Version 3.34-1

- Added configuration item for HLA Timestamp format.
- Fixed RMS bug when deleting system user with no model loaded.

(7/3/07) Telestra Software Version 3.32-1 & 3.33-1

- Supports the Advantech mainboard referred to by the ASTi part number “TL.”
- Improved reliability of the Radio Environment using the Pathloss interface.
- HLA updates for FACTT tool.
- Added RPR_2.0 audio support.
- Updated the kernel to present ethernet ports in the same order as older kernels.

(5/1/07) Telestra Software Version 3.31-1

- Update to the Telestra RMS System Configuration Backup to prevent the possibility of setting different lockout values on the same system. Several minor RMS fixes and improvements.
- New RecordGroup and ReplayGroup components. Also support for loop mode.
- Fix HLA object registration and audio glitch.
- Added CCTT system type for Comm Builder support.
- Component updates for E-2 HLA program. Pseudo-radio (E-2) status display is now available in RMS and radiomon.

(3/21/07) Telestra Software Version 3.29-2

This update is a branch release from 3.29-1 with a new radio environment to mainly fix an audio glitch.

(2/16/06) Telestra Software Version 3.30-1

Updates

- Modified kernel and RT framework to support either1msec or 2msec realtime tick rate. The 2msec rate requires a reduced audio sample rate of 16KHz.
- Component updates (new E2C_H_tap, Keyer now controllable by VORTAC, filter in simple_rx now enabled by default, local/bus audio mix capability added to tx).
- DDM support for HLA
- Security updates

(1/16/07) Telestra Software Version 3.29-1

Enhancements

- Added a new RMS Pathloss Configuration page.

(12/20/06) Telestra Software Version 3.28-1

Enhancements

- New hardware-status command (XML-RPC and ‘telestra’ script).
- New Audio/Resequencer component, allows control of a sequence of up to 255 playfiles.
- New default channel handle “<NONE>” for channel 0 (disabled) which allows easy unassignment of channel handles.
- Add X Window System reconfig button to “Welcome” screen.
- Improved error handling while upgrading system software.

Updates

- Improved Satcom server configuration in RMS and status reporting bug.
- Minor fix to NTP client configuration in RMS.
- Fixed RT trap in async_router caused by unassigned host out packet.
- HLA gateway server fixes.
- Improved receiver state change logic in radio environment.
- Updated pathloss factor defaults and pathloss request generation.

(10/30/06) Telestra Software Version 3.27-1

Enhancements

- Added new sidetone_selector input for ComSing and ComQuad and added sidetone lockout during crypto tones for radios.
- Audio/Sequencer now supports up to 255 playsounds.
- Better handling of Iris DOs during init, model reload, and system shutdown/reboot. This allows DOs to drive an enable on output amps.
- Improved reliability for CD booting (cold-start and diskless).
- Modularized non-exportable (SSL) security enhancements for International software release.
- Added configurable logfile viewing.

Updates

- Major RMS security update: now using apache+ssl, all-new user system.
- Fix “rotor blowup” and other IIR filter positive feedback issues, used in the following components:
  - Audio: E2CFilter, Filter, NoiseFilter, RunwayBump, Vox, Vox_AB
  - Engine: Engine, Engine2, EngineLevelD, SimpleRotor, Rotor
  - Radio: ARC-210, Generic, Link16, Receiver, Standard
- DIS timestamp format fix.
- Fix diskless Telestra kernel for 945-based hardware support.
- HLA gateway updates.

Upgrade Issues

If you upgrade from Telestra Software release 3.26-4 or older:

You must cold-start. The RMS's underlying framework has been completely changed starting with 3.27-1, making a smooth upgrade practically impossible. Make sure you backup all configuration and models to a different machine prior to cold-starting. If you are upgrading a diskless server, you may need to perform some additional manual backup procedures (see Application Note #67 on ASTi's web site www.asti-usa.com/support/appnotes).

(10/20/06) Telestra Software Version 3.26-4

Component updates include:

- Filter stability enhancements
- New sidetone_selector input for ComSing and ComQuad
- Add sidetone lockout during crypto tones for radios

Other enhancements include:

- Improved handling of Iris DOs during init, model reload, and system shutdown/reboot. This allows DOs to drive an enable on output amps.
- Improved reliability for CD booting (cold-start and diskless).

(9/27/06) Telestra Software Version 3.26-3

The only difference is an update to the diskless kernel, this allows the user (via RMS) to change a model's hardware mapping on the diskless Telestra.

(9/13/06) Telestra Software Version 3.26-2

This release is a components update to 3.26-1, but there were several components updated.

Changes to the filter2, iir2, and rotor primitives which are used in the following components:

- Audio: E2CFilter, Filter, NoiseFilter, RunwayBump, Vox, Vox_AB
- Engine: Engine, Engine2, EngineLevelD, SimpleRotor, Rotor
- Radio: ARC-210, Generic, Link16, Receiver, Standard.

The Audio/Sequencer now supports up to 255 playsounds.

(8/31/06) Telestra Software Version 3.26-1

- Fix NetIntercom component (broken in 3.24-1)
- Enhanced ARC-210, Generic, and Receiver radios by adding new inputs for host control of TransmitterEnable, VoiceLockout, PropagationControl
- New component: Audio/AutoDRED
- Radio Environment updates for Link16, radio registration updates

(8/15/06) Telestra Software Version 3.25-1

- Fix missing dependency for ICD Tool

(8/14/06) Telestra Software Version 3.24-1

- Fixes to EngineLevelD component
- Commplan updates to Radio Environment
- Audio stability tuning to Radio Environment
- HLA enhancements

(6/5/06) Telestra Software Version 3.23-1

- Comm Builder support (updates to radio environment and “Standard” radio component).
- **XML-RPC: separation of public vs. private methods**. The public methods will be supported, whereas ASTi does not promise backwards compatibility in future releases for the private methods 'telestra' script updates to match the new XMLRPC commands.
- Fix to radio environment (various issues when using large number of radios on same frequency). This bug was introduced in 3.21-1.

(05/08/06) Telestra Software Version 3.22-1

Enhancement/Features

- HLA support in RMS
- Radio Environment
- Component updates including components for Commplan
  - New components: Engine/EngineLevelD, Control/StereoPan3D, Radio/Standard (for Commplan support), Audio/WavePulseMod (supersedes WaveModulated).
- Components have been segregated into three separate packages: base, us-only, and E-2.
- Ethereal can now be launched from the Development Mode desktop toolbar.
- Added ability to set data values on Host Inputs via RMS Debug pages.
- Removed potential deadlock from RMS message handler for Radio pages.

Upgrading Issues for 3.22-1

From 3.21-1 or older

The X desktop toolbar has been updated, but existing users' desktops don't automatically get updated (so that user customizations aren't lost). To manually update a user's desktop, that user needs to be logged out of X. Login as that user on the console (e.g. Ctrl-Alt-F2), then type 'build-mbv-desktop --force'. This needs to be repeated for each existing user.

3.14-1 or older

A second upgrade is required to clean off the older (2.4.22-asti) kernel. Just do another RMS upgrade with the same CD after rebooting from the first upgrade. (This is not required for 3.11-1, since the post-upgrade.sh script is manually executed.)

3.11-1 only

The upgrade (via RMS) always fails and displays an error message. The work-around is a manual upgrade: (as 'root')

```
mv /etc/apt/sources.list /etc/apt/sources.list.old
apt-cdrom add
apt-get update
apt-get dist-upgrade --assume-yes
  answer "n" to "Do you want to quit now?"
mount /cdrom
/cdrom/post-upgrade.sh
eject
reboot
```

3.11-1 or older

The xfce4-iconbox package is no longer included, but the upgrade process does not remove already-installed packages. To manually remove this package [which creates the extraneous icon-box that “grows” across the lower-right part of the desktop], type (as root) 'apt-get remove xcfe4-iconbox'.

3.10-1 or older

Any models in rmsuser's account will become “invisible” to the RMS after this upgrade. You need to backup any models under rmsuser *before* upgrading and then restore them to a new/different user.

3.5-1 or 3.4-1

Telestra upgrade process (via RMS) appears to hang, although upgrade does complete.

2.X Series Telestra

There is no upgrade from 2.X Telestra, but a cold-start over an existing 2-series Telestra causes a warning message. Selecting “Ignore” resumes the cold-start, which completes successfully.

(02/27/06) Telestra Software Version 3.21-1

Enhancement/Features

- Link 16 updates
- CVSD enhancements regarding packet sizes for audio quality
- Fixed the radio environment’s dependency on the ***eth0*** connection.

(01/19/06) Telestra Software Version 3.20-1

The purpose of this release was to add CVSD codec support for DIS radios.

Enhancements/Features

- Enhancements to the radio environment
- Enhancements to RMS including the ability to set CVSD in DIS settings

(11/23/05) Telestra 3.19-1

Features/Enhancements

- Added support for new 945-based mainboard hardware
- Replaced kgdb kernel debugger with a more reliable less intrusive kdb
- Added HLA pages in RMS
- Enhanced radio settings and radio receive audio

Upgrade Issues to 3.19-1

Upgrading From 3.14-1 or Older- A second upgrade is required to clean off the older kernel. Complete a second RMS upgrade with the same CD after rebooting from the first upgrade. (This is not required for 3.11-1.)

Upgrading From 3.11-1 Only- The upgrade via RMS always fails and displays an error message. The work-around is a manual upgrade: (as ‘root’)

```
mv/etc/apt/sources.list/etc/apt/sources.list.old
apt-cdrom add
apt-get update
apt-get dist-upgrade --assume-yes
answer ‘n’ to ‘Do you want to quit now?’
mount/cdrom
/cdrom/post-upgrade.sh
eject and reboot
```

Upgrading From 3.11-1 or Older- The xfce4-iconbox package is no longer included, but the upgrade process does not remove already-installed packages. To manually remove this package (which creates the extraneous iconbox that “grows” across the lower-right part of the desktop), type (as root) ‘apt-get remove xcfe4-iconbox.’

The X desktop toolbar has been cleaned up, but existing users’ desktops don’t automatically get updated (so that user customizations don’t get lost). To manually update a user’s desktop, that user needs to be logged out of X. Login as that user on the console (e.g. Ctrl-Alt-F2), then type ‘build-mbv-desktop --force.’ This needs to be repeated for each existing user.

Upgrading From 3.10-1 or Older- Any models in rmsuser’s account will become “invisible” to the RMS after this upgrade. **Users need to backup any models under rmsuser before upgrading and then restore them to a new/different user.**

Upgrading From 3.5-1 or 3.4-1- Telestra upgrade process (via RMS) appears to hang, although upgrade does complete.

Upgrading From 2.X Series Telestra- There is not an upgrade from 2.X Telestra, but a cold-start over an existing 2-series Telestra causes a warning message. Selecting “Ignore” resumes the cold-start, which completes successfully.

(10/26/05) Telestra Software version 3.18-1

Features/Enhancements

- Several minor RMS enhancements
- The units for Host Interface “periodicity” have been changed to “ticks” (1 tick = 10msec).
- Many enhancements to the Radio Environment for HLA, plus a fix for multicast/IGMP.
- Updated radio components for improved processing efficiency

09/19/05 Telestra Software version 3.17-1

Features/Enhancements

- Improved the radio environment startup/shutdown stability along with several HLA feature enhancements.
- Fixed 3.16-1 where the entire radio environment is disabled unless the ALE option is enabled.
- Fixed RMS debug pages for setting 64-bit values.
- Fixed realtime trap in Development Mode when restarting X caused by logout/login.

09/01/05 Telestra Software version 3.16

Features/Enhancements

- HLA enhancements
- Radio environment fixed Exercise ID
- RMS debug page can now support Iris and UDP assets
- Updated RMS hardware profiles
- When Telestra is shut down it powers off.
- RMS Upgrade System page has new option to verify CD before upgrading.

Upgrade Issues to Telestra 3.16

Upgrading From 3.11-1- The upgrade (via RMS) will fail and display an error message. The work-around is a manual upgrade: (as 'root')

```
mv /etc/apt/sources.list/etc/apt/sources.list.old
apt-cdrom add
apt-get update
apt-get dist-upgrade--assume-yes
```

Upgrading From 3.11-1 or Older- The xfce4-iconbox package is no longer included, but the upgrade process does not remove already installed packages. To manually remove this package (which creates the extraneous iconbox that "grows" across the lower-right part of the desktop), type (as root)

```
apt-get remove xcfe4-iconbox
```

The X desktop toolbar has been cleaned up, but existing users' desktops don't automatically get updated so that user customizations don't get lost. To manually update a user's desktop, that user needs to be logged out of X. Login as that user on the console (e.g. Ctrl-Alt-F2), then type

```
build-mbv-desktop--force
```

This needs to be repeated for each existing user.

Upgrading From 3.10- or Older- Any models in rmsuser's account will become "invisible" to the RMS after this upgrade. You need to backup any models under rmsuser before upgrading and then restore them to a new/different user.

A second upgrade is required to clean off the older (2.4.22-asti) kernel. Repeat another RMS upgrade with the same CD after rebooting from the first upgrade.

Upgrading From 3.5-1 or 3.4-1

Telestra upgrade process (via RMS) appears to hang, although upgrade does complete.

08/22/05 Telestra Software version 3.15

Features/Enhancements

- Radio Environment ALE enhancement to support Call Sign and Net synchronization.
- RMS general improvements/enhancements.

08/11/05 Telestra Software version 3.14-1

The 3.14-1 release is an update to the radio ARC-210 component for better Have-Quick simulation, and a fix to the radio environment to allow the radio view to display three (3) decimal places in the list view.

07/29/05 Telestra Software version 3.13-1

Features/Enhancements

- Fixes related to Diskless Telestra:
  - Telestra restart is configured after Diskless package is downloaded.
  - Telestra-remote clients allow optional upload of configuration TGZ file when adding new clients.

07/08/05 Telestra Software version 3.12-1

This release increased the total number of playsounds allowed in the model from 512 to 768.

07/01/05 Telestra Software version 3.11-1

Features/Enhancements

- Full functionality for diskless Telestra.
- Users can now shutdown, reboot, and lock screen from the development mode desktop toolbar.
- RMS Model Management page is reorganized for enhanced usability.
- Radio environment was updated (NetIcom, etc.).

Note: Any models in rmsuser's account will become “invisible” to the RMS after this upgrade. The user will need to backup any models under rmsuser **before** upgrading and then restore them to a new/different user.

06/13/05 Telestra Software version 3.10-1

The NetIntercom in-tune logic problem was fixed. This problem occurred when multiple network intercoms were tuned to the same channel (regardless of whether the network intercoms were on the same Telestra or different Telestras). If multiple intercoms were transmitting, some of the intercoms on that channel would receive all streams and some would receive only one, which resulted in certain operators not being able to hear other operators.

05/27/05 Telestra Software version 3.9-1

Features and Enhancements include:

- Improved radio components
- Improved stability in MBV
- Enhanced RMS

04/22/05 Telestra Software version 3.8-1

Features/Enhancements

- This release is mainly a stability and feature enhancement for the radio environment and related RMS pages.
- There are also a few component improvements (Engine, Rotor, Simple Rotor, E2C, radio, and gain scales for Mixers and Balancer).
- New RMS features include the ICD PDF generator added to the model management page and the incremental model backup and restore capability.

04/01/05 Telestra Software version 3.7-1

Features/Enhancements

- This release enhanced the reliability of the radio environment.

Limitations:

- DTED terrain data not included, nor upload capability via RMS.
- Same issues from 3.6-1

03/23/05 Telestra Software version 3.6-1

Features/Enhancements in 3.5-1(not announced)

- An enhancement to pathloss requests combines results from HF and Terrain servers.

Features/Enhancements (Since 3.5-1)

- New RMS pages for Telestra configuration save, restore, management.
- Updated Host input and output inspectors in MBV can now use +/-/delete and save, restore, and clear to modify values.
- ALE radio support.
- Host generation of configuration files (XML-RPC).

Limitations:

- Telestra upgrade process via RMS from 3.4-1 or 3.5-1 appears to hang, although the upgrade did complete. This problem should not occur if upgrading from any other release.
- When starting framework via RMS in development mode, Irises disappear in model. Use MBV to start framework.
- “DHCP server failed to start” error message on boot screen, which does not indicate an error if not configured for server for diskless Telestras.
- Iris loopback test sometimes causes Iris to cease operating (requiring power cycle) or system lockup (if followed by readiness test).

03/02/05 Telestra Software Version 3.5-1

Features/Enhancements

- LINK16 is now operational.
- Enhancement to pathloss server: Pathloss server now combines results from HF and Terrain servers.

Limitations:

- Telestra upgrade process via RMS appears to hang, although upgrade did complete. (This is fixed in 3.6-1.)
- LINK16 is not supported.
- DTED data is not included, nor upload capability via RMS.
- Starting framework via RMS in development mode causes “missing” Irises. Use MBV to start framework.
- “DHCP server failed to start” error message on boot screen, which does not indicate an error if not configured for server for diskless Telestras.
- Resetting record files takes a significant amount of time.

Using the broadcast address for UDP output results in a loopback packet. If any of the input port numbers match the broadcast output port number, there will be a problem.

03/02/05 Telestra Software version 3.4-1

Features/Enhancements (Since 3.3-2)

- Network and CD-ROM booting functionality available on diskless Telestra clients with RMS interface to manage the diskless clients from a central server (options file permitting).
- Number of playsounds supported per model were increased to a maximum number of 512.
- Number of records supported per model were increased to a maximum number of 24 channels.
- Number of replays supported per model were increased to a maximum 48 channels.
- Users can now set the periodicity in the hardware mapping file through RMS.
- HF pages were added to RMS.

Limitations:

- LINK16 is not supported.
- DTED data not included, nor RMS upload capability.
- Starting framework via RMS in development mode causes “missing” Irises. Use MBV to start framework.
- “DHCP server failed to start” error message on boot screen, which does not indicate an error if not configured for server for diskless Telestras.
- Resetting record files takes a significant amount of time.
- Host Input and Output: Using the broadcast address for UDP output results in a loopback packet. If any of the input port numbers match the broadcast output port number, there will be a problem.

Appendix G: Warranty and Repairs

Warranty Information

The equipment is warranted for a period of one (1) year following purchase.

In the case of equipment upgrades, warranty applies to original date of shipment of individual components.

Other commercial equipment purchased or provided such as monitors, amplifiers, speakers, fiber optic links, etc. are also covered under the one year warranty unless otherwise stated.

The warranty does not cover improper equipment handling or improperly packaged returns.

Extended warranties are available. Contact ASTi for details (703) 471-2104.

Repairs and Returns

If it becomes necessary to return equipment to ASTi please observe the following instructions:

1. Obtain an RMA number through ASTi's website: http://www.asti-usa.com/support/
2. When packaging the equipment in question, make sure it is well protected. The device should be properly enclosed in an antistatic bag to prevent possible ESD damage. Failure to properly package the equipment during shipping could void the warranty.
3. Do not include accessory pieces such as rack mount kits, power supplies or software. Only send items that do not work.
4. The shipping label must include the RMA number.
5. Include a description of the problem, point of contact, phone number, return address and unit serial number(s). Failure to include this information could extensively delay the return of the equipment.
6. Evaluation of equipment is performed free of charge. No work will be done without prior customer approval. Customer is responsible for shipping charges to ASTi for warranty and non-warranty repairs.
7. If an RMA number is not used within thirty (30) days of issuing date, the request data and number issued will be closed and designated as unused.
8. Any items received from customers without RMA numbers or appropriate contact information included with shipment will not be tested. After sixty (60) days, ASTi reserves the right to scrap all hardware received in this condition.
9. If the equipment is not under warranty a Purchase Order will be required to cover the cost of any repairs. ASTi will provide a quote for all non-warranty repair items.
10. Equipment will be shipped back using Federal Express, unless otherwise directed. If the repair is non-warranty then shipping charges will be billed.
11. **International customers** must include the correct product value on all shipping documents. Contact ASTi for proper harmonized tariff codes. The customer is responsible for all duties, taxes and fees incurred in shipment of the equipment.

Disclaimer and Warnings

- Connect only ASTi-approved devices to the USB ports. Attempted use of non-ASTi USB devices may result in equipment damage.
- Do not use commercial extender cables with ASTi USB devices.
- There are NO user serviceable components in this device. Opening the chassis will void the warranty.