



NightStar LX Installation Guide

Version 4.1

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NightStar's integrated help system is based on Qt's Assistant from Trolltech.

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1.0. Introduction

NightStar LX Version 4.1 is a production release of the NightStar Tools running under Red Hat Enterprise Linux 4 and 5, SUSE Linux Enterprise 10, and openSUSE 10.2.

NightStar LX consists of the NightProbe data monitor, NightTrace event analyzer, NightTune system and application tuner, and the NightView source-level debugger.

The major enhancement in NightStar LX Version 4.1 is the graphical user interface which is based on Qt, allowing users greater flexibility in customizing the layout of each NightStar application. The Qt interface allows the user to maintain multiple tabbed pages that each contain a customizable view of the data and the mechanisms that manipulate that data. Each page is configured using various panels that are movable and resizable allowing the user to configure the display as they desire. In addition, right-clicking the mouse in any of the tools displays a context menu of items related to the area where the mouse is located. See “NightStar LX GUI Features” on page 7 for more details and examples of these features.

NightStar LX no longer includes a kernel as part of its distribution. Previous versions included an enhanced kernel applicable to Red Hat systems which provided performance advantages as well as NightTrace kernel tracing. Kernel tracing is no longer support under NightStar LX unless you are already using the NightStar LX 3.2 enhanced kernel. NightStar LX 4.1 will take still take advantage of that kernel if it is running. Other operating system distributions provide real-time kernels which benefit NightStar. See the “Kernel Dependencies” chapter of any of the NightStar User’s Guides for more information on recommended real-time kernels.

2.0. Software Installation

Follow the instructions under “Installing NightStar LX” on page 2 to install NightStar LX on your system.

Then take a look at “NightStar LX GUI Features” on page 7 to learn about the new graphical interface of the NightStar LX tools.

2.1. Prerequisites

Prerequisites for NightStar LX Version 4.1 for both the host system and target system are as follows:

2.1.1. Host System

Any of the following distributions:

- Red Hat Enterprise 4 (w/ Update 4 or 5)
- Red Hat Enterprise 5
- SUSE Linux Enterprise Desktop 10
- SUSE Linux Enterprise Server 10
- openSUSE 10.2

Any Intel Pentium Xeon or Intel EMT64 or AMD Opteron supported by the operating system distribution.

2.1.2. Target System

Any of the following distributions:

- Red Hat Enterprise 4 (w/ Update 4 or 5)
- Red Hat Enterprise 5
- SUSE Linux Enterprise Desktop 10
- SUSE Linux Enterprise Server 10
- openSUSE 10.2

Any Intel Pentium Xeon or Intel EMT64 or AMD Opteron system supported by the target operating system.

2.2. Installing NightStar LX

There are two methods of installing NightStar LX.

- Network Installation
- CD Image Installation

2.2.1. Network Installation

To install NightStar LX from Concurrent's Software Repository:

- Download the installation bootstrap tar file:

```
wget http://redhawk.ccur.com/nightstar-lx/nightstar-lx.tar.gz
```

- Extract the files from the tar file:

```
tar zxvf nightstar-lx.tar.gz
```

- To complete the installation, you will need to supply an Order Number and an Email Address. If you purchased NightStar LX, provide the order number you received when you purchased it and use the email address you registered at that time. If you would like to evaluate the tools on a trial basis, first register at <http://www.ccur.com/NightStar> to obtain a trial Order Number.

```
cd nightstar-lx; ./install-nstar
```

- Obtain a license key by following the instructions listed under "Obtaining License Keys" on page 5.

2.2.2. CD Image Installation

To install NightStar LX using the *NightStar LX Installation CD*:

- Insert the *NightStar LX Installation CD* in the CD-ROM drive.
- If the CD does not auto-mount, mount the CD-ROM drive (assuming the standard mount entry for the CD-ROM device is `/media/cdrom` in `/etc/fstab`)

```
mount /media/cdrom
```

- Double-click on the CD icon labeled NightStar LX on your desktop.
- Double-click on the icon labeled Launch Install Script.

NOTE

If you are not using a file browser to access the CD, change the current working directory to `/media/cdrom` and invoke the `./install-nstar` script.

The NightStar icons will be installed on root's desktop..

NOTE

Since you are running as root, these icons will only be installed on root's desktop. To install these on your normal user's desktop, run the following script when logged on as your normal user:

```
/usr/lib/NightStar/bin/install_icons
```

2.2.3. Keeping NightStar LX Up To Date

After installation, you can keep your system up to date interactively using NUU (Concurrent's Network Update and Installation Utility) or even install a **cron** job to update your system nightly.

To query Concurrent for updates and optionally install them interactively, invoke NUU:

```
/usr/bin/nuu
```

Once you have successfully entered your authentication information using NUU (your Order Number and your Concurrent-registered Email address), you can set up your system to automatically update.

To automatically update your system nightly with any available NightStar updates, add a line similar to the following to **root**'s cron table (**/usr/bin/crontab -e**):

```
1 0 * * * /usr/bin/yum -y --disablerepo=* --enablerepo=ccur-nstar-lx update
```


2.3. Obtaining License Keys

If you are upgrading from a prior version of NightStar LX, you must obtain new permanent license keys (NightStar LX Version 4.1 uses a different license feature code than in prior releases).

License Key

- If you have purchased NightStar LX or registered as a trial user, you can obtain your license key at the following URL:

<http://www.ccur.com/NightStarRTKeys>

You will need your permanent or trial Order Number, your Email Address, and your System Identification number which was displayed during product installation. You can obtain that number again by running the following command on the system where the license keys will be installed:

```
/usr/bin/ns1m_admin --code
```

See “NightStar LX Licensing” on page 20 for more detailed information about the NightStar License Manager (NSLM).

2.4. Removing NightStar LX

To remove NightStar LX, mount the CD or ISO image as described in “CD Image Installation” on page 3 and execute the following command as root:

```
./uninstall-nstar
```

3.0. Documentation

The following table lists the NightStar LX 4.1 documentation available from Concurrent.

NightStar LX Version 4.1 Documentation

Manual Name	Pub. Number
<i>NightStar LX Installation Guide (Version 4.1)</i>	0897008-4.1
<i>NightStar LX Tutorial (Version 4.1)</i>	0878009-070
<i>NightProbe User's Guide (Version 4.1)</i>	0897465-100
<i>NightTrace User's Guide (Version 7.1)</i>	0897398-160
<i>NightTune User's Guide (Version 3.1)</i>	0897515-030
<i>NightView User's Guide (Version 7.1)</i>	0897395-330

Additionally, the manuals are available:

- in PDF format in the **documentation** directory of the *NightStar LX Installation CD*
- on the Concurrent Computer Corporation web site at http://news.ccur.com/isd_support_documentation.asp

and, after installation:

- online using the NightStar integrated HTML viewer **nhelp**
- in PDF format in the directory **/usr/share/doc/NightStar/pdf**
- in HTML format in the directory **/usr/share/doc/NightStar/html**

4.0. NightStar LX GUI Features

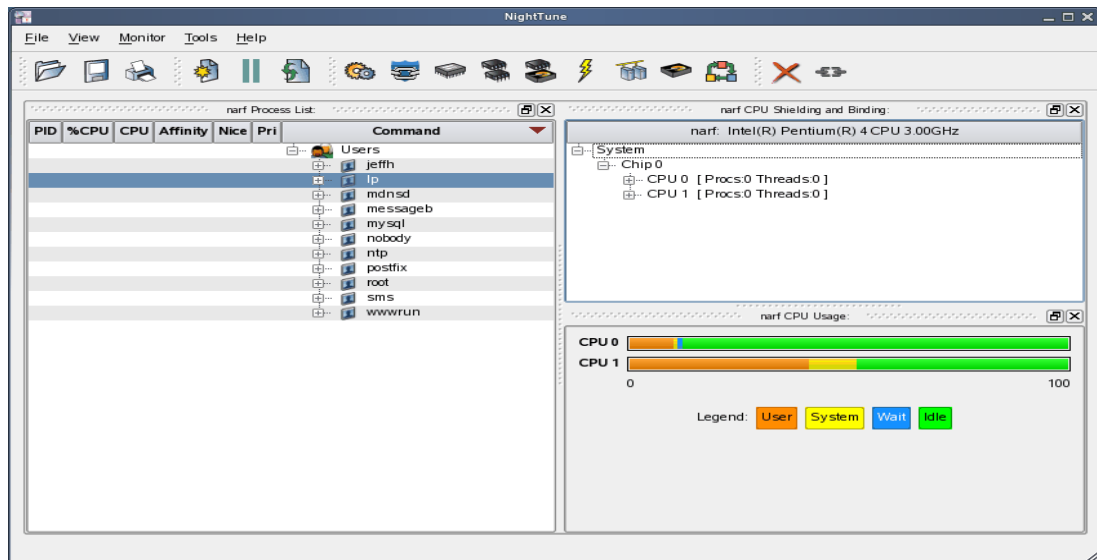
Some of the common features of the NightStar LX Tools graphical user interface include:

- movable and resizable panels
- tabbed pages
- context menus

4.1. Movable and Resizable Panels

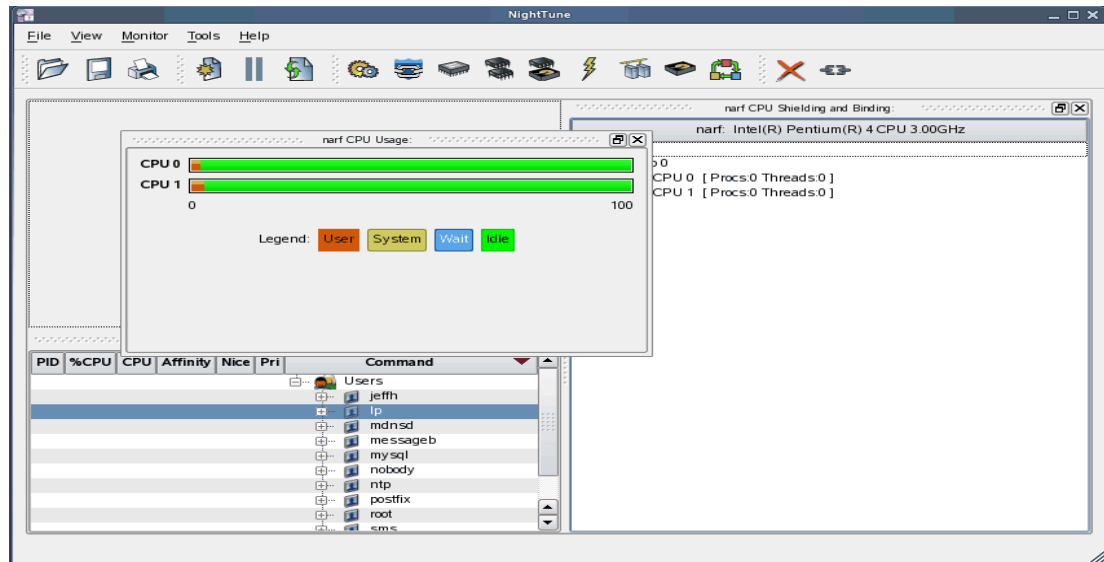
The NightStar LX Tools allow the user flexibility in configuring the graphical user interface to suit their needs through the use of resizable and movable panels.

For instance, consider the default configuration for NightTune. When NightTune is invoked, the graphical user interface looks similar to the following figure:

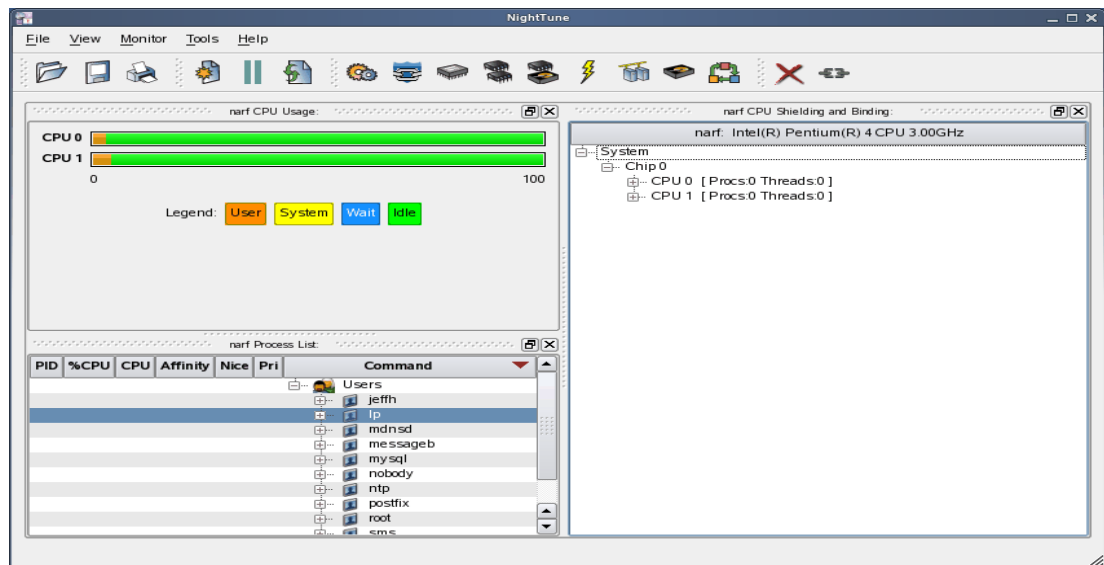


To move one of the panels in the current page, left-click on the title bar for the panel you wish to move and begin to drag the panel to the desired location. The application will respond by creating space on the page based on where you move the panel while resizing and moving the other panels accordingly.

For instance, to move the CPU Usage panel above the Process List panel, left-click on the title bar of the CPU Usage panel and begin to drag it up and to the left. NightTune will respond by creating space above the Process List panel as shown in the figure below:

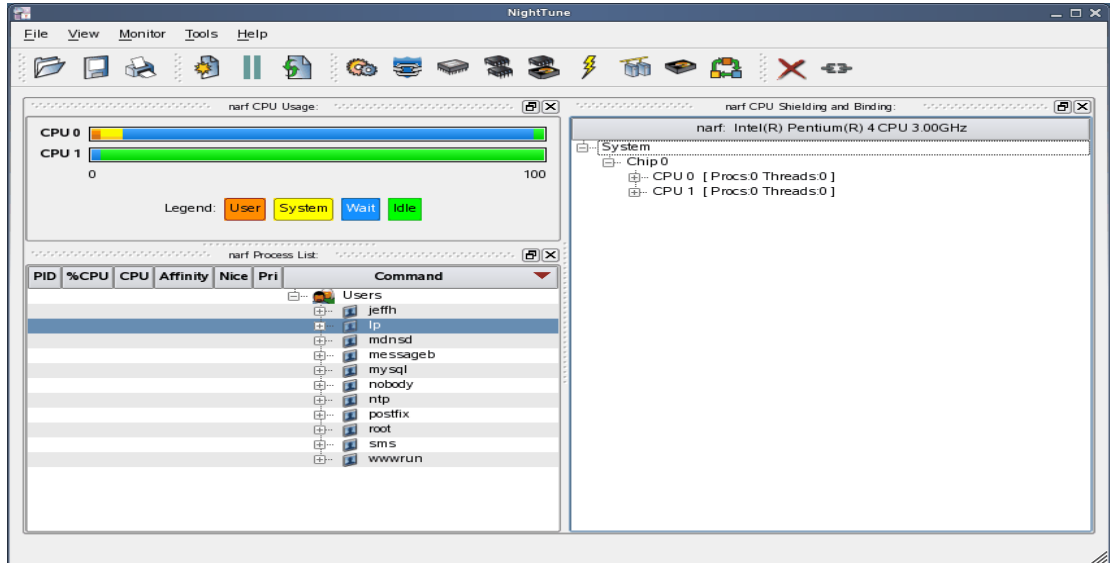


Release the mouse button when NightTune has opened a space where you desire and NightTune will place the panel in that location. The CPU Usage panel now resides in the upper left corner of the NightTune display.



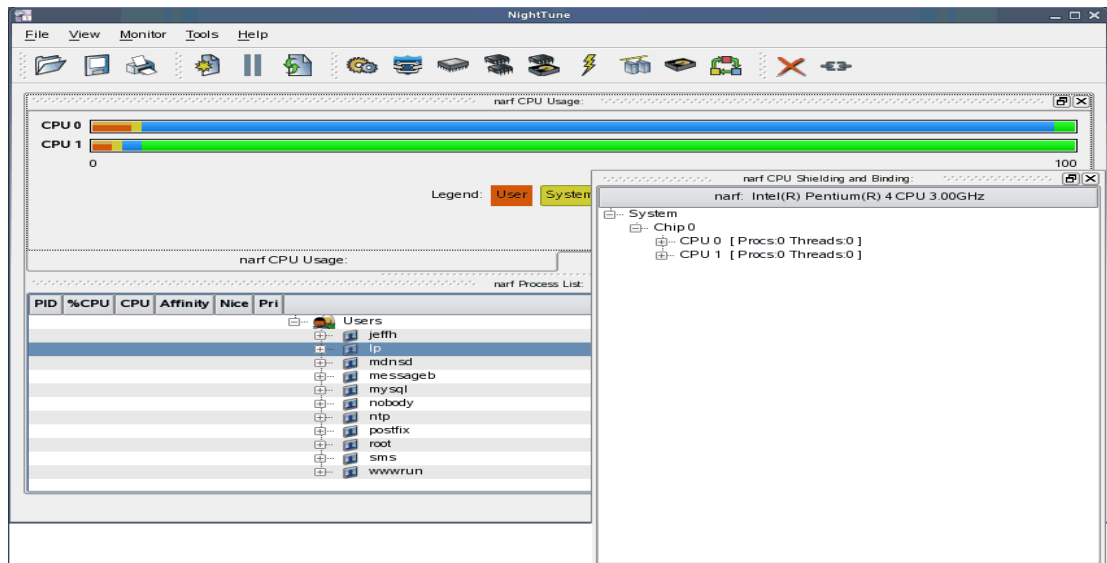
If an empty space does not appear where you desire it, try increasing the size of the main window, decreasing the size of the undocked panel, and moving an alternative edge of the undocked panel near where you want to place it.

Panels can be resized by left-clicking on the separator between the panels and dragging it to the desired size. For instance, to increase the height of the Process List panel (and thereby decrease the height of the CPU Usage panel), left-click on the separator between the two panels (the cursor will become a double-headed arrow) and drag the separator until the panels are the desired size.

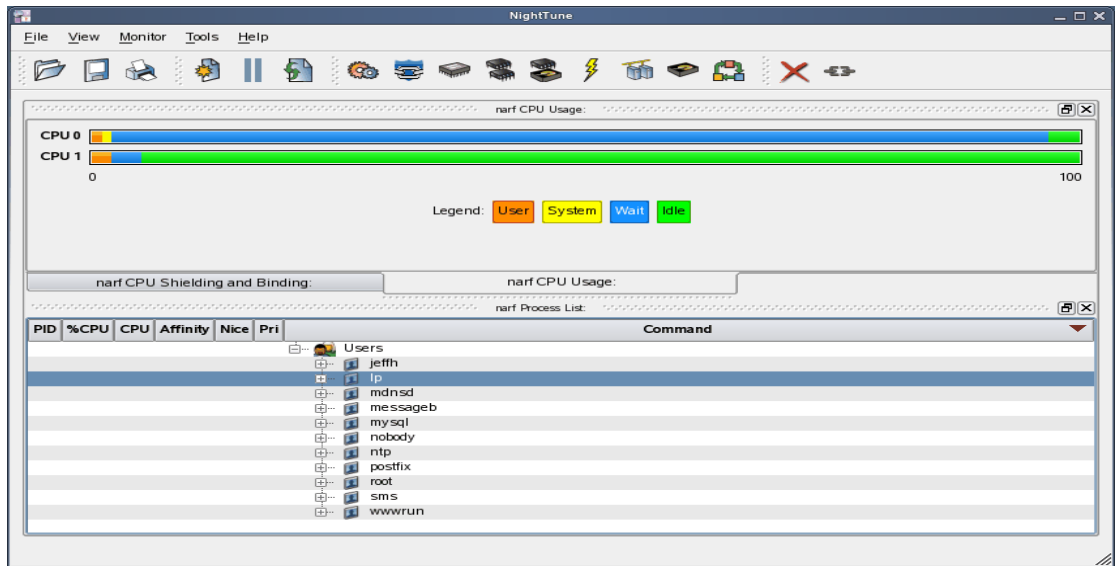


Another feature of the NightStar LX Tools graphical user interface is the use of tabbed panels. Tabbed panels allow you to maximize your GUI real estate by placing two or more panels in the same location. You can then switch between the panels using the tabs created.

In our example, we can configure NightTune so that the CPU Shielding and Binding panel and the CPU Usage panel share the same space. Left-click on the title bar of the CPU Shielding and Binding panel and drag it beneath the CPU Usage panel until you see a tab labeled "CPU Usage" created at the bottom of the CPU Usage panel as shown in the figure below.



Release the mouse button and NightTune places the CPU Shielding and Binding panel in the same location as the CPU Usage panel and creates two tabs underneath enabling you to switch back and forth between the two.

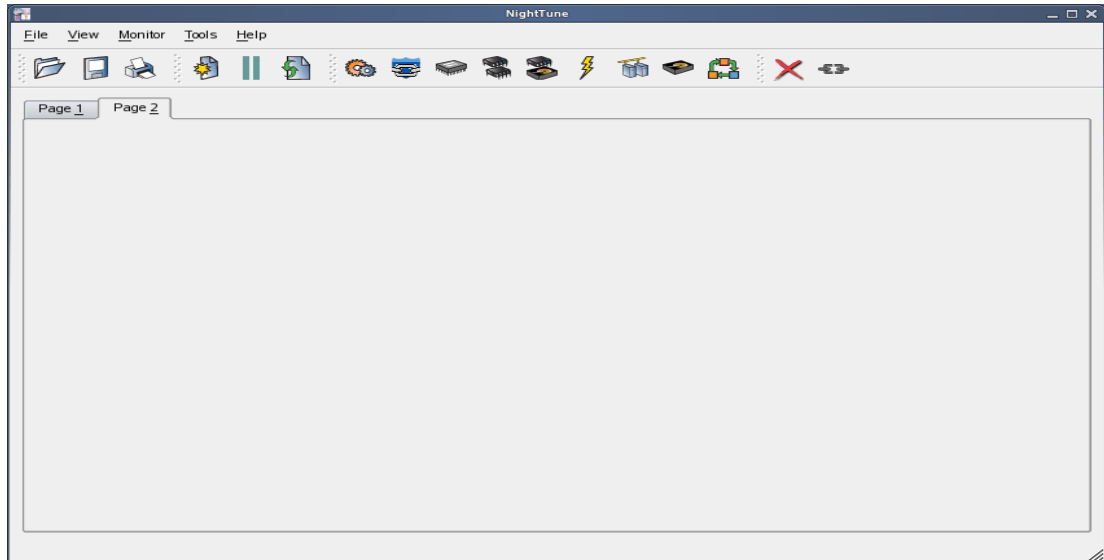


4.2. Tabbed Pages

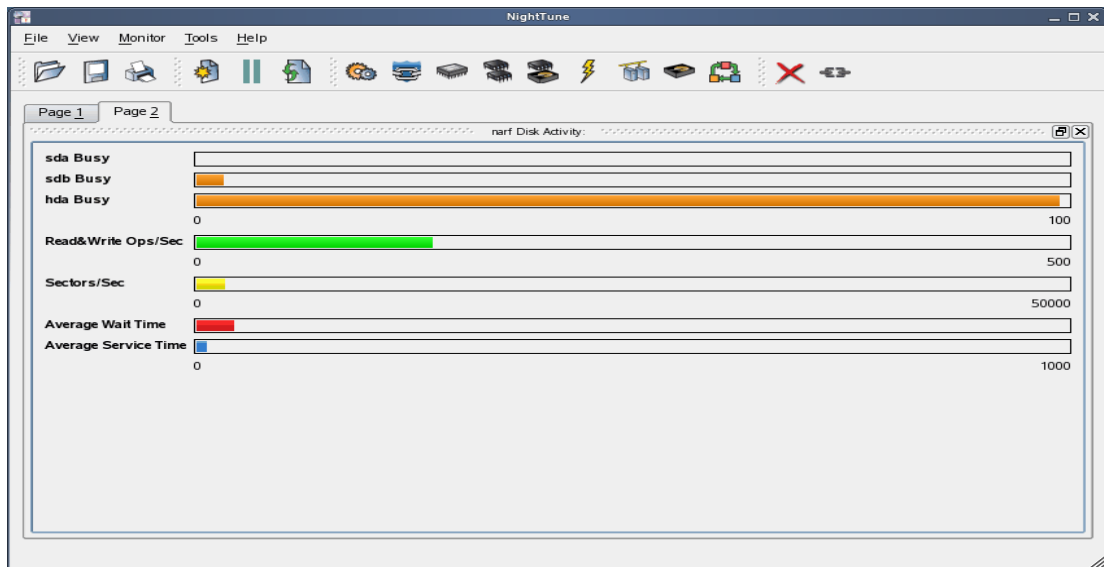
The NightStar LX Tools allow the user to maintain multiple views of data and the mechanisms that manipulate that data within each application through the use of tabbed pages. By default, only one page is displayed when the tool is invoked.

In our NightTune example from the previous section, we can create another page in which to display a different set of data. For instance, perhaps we would like to monitor disk activity, interrupt activity, and memory activity but do not want to clutter up our original page.

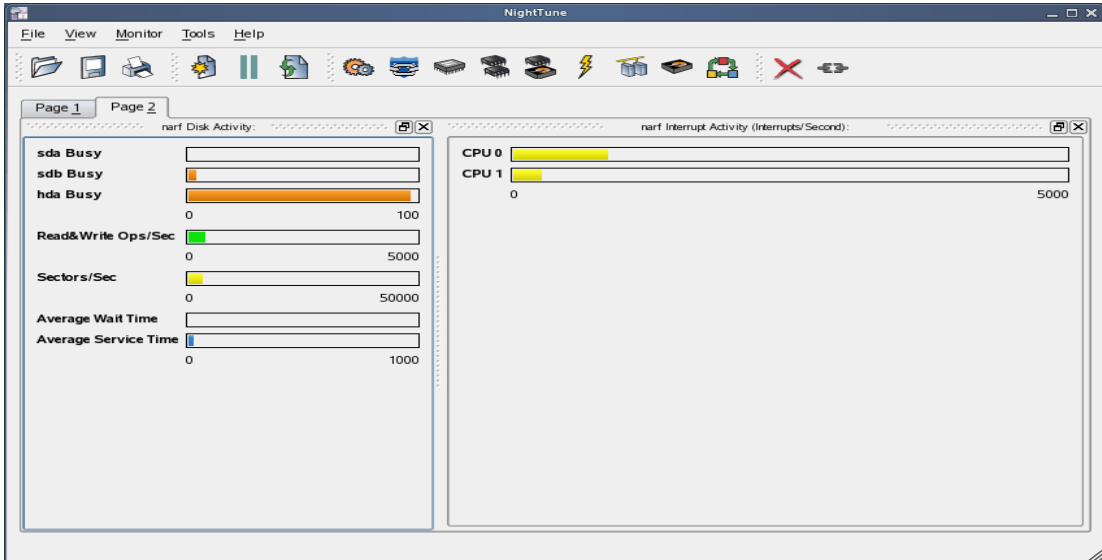
Select **Add Page** from the **View** menu. NightTune will create two tabbed pages; our original page is placed under the first tab and a new empty page will be presented under the second.



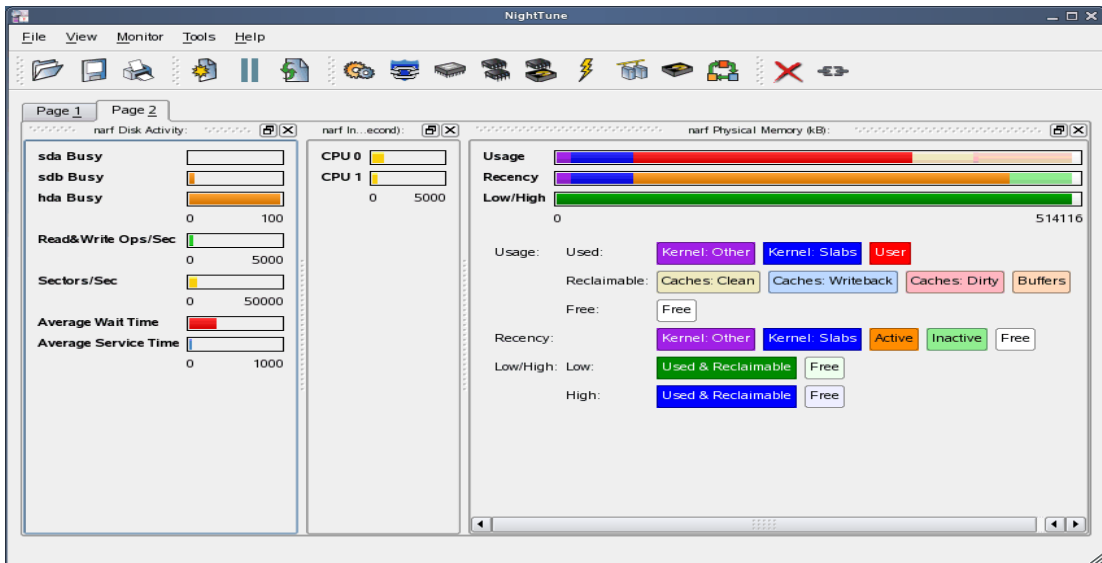
To add the desired NightTune panels, click on the **Monitor** menu item. You will be presented with a menu of panels to choose from. Select the **Disk Activity** menu item and then select **Bar graph** pane from the sub-menu. The **Disk Activity** panel displaying the information in bar graph format is added to our new page.



Select Bar graph pane from the Interrupt Activity sub-menu. The Interrupt Activity panel is added to the page.



Select Bar graph pane from the Memory: Physical sub-menu. The Physical Memory panel is added to the page.



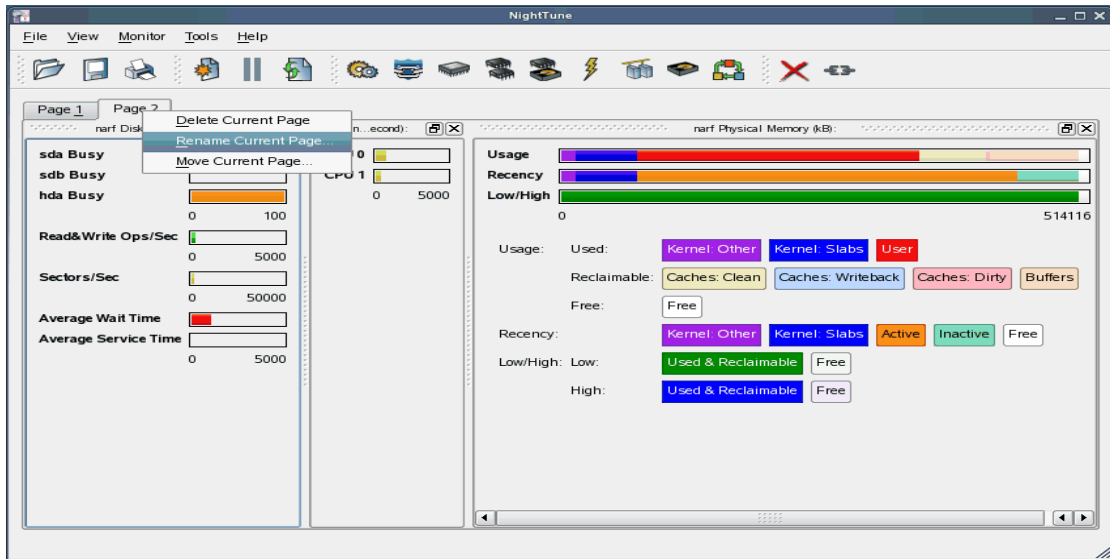
Our new page now contains the Disk Activity, Interrupt Activity, and Physical Memory panels all displaying their information in bar graph format. We can switch back to our first page by clicking on the tab labeled “Page 1” and return to our new page by clicking on the tab labeled “Page 2”.

4.3. Context Menus

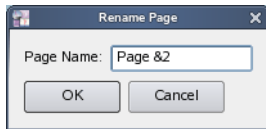
The NightStar LX Tools provide extensive use of context menus. Right-clicking in any of the NightStar LX Tools will provide the user with a menu containing items related to the location of the mouse in the tool.

We can demonstrate this feature using our NightTune example. For instance, perhaps we would like to give our new page that we created in “Tabbed Pages” on page 10 a more meaningful name.

Right-click on the tab labeled “Page 2”. We are presented with a context menu with the menu items Delete Current Page, Rename Current Page..., and Move Current Page....



Select Rename Current Page... from the context menu. The Rename Page dialog is presented.

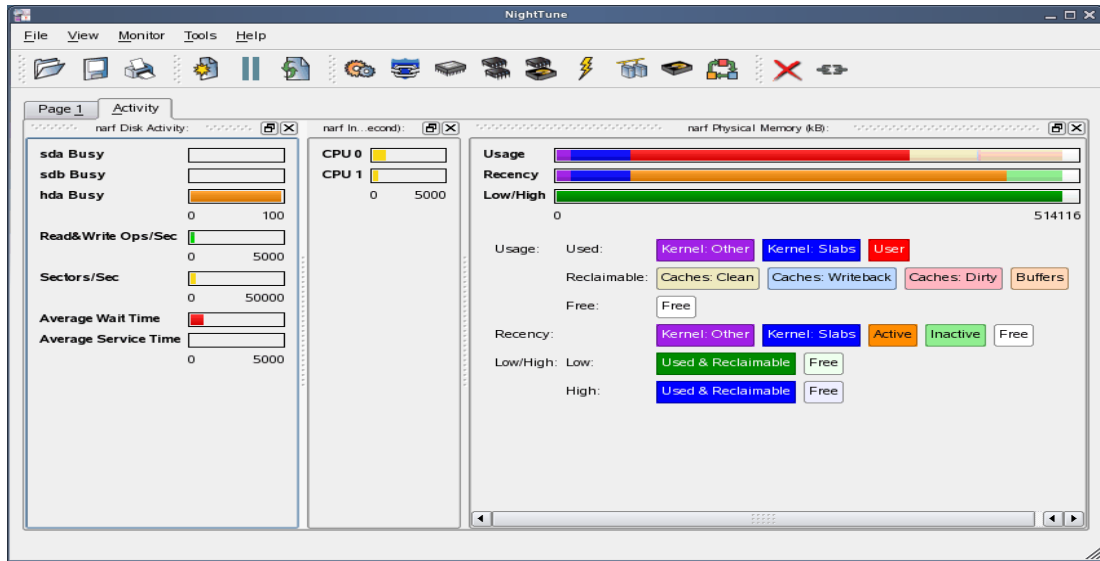


Change the Page Name to “&Activity”.

NOTE

An ampersand (&) before a particular character creates an accelerator for that page. The user can then switch to a particular page by holding down the Alt key and pressing the accelerator for that page. The accelerator is indicated on the tab by an underline.

Press Alt-1 to switch to our original page; press Alt-A to return to our Activity page.



5.0. Overview of NightStar LX

The following sections describe the basic features of each of the NightStar LX tools.

5.1. NightProbe

The features of the NightProbe data monitor include:

- Independent sampling and recording of program data
- Synchronous and asynchronous data capture
- Flexible data display features
- Sampling, recording and replay APIs
- Time stamping of acquired data

NightProbe is a tool for independently monitoring, modifying and recording data values from multiple application resources, including programs, shared memory segments, and memory mapped files.

NightProbe can be used in a development environment for debugging, analysis, proto-typing and fault injection, or in a production environment to create a GUI control panel for program input and output.

Synchronized and Asynchronous Logging

NightProbe can perform synchronous logging of data via a simple API. Asynchronous logging can be performed via on-demand sampling or a cyclic clock rate.

NightProbe provides for logging data items using tracepoints for simultaneous analysis by the NightTrace event analyzer. Sampled data can be combined with additional user trace data to obtain a synchronized picture of application behavior. NightProbe can record data to disk files or provide data directly to the NightTrace tool.

Interactive Sampling and Modification

NightProbe provides a flexible spreadsheet display for on-demand or cyclic sampling of data at user-specified refresh rates. Direct modification of user data is accomplished by typing in new values for data items into the spreadsheet. NightProbe provides colorized notification of violations of user-defined data thresholds for individual data items. NightProbe allows sampled data to be timestamped and passed off to user applications written with the NightProbe API for subsequent analysis, recording or customized display.

NightProbe supports scalar and structured data types in C/C++ and Fortran that have statically-determined addresses and shapes. NightProbe scans the symbol table and debug information of user programs allowing the user to browse for data items or specifically enter the names of data items to be monitored. Any application that contains symbol table and debug information may be used with NightProbe. No application source code changes are required.

5.2. NightTrace

The features of the NightTrace event analyzer include:

- Synchronized graphical or text display of system application activity
- User-defined event logging in single or multi-threaded applications
- Data analysis API
- Application Illumination, featuring automated program instrumentation

NightTrace is a tool for displaying and analyzing the dynamic behavior of applications, the Linux operating system and the interaction between them. NightTrace can log events from multiple processes executing simultaneously on multiple CPUs or systems. NightTrace then creates a graphical time-based view of all logged events. NightTrace allows users to zoom, search, filter, summarize and analyze events. Tracing analysis can be performed live or post execution.

NightTrace was specifically designed to meet the most stringent requirements of time-critical applications. Using synchronized, fast-access hardware clocks and kernel-free primitives, NightTrace tracepoints are logged with minimal overhead. Tracepoints can be inserted into any user application. Tracepoints can be left in production-quality applications even when not collecting trace data.

NightTrace's Application Illumination feature allows you to automatically instrument a user application without making source changes. It allows you to selectively enable or disable tracing for all functions or specific sets of functions and describes the entry and exit of functions, their parameters, and return values.

Graphical and Interactive

NightTrace graphically displays requested events and states along a timeline graph or event log to clearly show the relative timing of events and provide an overall picture of application activity. NightTrace can locate specific events and zoom in on them with a fine degree of granularity for precise timing observation. The NightTrace graphical display is completely user-configurable for customized viewing. Configurations can be saved and later recalled, and multiple configurations can be viewed simultaneously.

NightTrace generates source code using an Analysis API that allows users to easily create custom applications that monitor or analyze application or system activity.

5.3. NightTune

The features of the NightTune system and application tuner include:

- Dynamic display of system and application performance
- Monitoring of CPU use, memory paging and network operation
- Interactive control of processes, priorities, policies and interrupts
- Dynamic CPU affinity control for processes, threads and interrupts

NightTune provides a graphical interface to system facilities for monitoring and tuning application and system performance. Users can monitor the priority, scheduling policy, CPU assignment and CPU usage of user applications. NightTune also monitors system CPU usage, context switches, interrupts, memory paging and network activity.

NightTune can monitor processes individually or in groups determined by user or by CPU. NightTune also displays information about individual threads or tasks within a process. Multiple frames and windows are used to display information allowing users to customize their display.

Application Tuning

NightTune allows users to change the process attributes of an individual thread, task or process or a group of processes as a whole using pop-up dialogs and drag-and-drop actions. For example, dragging a process icon to a CPU icon binds the process to that processor. The user then instantly sees the results of the tuning effort both graphically and as text.

System Tuning

NightTune allows users to change the CPU assignment of interrupts using pop-ups or drag-and-drop actions. NightTune optionally provides a textual log of all application and system tuning actions taking during a NightTune session.

5.4. NightView

The features of the NightView source-level debugger include:

- Multi-system, multi-processor, multi-process, multi-thread debugging via single interface
- Hot patches including breakpoints, monitorpoints and watchpoints
- Application speed conditions
- Dynamic memory “heap” debugging
- Modification and display of variables during execution

NightView allows users to simultaneously debug multiple, time-critical processes. With NightView, a programmer can change program execution and modify or display data without stopping or interrupting the program. Eventpoint conditions, such as hit and ignore counts, are patched directly into an application and can execute at full application speed. NightView provides fine-grained control without adversely affecting application timing.

NightView monitorpoints can display expressions at user-selected locations without stopping a process, thus providing data displays that are synchronized with the application's algorithms. Watchpoints utilize hardware address trap features that cause an application to stop when user-specified variables or memory locations are selectively read or modified.

Language-sensitive Debugging

NightView supports the debugging of multiple applications written in any combination of C/C++ and Fortran. All variables and expressions in each program are referenced in the appropriate language. NightView is also integrated with the NightTrace event analyzer. NightView can insert tracepoints at user-specified locations for concurrent or post execution analysis by NightTrace.

More Powerful Than The Gnu Debugger

NightView offers many features not available in the gnu debugger (**gdb**). Advantages of NightView include the ability for users to debug multiple processes from a single session and processes started from scripts. With NightView, patched-in code runs at full speed. While a process is executing, hot patching can modify variables or add eventpoints. Monitorpoints can display expressions and stack variables, and signals can be sent directly to the process, bypassing the debugger.

Dynamic Memory Debugging

NightView includes an interactive memory debugger that helps find and eliminate memory problems during the debug process without code recompilation. NightView watches for heap memory leaks, monitors the amount of memory an application uses, and tracks how it allocates and frees memory. With its memory debugger enabled, NightView lets users track heap allocations and deallocations in real-time, thus allowing for more efficient debugging than post-run analysis. Programmers can stop execution, check for problems, test patches and then continue debugging. NightView can detect double-frees, dangling pointers, heap area overruns, and other common user application bugs.

6.0. Getting Started

The NightStar Tutorial is highly recommended reading. It provides step-by-step instructions which introduce you to some of the major features of NightStar LX.

After installation, launch the NightStar Help system by typing the following command:

```
/usr/bin/nhelp
```

NightStar's help system is integrated with each of the tools so that you can get context-sensitive help on diagnostic messages or on specific widgets, panels, dialogs or windows.

The help system presents each of the individual User Guides as well as this installation guide and the NightStar Tutorial.

7.0. NightStar LX Licensing

NightStar LX uses the NightStar License Manager (NSLM) to control access to the NightStar LX tools.

License installation requires a licence key provided by Concurrent. The NightStar LX tools request a licence from a license server (see “License Server” on page 21).

Tools are licensed per system, per concurrent user. Concurrent usage of any or all NightStar LX tools by the same user from the same system automatically share a single license. The intent is to allow “*n*” developers to fully utilize all the tools at the same time while only requiring “*n*” licenses. When operating the tools in remote mode, where a tool is launched on a local system but is interacting with a remote system, licenses are required only from the host system.

You can obtain a license report which lists all licenses installed on the local system, current usage, and the expiration date for demo licenses (see “License Reports” on page 21).

7.1. License Keys

Licenses are granted to specific systems.

License installation requires a license key provided by Concurrent.

To obtain a license key, you must provide your system identification code. The System Identification code is generated by the `nslm_admin` utility:

```
nslm_admin --code
```

System identification codes are dependent on system network configurations. Replacing network devices may require you to obtain new license keys.

To obtain a license key, use the following URL and click on the appropriate link:

```
http://www.ccur.com/NightStarRTKeys
```

Provide the requested information, including the System Identification code. Your license key will be immediately emailed to you.

Install the license key using the following command:

```
nslm_admin --install=xxxx-xxxx-xxxx-xxxx-xxxx
```

where `xxxx-xxxx-xxxx-xxxx-xxxx` is the key included in the license acknowledgment email.

IMPORTANT

Both the System Identification code and the license key may contain both upper case “O” characters as well as zero (“0”) characters. Depending on the font in use, they may be almost indistinguishable. Copy and paste techniques are recommended to avoid problems.

If the required information is not readily available, or you have special circumstances, contact Concurrent support (see “Direct Software Support” on page 23 for more information).

7.2. License Server

The NSLM license server is automatically installed and configured to run when you install NightStar LX.

The **nslm** service is automatically activated for run levels 2, 3, 4, and 5. You can check on these settings by issuing the following command:

```
/sbin/chkconfig --list nslm
```

In rare instances, you may need to restart the license server via the following command:

```
/sbin/service nslm restart
```

See **nslm(1)** for more information.

7.3. License Reports

A license report can be obtained using the **nslm_admin** utility.

```
nslm_admin --list
```

lists all licenses installed on the local system, current usage, and expiration date (for demo licenses). Use of the **--verbose** option also lists individual clients to which licenses are currently granted.

See **nslm_admin(1)** for more options and information.

7.4. License Support

For additional aid with licensing issues, contact the Concurrent Software Support Center. See “Direct Software Support” on page 23 for details.

8.0. Architecture Interoperability

The NightStar LX tools were designed to be used in a self-hosted environment as well as remotely, separating the host processing from the time-critical target system.

The following table describes the interoperability of each tool between systems of different architectures.

NightStar Tool	Host	Target	Limitation
NightProbe	Intel	AMD64	No limitations
	AMD64	Intel	No limitations
NightTrace	Intel	AMD64	Not supported
	AMD64	Intel	Not supported
NightTune	Intel	AMD64	No limitations
	AMD64	Intel	No limitations
NightView	Intel	AMD64	Cannot debug 32-bit applications on AMD64 systems
	AMD64	Intel	Cannot execute AMD64 user applications on Intel systems

9.0. Direct Software Support

Software support is available from a central source. If you need assistance or information about your system, please contact the Concurrent Software Support Center at our toll free number 1-800-245-6453. For calls outside the continental United States, the number is 1-954-283-1822. The Software Support Center operates Monday through Friday from 8 a.m. to 5 p.m., Eastern Standard Time.

You may also submit a request for assistance at any time by using the Concurrent Computer Corporation web site at http://www.ccur.com/isd_support_contact.asp or by sending an email to support@ccur.com.

