

**RED**  
**HAWK** *Architect™ User's Guide*

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## Scope of Manual

This manual describes the RedHawk Architect™, an easy-to-use GUI interface for creating and maintaining a runtime and development environment for a single board computer (SBC).

## Structure of Manual

This manual consists of:

- Chapter 1, which introduces you to RedHawk Architect and guides you through its use.
- An Index containing an alphabetical reference to key terms and concepts and the pages where they occur in the text.

## Syntax Notation

The following notation is used throughout this manual:

<i>italic</i>	Books, reference cards, and items that the user must specify appear in <i>italic</i> type. Special terms may also appear in <i>italic</i> .
<b>list bold</b>	User input appears in <b>list bold</b> type and must be entered exactly as shown. Names of directories, files, commands, options and man page references also appear in <b>list bold</b> type.
list	Operating system and program output such as prompts, messages and listings of files and programs appears in list type.
[]	Brackets enclose command options and arguments that are optional. You do not type the brackets if you choose to specify these options or arguments.
hypertext links	When viewing this document online, clicking on chapter, section, figure, table and page number references will display the corresponding text. Clicking on Internet URLs provided in blue type will launch your web browser and display the web site. Clicking on publication names and numbers in red type will display the corresponding manual PDF, if accessible.

## Related Publications

The following table lists Concurrent documentation for RedHawk Architect and the components that can be installed using RedHawk Architect. Depending upon the

document, they are available online on RedHawk Linux systems or from Concurrent's documentation web site at <http://redhawk.ccur.com/docs>.

<b>RedHawk Architect</b>	<b>Pub. Number</b>
<i>RedHawk Architect Release Notes</i>	0898600
<i>RedHawk Architect User's Guide</i>	0898601
<b>RedHawk Linux</b>	
<i>RedHawk Linux Release Notes</i>	0898003
<i>RedHawk Linux User's Guide</i>	0898004
<i>RedHawk Linux FAQ</i>	N/A
<b>NightStar Development Tools</b>	
<i>NightView User's Guide</i>	0898395
<i>NightTrace User's Guide</i>	0898398
<i>NightProbe User's Guide</i>	0898465
<i>NightTune User's Guide</i>	0898515

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# Using RedHawk Architect

This chapter introduces you to the RedHawk Architect and provides instructions for its use.

## Introducing Architect

RedHawk Architect is an easy-to-use GUI interface for configuring, building and flashing embedded solutions.

RedHawk Architect greatly simplifies the following tasks to create and maintain a runtime and development environment for single board computers (SBCs):

- installing custom configurations of the Red Hat® Enterprise Linux® distribution
- installing and configuring the RedHawk™ operating system
- installing NightStar™ application development tools
- maintaining and reconfiguring an SBC's root file system

With Architect, you choose the Linux and application modules that will be installed with the RedHawk kernel. For example, select networking, web server, web browser, database, X server, minimal or all packages. Architect allows the Linux file system to be customized and minimized for embedded applications using flash memories as small as 2 GB.

Architect creates and processes a configuration file based upon your selections and performs actual RPM package installation. It prompts you to insert the necessary RedHawk, Red Hat and NightStar media depending upon the features selected.

A flashing tool is provided for installing RedHawk and your application image onto a CPU board's non-volatile memory.

## Creating a root File System for Embedded Target Boards

To create a root file system that can be used on a single board computer, use RedHawk Architect on a RedHawk Linux host system to perform the following steps:

1. Create an image by selecting the software to be installed and building the image.
2. Configure the image.
3. Customize the image for your embedded application.

4. Flash the image to install it on your target boards.

These procedures are described in the sections that follow. The steps may be repeated to change the image and/or flash it any number of times.

## Running Architect

For instructions for installing RedHawk Architect, refer to the *RedHawk Architect Release Notes*.

Architect must be run as the root user.

To run Architect, type **architect** at a shell prompt:

```
# architect
```

When Architect starts, a dialog appears presenting you with the option to start a new session or load an existing session.



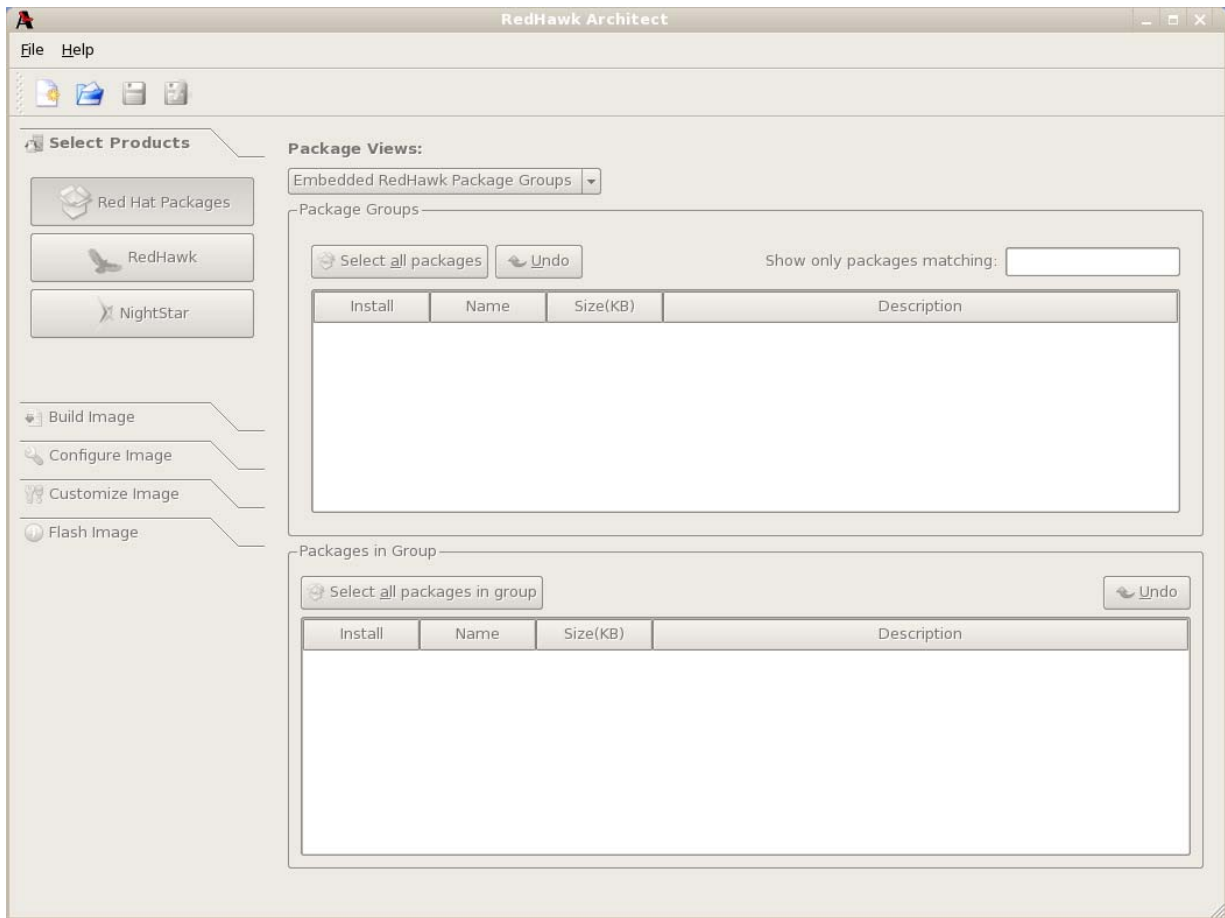
**Figure 1-1 Opening RedHawk Architect Dialog**

To start a new session, click on the **New** button. See “Creating a New Session” on page 1-3 for details.

A session can be saved at any time and loaded later to continue work on the file system image. To edit an existing session, click on the **Open** button. See “Editing an Existing Session” on page 1-23 for details.



When the **Close** button is clicked, the RedHawk Architect main window appears, as shown in Figure 1-2.





**Figure 1-2 RedHawk Architect Main Window**


Your choices are:

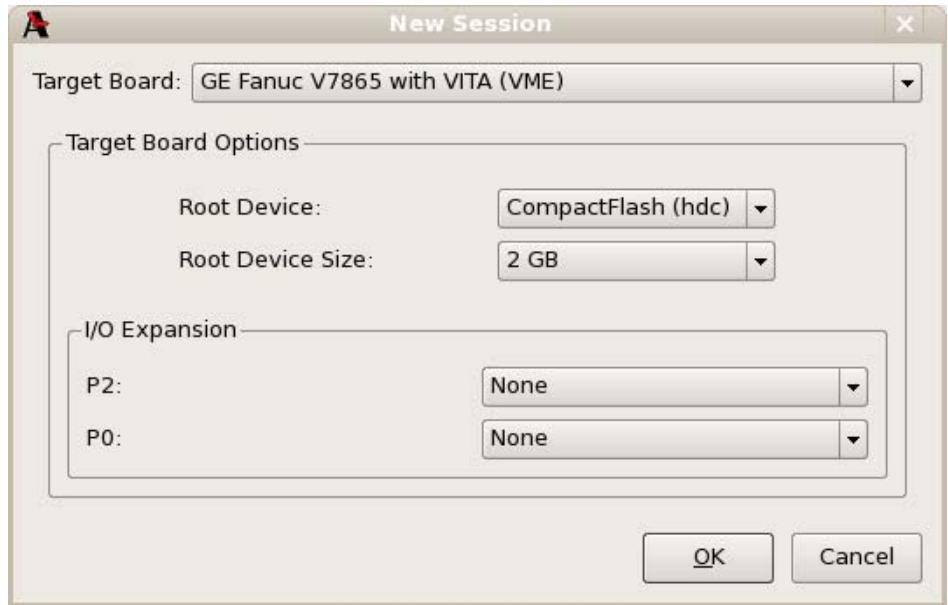
- start a new session by clicking on the New Session icon  or selecting **New Session** from the File menu along the top of the window. See “Creating a New Session” on page 1-3 for details.
- edit an existing session by clicking on the Open Session icon  or selecting **Open Session** in the File menu. See “Editing an Existing Session” on page 1-23 for details.

## Creating a New Session

An Architect session describes all decisions made about a particular file system image, including:

- the target SBC
- which software should be installed
- how the software should be configured

When you select the **New** button from the opening Architect dialog, or the **New Session** icon  or **New Session** from the **File** menu along the top of the RedHawk Architect main window, the **New Session** dialog, shown below, displays.



**Figure 1-3 New Session Dialog**

This dialog enables you to define the target board and its various characteristics using the fields described below.

### **Target Board**

Specify the target board from the dropdown.

### **Root Device**

Select the root device to use on the target board from the dropdown. The choices available depend on the board you have selected.

### **Root Device Size**

Select the size of the selected root device that is installed on your board from the dropdown. The choices available depend on the board you have selected.

### **I/O Expansion**

This section shows I/O expansion connectors that are available on the board you have selected. For each I/O expansion connector, you may designate an expansion module that you may have connected to it. The choices available depend on the board you have selected.

## OK

Click on this button when all desired selections have been made. This dialog closes and the RedHawk Architect main window is activated.

## Cancel

Click on this button to cancel any changes made. The dialog closes and you are returned to the RedHawk Architect main window.

## Selecting Software to Install in the Image

To select the software to install in the file system image, click on **Select Products** from the toolbox on the left side of the RedHawk Architect main window. This allows you to select software from the following three groups:

- Red Hat Enterprise Linux packages
- RedHawk Linux operating system
- NightStar RT tools

Some initial selections are made for you by default; e.g. the core RedHawk OS.

The **Estimated Image Size** gauge at the top of the RedHawk Architect main window indicates the approximate size the file system image will be when built. It also indicates the percentage of the target board's root device that will be consumed by the image.

## Selecting Red Hat Packages

To select Red Hat Enterprise Linux packages for the file system image, click on the **Red Hat Packages** selection from the **Select Products** toolbox.

Red Hat packages may be navigated by way of several "Package Views". Select the desired package view from the **Package Views** dropdown. The following views are available and are described in the subsections that follow.

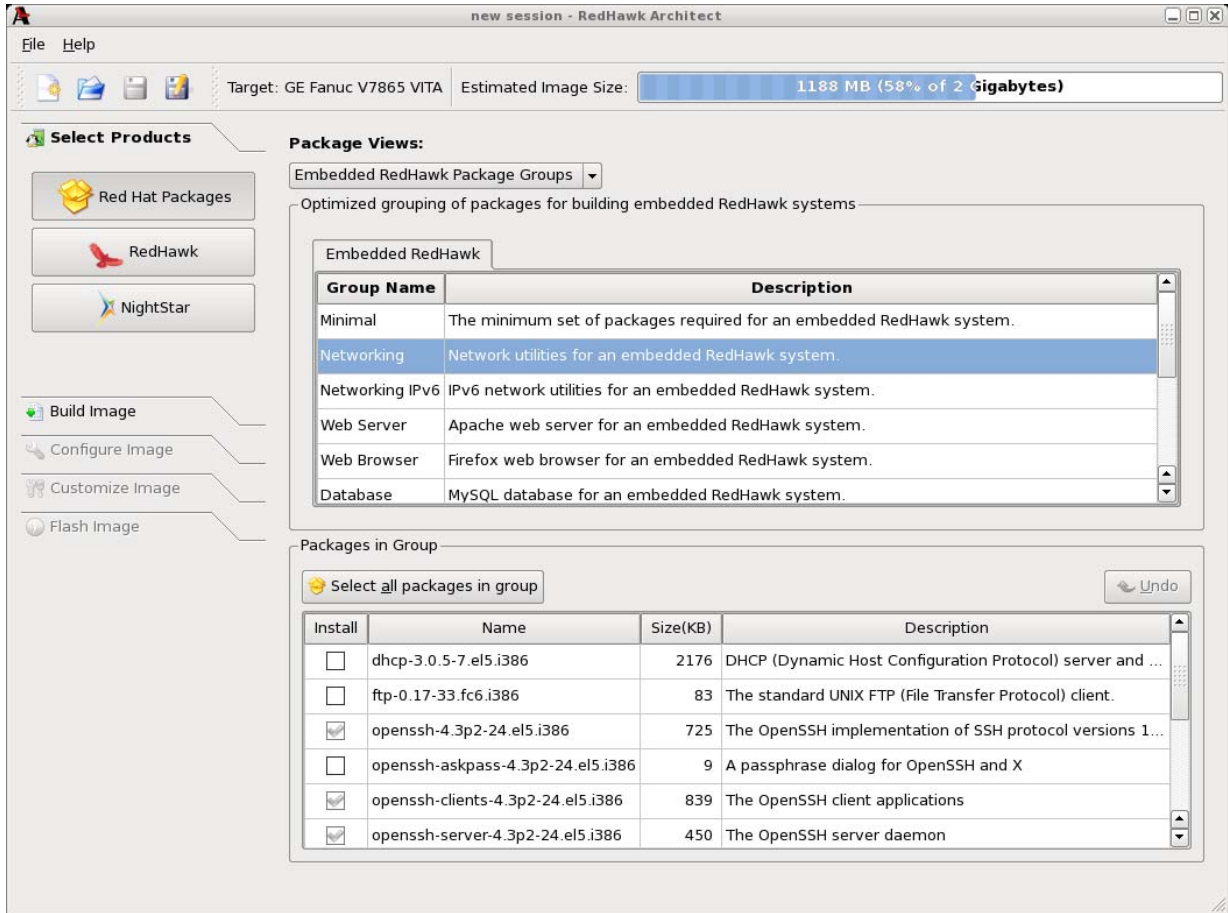
- Embedded RedHawk Package Groups
- Red Hat Package Groups
- All Packages
- Selected Packages

## Using the Embedded RedHawk Package Groups View

The **Embedded RedHawk Package Groups** view provides a view of some Red Hat packages organized into groups. The groups of packages have been optimized for embedded RedHawk systems and are meant to simplify the task of choosing packages for common functionality. This view is shown in Figure 1-4.

Packages may be selected or deselected by choosing a package group in the upper pane and then checking or un-checking packages in that group in the lower pane. All packages may be selected with the **Select all packages in group** button.

The **Undo** button cancels out your last select or unselect operation.



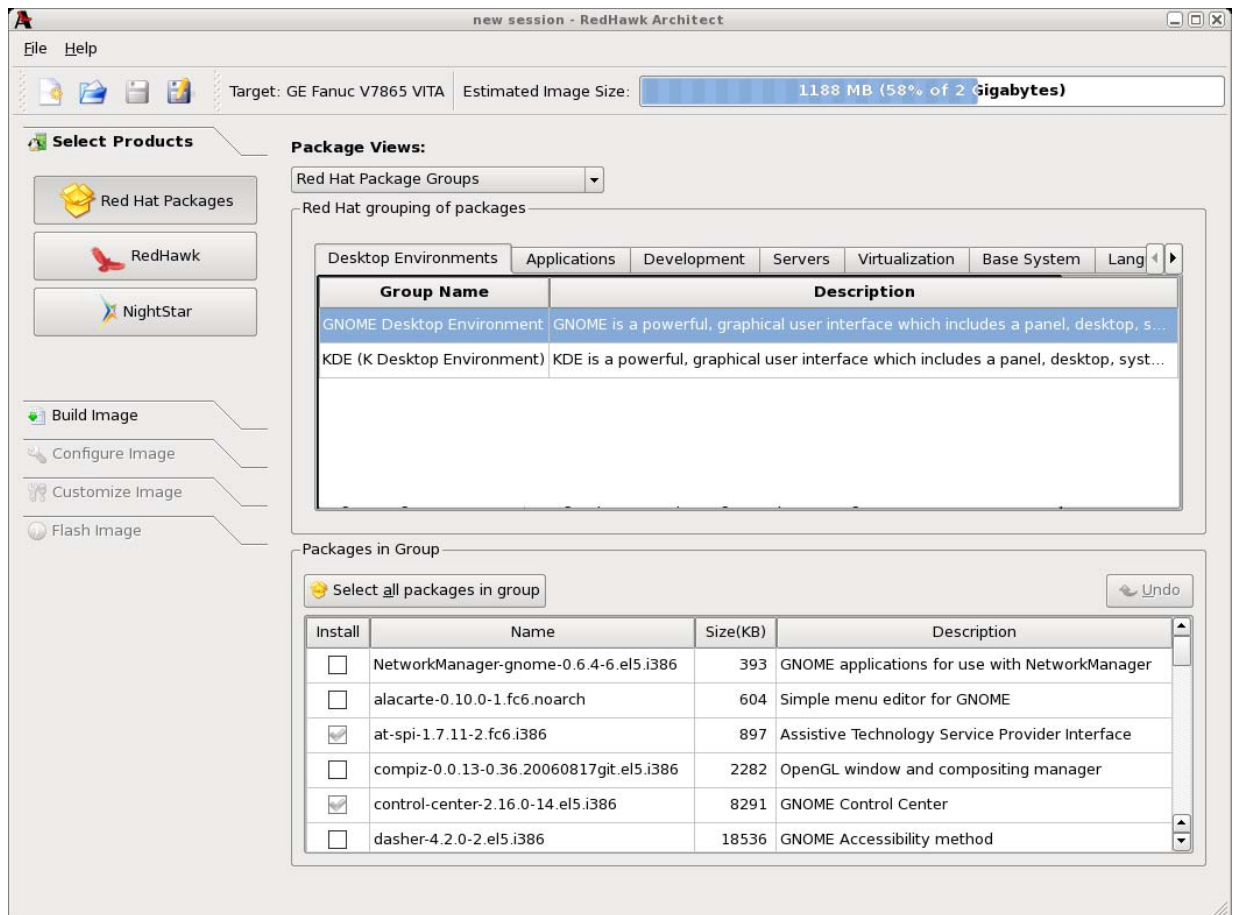
**Figure 1-4 Selecting Red Hat Packages, Embedded RedHawk Package Groups View**

## Using the Red Hat Package Groups View

The Red Hat Package Groups view provides a view of Red Hat packages organized in a hierarchy of groups. The package group hierarchy is the standard Red Hat package group hierarchy. This view is shown in Figure 1-5.

Packages may be selected or deselected by choosing a package group in the upper pane and then checking or un-checking packages in that group in the lower pane. All packages may be selected with the **Select all packages in group** button.

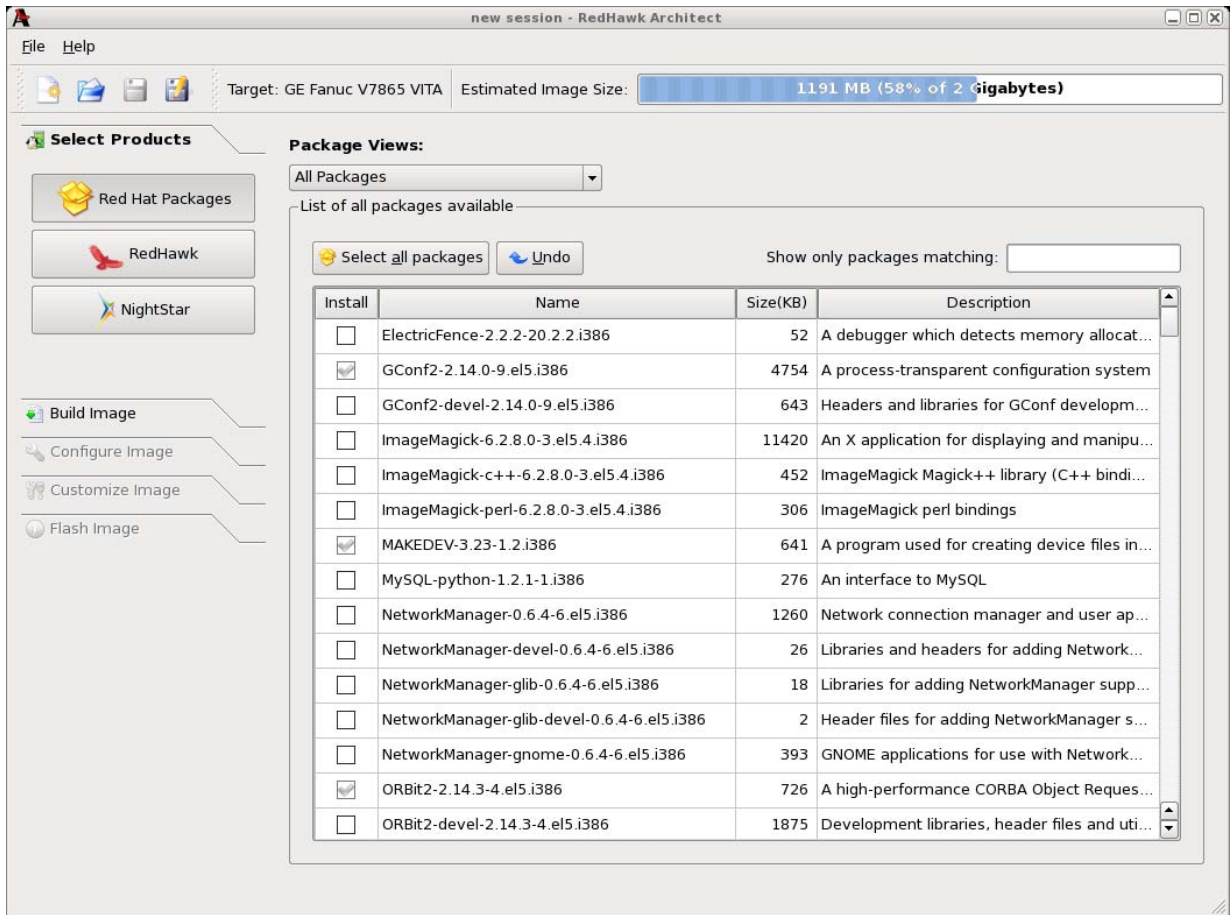
The **Undo** button cancels out your last select or unselect operation.



**Figure 1-5 Selecting Red Hat Packages, Red Hat Package Groups View**

## Using the All Packages View

The All Packages view, as shown in Figure 1-6, provides a linear list of all Red Hat packages.



**Figure 1-6 Selecting Red Hat Packages, All Packages View**

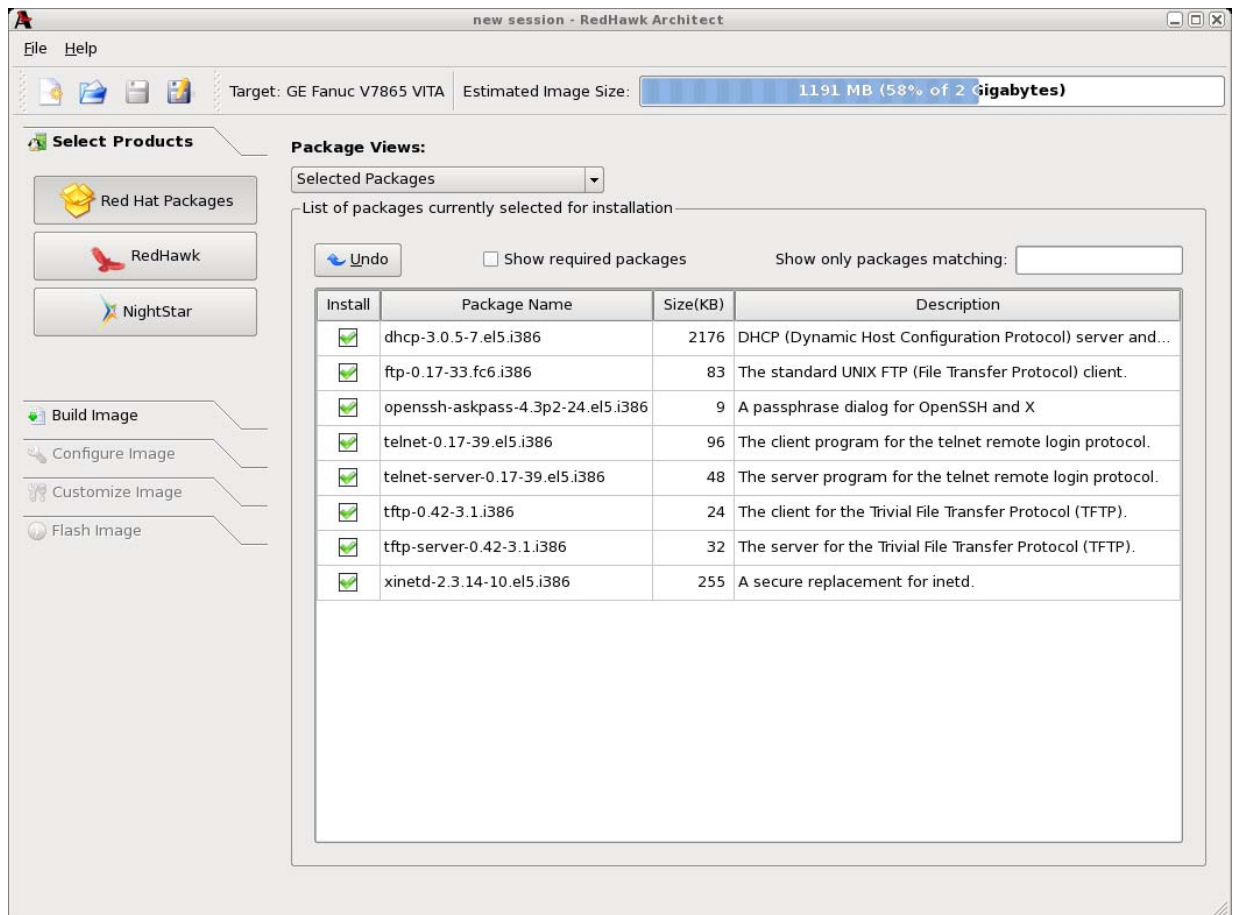
Packages may be selected or deselected from this list. The Show only packages matching box allows you to search for packages by name.

All packages can be selected by clicking on the Select all packages button.

The Undo button cancels out your last select or unselect operation.

## Using the Selected Packages View

The Selected Packages view, as shown in Figure 1-7, provides a linear list of all Red Hat packages that are currently selected for installation.



**Figure 1-7 Selecting Red Hat Packages, Selected Packages View**

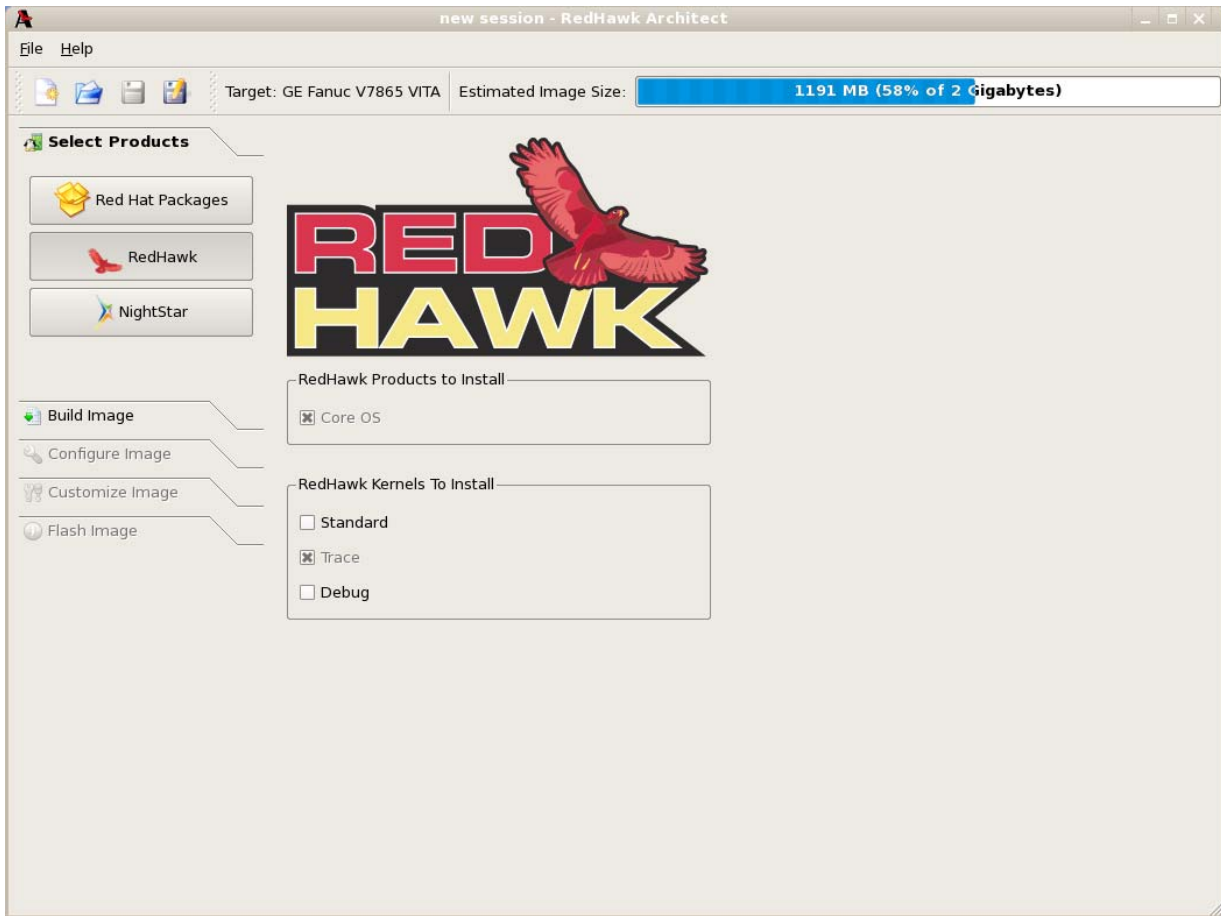
Packages may be deselected from this list. The Show only packages matching box allows you to search for packages by name.

To include the required packages in the list, check the Show required packages checkbox. When this box is unchecked, only the optional packages are shown.

The Undo button cancels out your last select or unselect operation.

## Selecting RedHawk OS Options

To select RedHawk Linux OS and kernels for the file system image, click on the RedHawk selection from the Select Products toolbox. The RedHawk page, shown in Figure 1-8, displays.



**Figure 1-8 Selecting RedHawk Options**

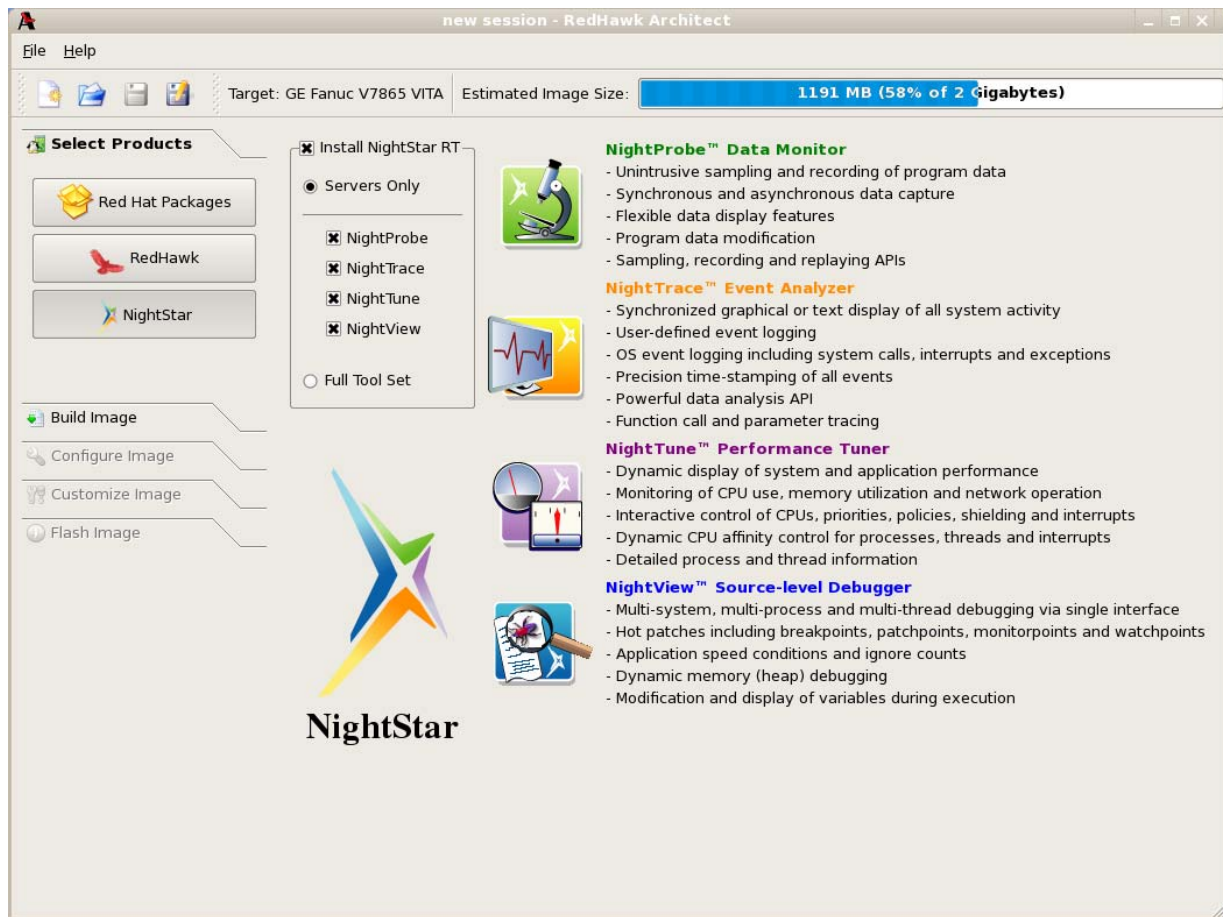
The Core OS product is required and cannot be deselected. Other RedHawk products will be available in future releases.

Select which RedHawk kernel(s) to install by checking the appropriate checkbox(es): Standard, Trace and/or Debug.

## Selecting NightStar RT Options

To select NightStar RT tools for the image, click on the NightStar selection from the Select Products toolbox. The NightStar page, shown in Figure 1-9, displays.





**Figure 1-9 Selecting NightStar Tools**

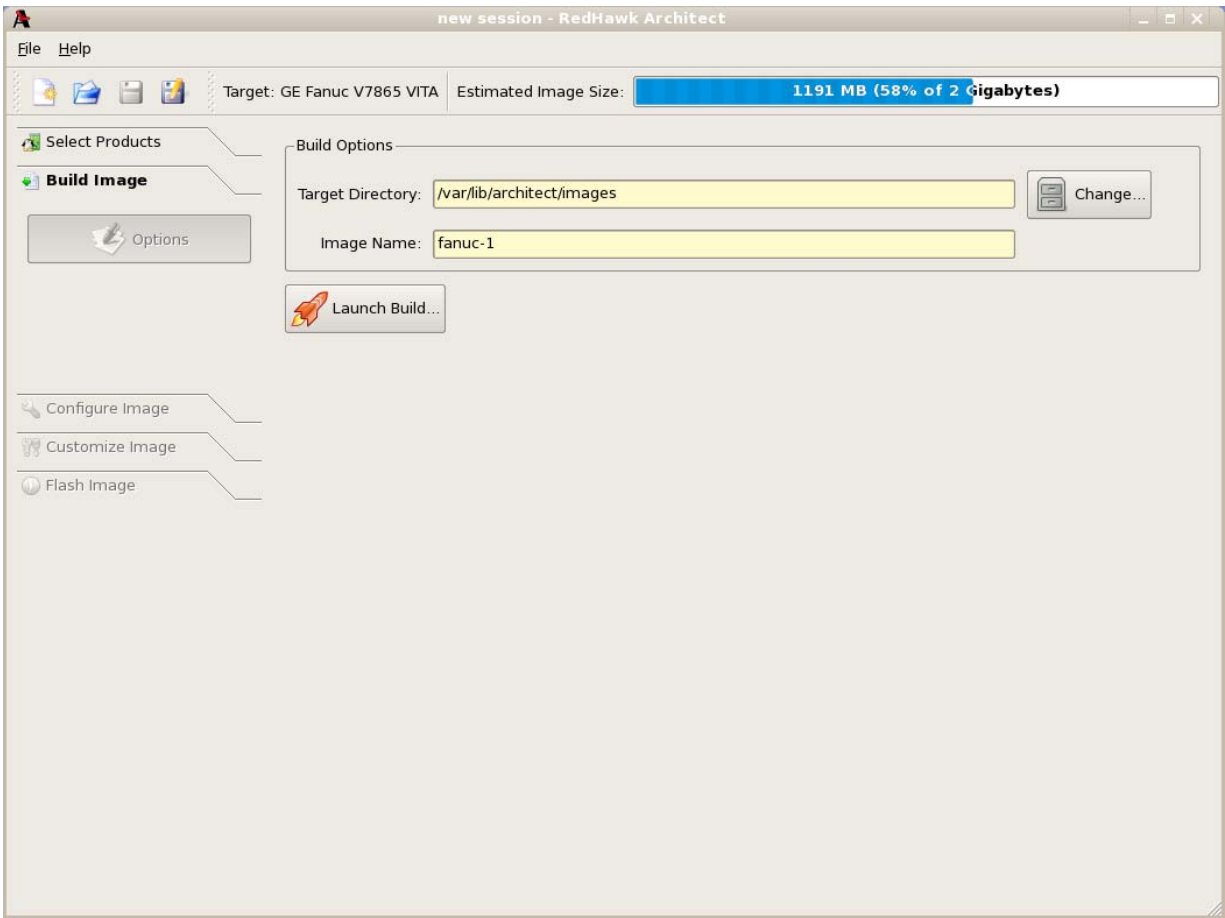
Each NightStar tool is described in the righthand side of the page.

Click on the **Servers Only** radio button to indicate that only NightStar servers are to be installed in the image. You may select individual servers from the list by clicking on the checkboxes for each tool.

Click on the **Full Tool Set** radio button to indicate that NightStar servers and clients are to be installed in the image.

## Building an Image

To build the file system image by installing the selected software, select **Build Image** from the toolbox on the left side of the RedHawk Architect main window. The Build Image dialog shown in Figure 1-10 displays.



**Figure 1-10 Build Image Dialog**

Choose a directory in which to build the file system image and enter it in the **Target Directory** field, or click on the **Change** button to display a file browser from which to choose.

**NOTE**

Do not use `/tmp` as the image file directory. Packages like “tmp-watch” might remove files that have not been accessed in a certain number of days, thereby sabotaging the image directory.

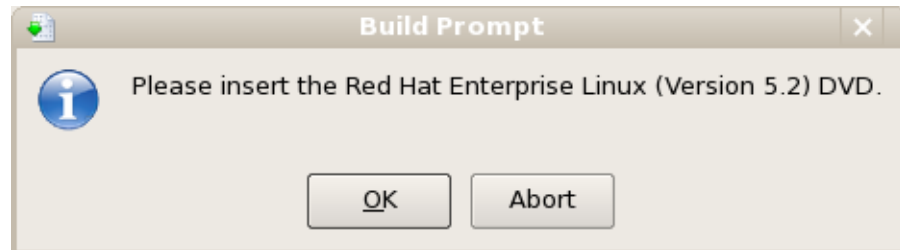
Choose a name for the file system image and enter it in the **Image Name** field.

**NOTE**

Make sure that the directory you specify has enough free disk space to hold one or more file system images, each of which can be several gigabytes in size.

Click on the **Launch Build** button to begin the build process.

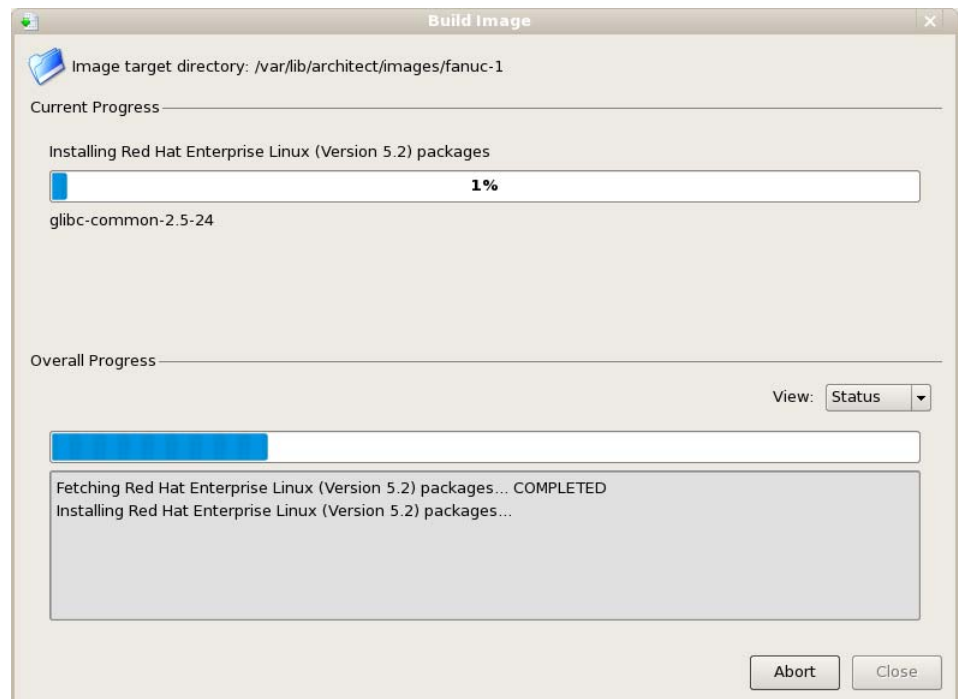
Dialogs are presented to guide you through the process of installing the software into the image. For example, you will be prompted to insert various DVD or CD media, as shown in Figure 1-11. Follow the directions to load the media, then click **OK** to begin.



**Figure 1-11 Build Prompt to Insert RHEL Media**

When **OK** is selected, the RHEL installation begins. The **Build Image** screen overlays the RedHawk Architect main window and tracks the progress, as shown in Figure 1-12.

Clicking **Abort** at any time in the build process aborts the build. A confirmation message then displays and you must click on the **Close** button to close the message box and reactivate the RedHawk Architect main window.



**Figure 1-12 Status of RHEL Installation**

A progress bar at the top of the **Build Image** screen shows the progress of the RHEL installation from the media.

A progress bar in the lower half of the screen tracks the progress of the complete build process, including installation of remaining packages. The progress bar can be changed to an “error log” using the **View** dropdown. Status messages display in the lower pane.

### View

When **Status** is selected, the Overall Progress displays as a progress bar. When **Error Log** is selected, overall progress displays as an error log, which shows any error messages generated by the build process. Regardless of the **View** setting, critical error messages result in pop-up error dialogs with which you can interact.

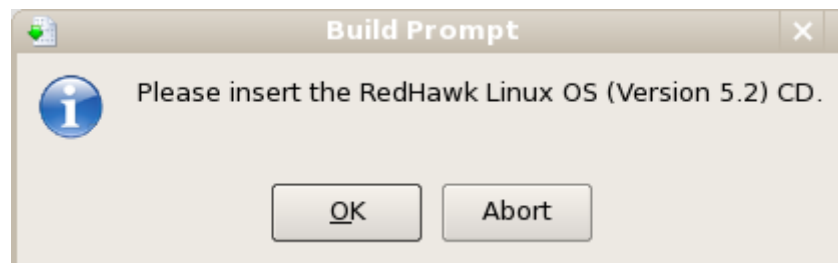
### Abort

Click on this button to abort the build. A confirmation dialog displays allowing you to confirm or decline aborting the build process.

### Close

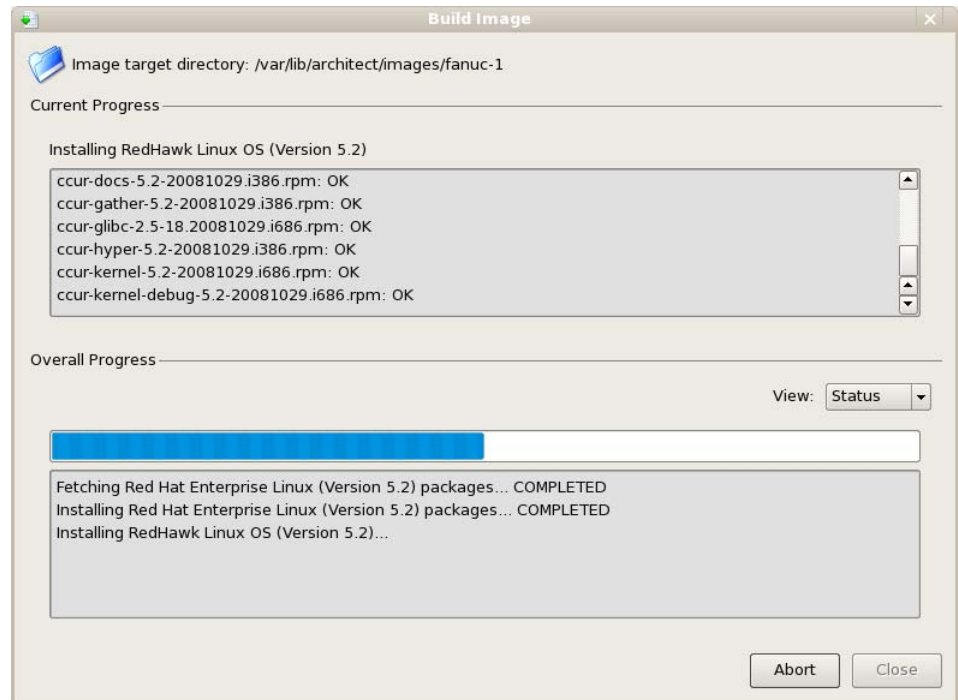
Once the build is completed or aborted, click on the **Close** button to close the **Build Image** screen and reactivate the **RedHawk Architect** main window.

When the RHEL installation is complete, the dialog shown in Figure 1-13 appears.



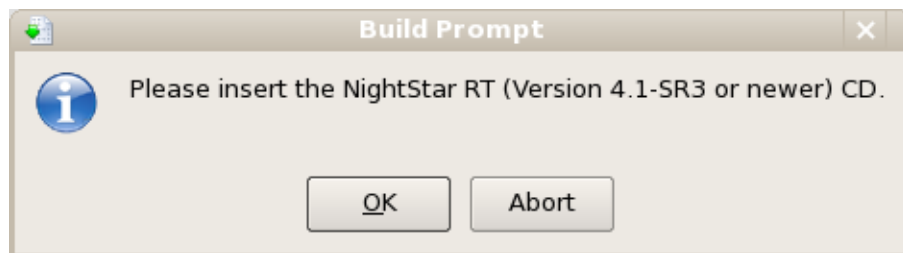
**Figure 1-13 Build Prompt to Insert RedHawk Media**

Load the RedHawk Linux media, then click **OK**. The RedHawk installation begins and the **Build Image** screen tracks the progress, as shown in Figure 1-14.



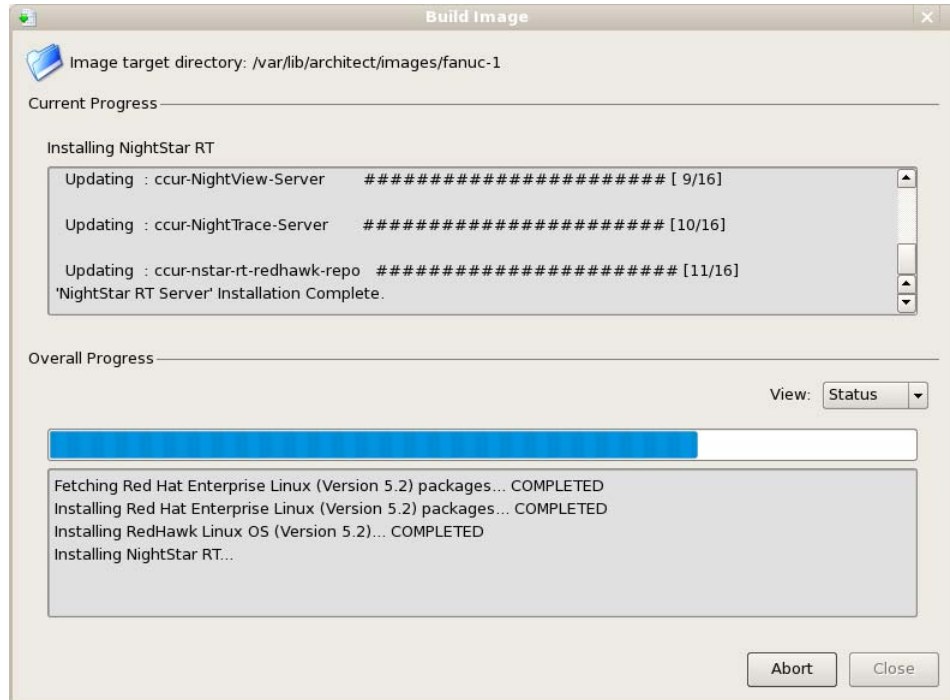
**Figure 1-14 Status of RedHawk Installation**

When the RedHawk installation is complete, the dialog shown in Figure 1-15 appears.



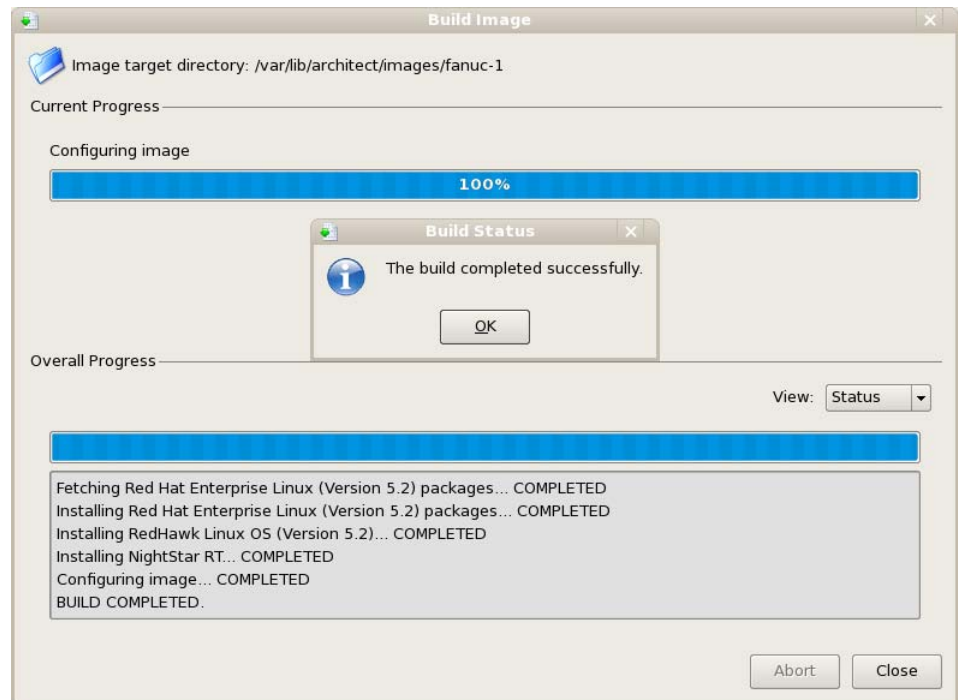
**Figure 1-15 Build Prompt to Insert NightStar Media**

Load the NightStar media, then click OK to begin. The NightStar installation begins and the Build Image screen tracks the progress, as shown in Figure 1-16.



**Figure 1-16 Status of NightStar Installation**

When all software is installed, the completion message shown in Figure 1-17 appears.



**Figure 1-17 Build Completed Successfully Message**

Click OK in the Build Status dialog, then click Close on the Build Image screen to close it and reactivate the RedHawk Architect main window.

## Configuring an Image

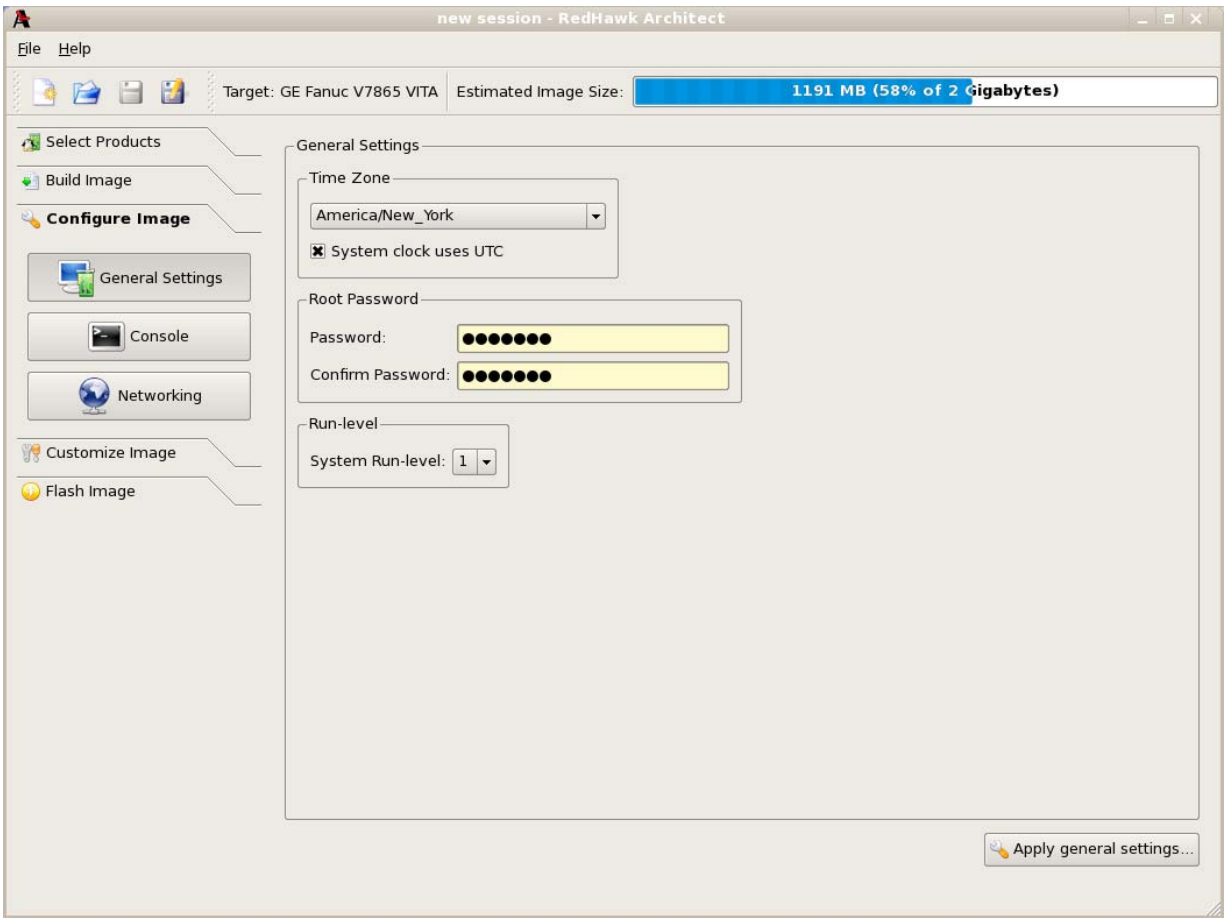
To configure the file system image, select **Configure Image** from the toolbox on the left side of the RedHawk Architect main window. This allows you to configure the following three groups:

- General Settings
- Console
- Networking

Some initial selections are made for you by default.

## Configuring General Settings

To configure time zone, root password and default system run level for the file system image, click on **General Settings** from the **Configure Image** toolbox. The **General Settings** configuration dialog appears, as shown in Figure 1-18.



**Figure 1-18 General Settings Configuration Dialog**

In the **Time Zone** section, select the proper time zone for your location from the dropdown. Click in the checkbox to indicate if your system clock uses UTC.

In the **Root Password** section, enter the root password in the **Password** field. Reenter it in the **Confirm Password** field.

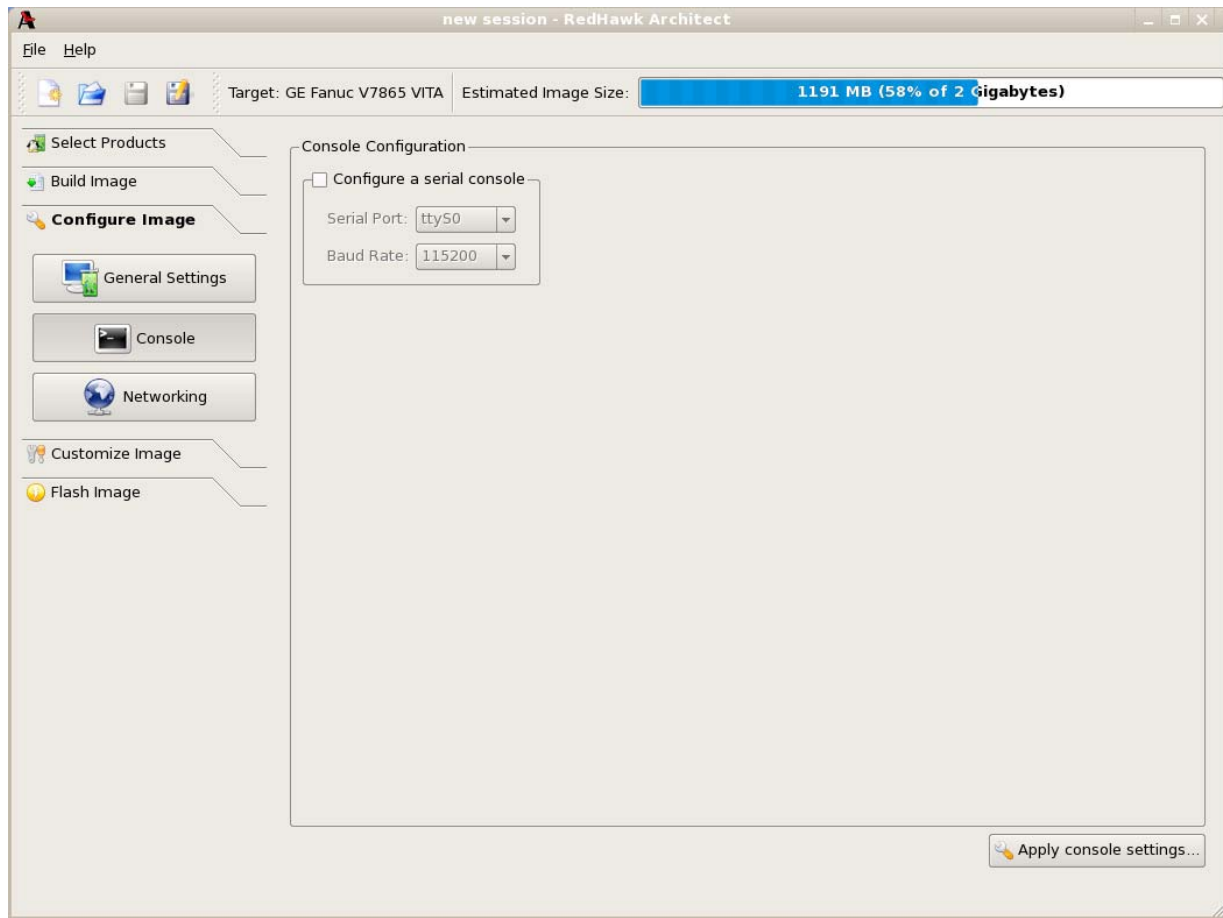
In the **Run Level** section, select the desired default run level from the dropdown.

When all entries are complete, click on the **Apply general settings...** button to apply the settings to the image.

## Configuring a Console

To configure a serial console for the file system image, click on **Console** from the **Configure Image** toolbox. The **Console Configuration** dialog appears, as shown in Figure 1-19.





**Figure 1-19 Console Configuration Dialog**

Click on the **Configure a serial console** checkbox to activate the fields that define the port and baud rate for the console.

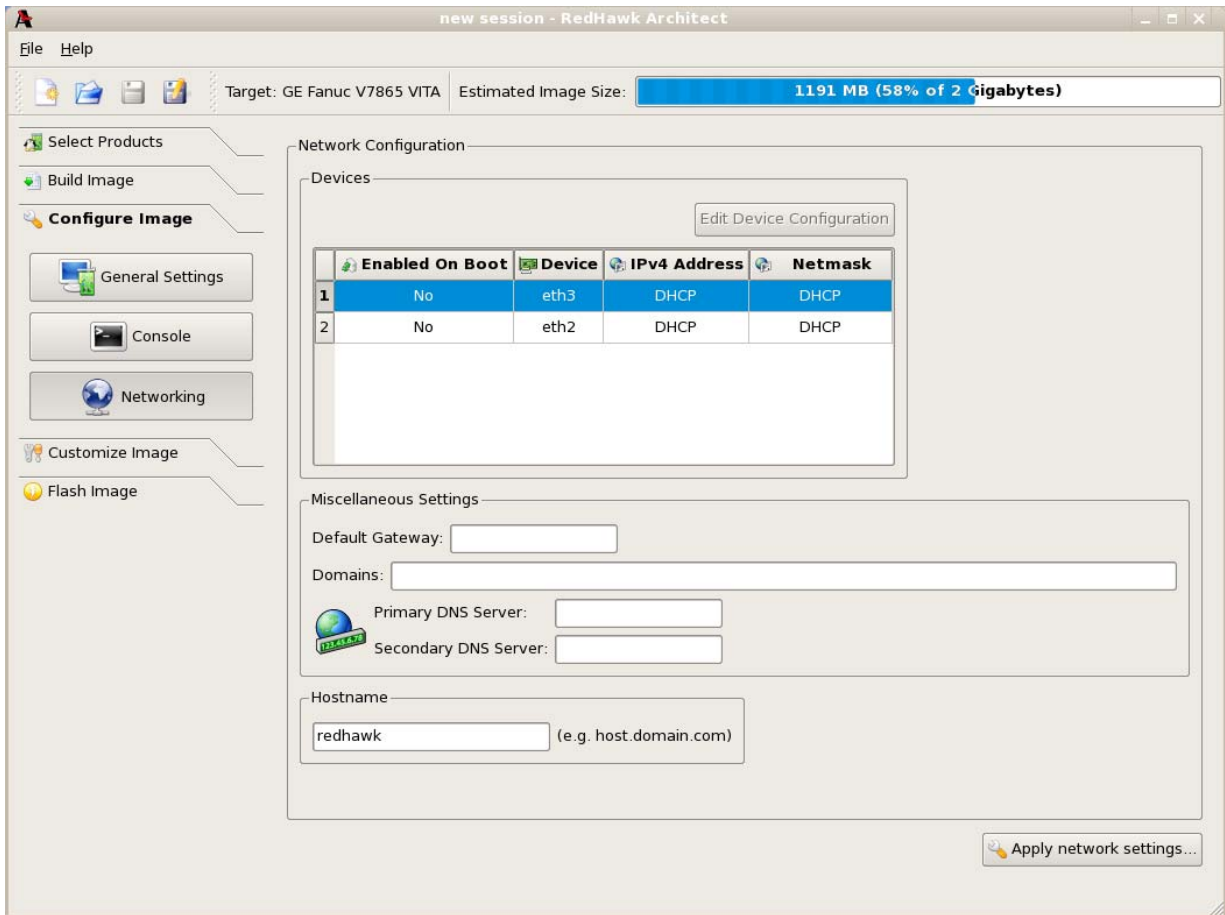
Select a port from the **Serial Port** dropdown.

Select a baud rate from the **Baud Rate** dropdown.

When all selections have been made, click on the **Apply console settings...** button to apply the settings to the image.

## Configuring Networking

To configure networking for the file system image, click on **Networking** from the **Configure Image** toolbox. The **Network Configuration** dialog appears, as shown in Figure 1-20.



**Figure 1-20 Network Configuration Dialog**

All available network devices are listed in the Devices section.

To configure a particular network device, click on the device to select it, then click on the Edit Device Configuration button. The Configure Network Device dialog shown in Figure 1-21 displays.



**Figure 1-21 Configure Network Device Dialog**

The selected network device is displayed at the top of the dialog.

Click on the **Enabled On Boot** checkbox to enable/disable the device automatically on boot.

Select **Dynamic** or **Manual** IP address configuration by clicking on the appropriate radio button. For manual configurations, enter the IP address and netmask in the appropriate fields.

Click on **OK** to apply the settings to the image and close the dialog. Click **Cancel** to cancel changes.

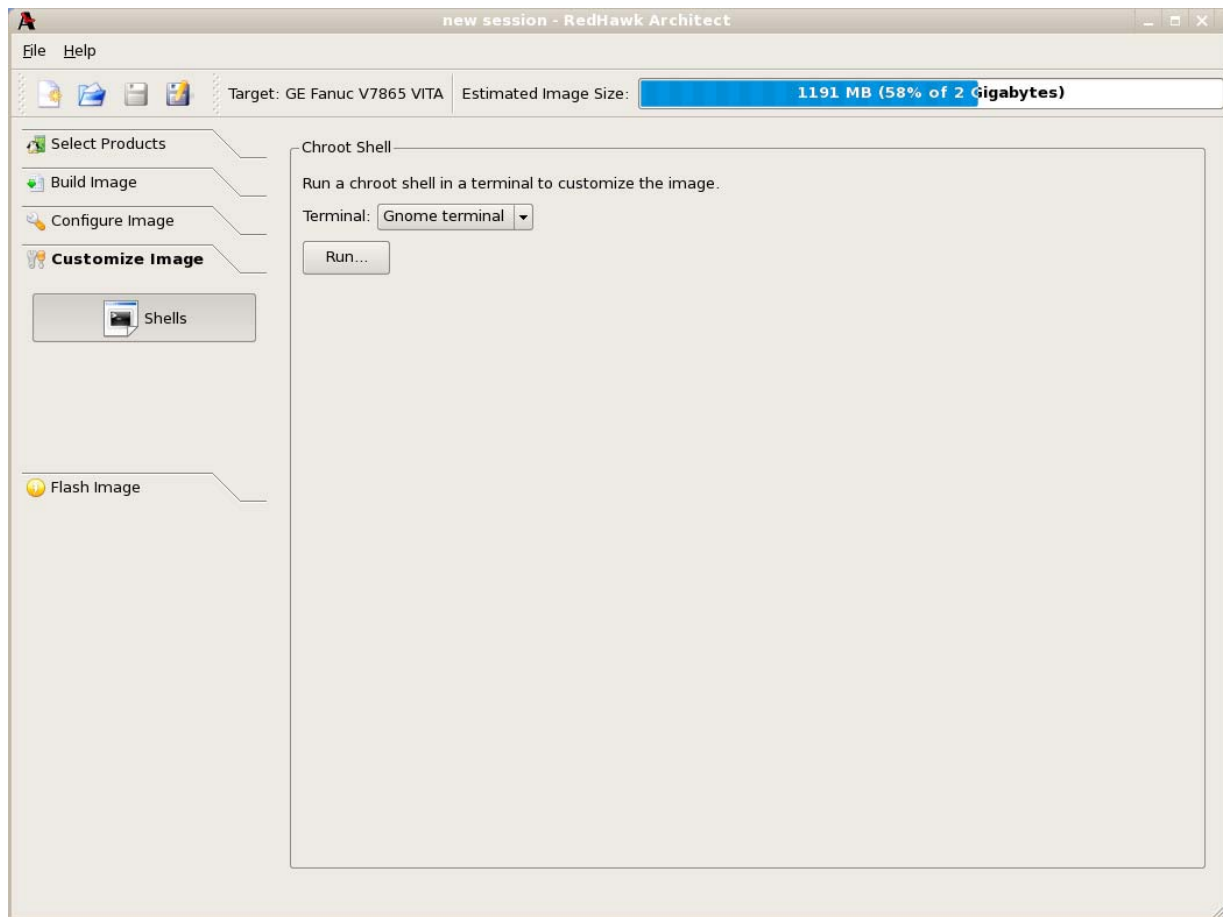
On the **Network Configuration** dialog (Figure 1-20) in the **Miscellaneous Settings** area, supply the default gateway, domains, primary and secondary DNS server addresses in the appropriate fields.

In the **Hostname** area, select whether the hostname is configured automatically or provided manually by selecting the appropriate fields.

When all selections have been made, click on the **Apply network settings...** button to apply the settings to the image.

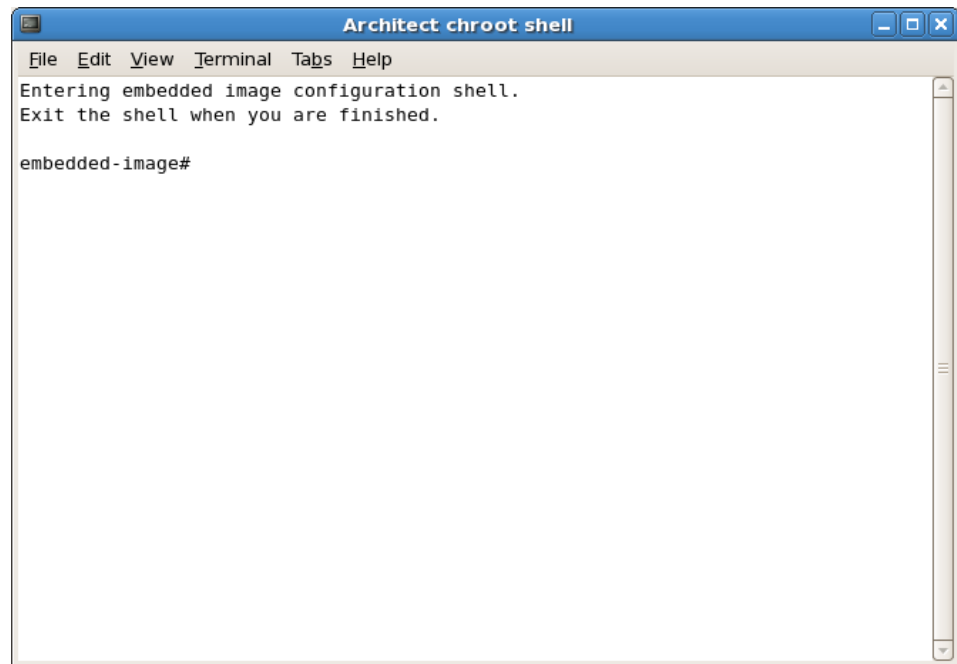
## Customizing an Image

To further customize the file system image, select **Customize Image** from the toolbox on the left side of the RedHawk Architect main window. The dialog shown in Figure 1-22 displays.



**Figure 1-22 Customize Image Dialog**

From this toolbox you can open a “chroot” shell in a terminal window. Select the type of terminal from the dropdown and click on the **Run** button. A terminal screen opens, as shown in Figure 1-23.





**Figure 1-23 chroot Shell**


This provides a shell with the root directory being the file system image directory. All changes made to system files (including software installed or removed) will be done in the file system image directory only. The host's root file system will not be affected.

Exit the shell when changes are complete.

## Editing an Existing Session

A session can be saved at any time and loaded later to continue work on a file system image.

To save the current session click on the Save Session icon  or on Save Session in the File menu. Selecting the Save As icon  or Save Session As in the File menu displays a file selection dialog.

To load an existing session, click on the Open Session icon  or on Open Session in the File menu. You may also click on the Open button from the opening dialog when Architect first starts.

## Flashing an Image

You can copy a root file system image created with Architect to a compact flash.

The **Flash Image** option from the toolbox on the RedHawk Architect main window does not function at this time. However, a utility is available to copy a root file system image onto a compact flash that is connected directly to the host machine, either via a USB-to-CompactFlash adapter or an IDE-to-CompactFlash adapter (these can be bought inexpensively at many retail stores that sell computer accessories).

To use this tool run:

```
/usr/bin/em-flasher image_directory
```

Be aware of the following **em-flasher** limitations:

1. Only one USB/flash adapter can be connected to the host.
2. **em-flasher** assumes the entire CompactFlash or any other flash medium as one partition.
3. IDE/SATA CompactFlash adapters are not recognized automatically and you must enter the device name when prompted.

## Updating Software with NUU

Concurrent's Network Update Utility (NUU) is a graphical user interface which allows you to install, update and remove RPM packages on a system. The packages are downloaded from a remote yum repository. For more information about NUU, see <http://redhawk.ccur.com/updates/index.html>.

NUU may be used to maintain the software installed in a file system image. NUU is an X-based application. Running X applications under a chroot shell requires the following special X configuration on the host system:

1. Run the **gdmsetup** command and uncheck the box that reads "Deny TCP connections to Xserver" under the "Security" tab.

```
# gdmsetup
```

2. Restart the X server:

```
# killall Xorg
```

3. Run the command:

```
# xhost +
```

## A

### Architect

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