



# **NightStar LX Installation Guide**

**Version 4.3**

**Red Hat Enterprise Linux**

**CentOS**

**Fedora**

**SUSE Linux Enterprise**

**openSUSE**

**Ubuntu**

**Debian**



**0897008-4.3**  
**February 2013**

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## 1.0. Introduction

NightStar LX Version 4.3 is a production release that runs on the following Linux distributions:

- Red Hat Enterprise Linux 4 through 6
- Fedora 9 through 17
- CentOS 5 and 6
- SUSE Linux Enterprise 10 and 11
- openSUSE 10.2 through 12.2
- Ubuntu 7.10 through 12.10
- Debian 4 through 6.

NightStar LX runs on any Intel Pentium Xeon or Intel EMT64 or AMD Opteron system (all modern “x86” architectures) supported by one of the Linux distributions listed above.

### 1.1. License Models

NightStar LX is available under three licensing models:

- Personnel and non-commercial or Educational Use (without charge)
- Product Evaluation for a limited time (without charge)
- Commercial Use (requires purchase of a license)

Please read the End User License Agreement at <http://redhawk.ccur.com/night-star-lx/download.html>. You must accept the terms of that agreement before installing or using NightStar LX.

### 1.2. Short Introduction to NightStar LX

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

NightStar LX Version 4.3 is a production release which provides major releases of NightView and NightTrace, as well as all updates to NightStar since the last production release.

This release also includes enhanced support for debugging and analyzing 32-bit applications on a 64-bit platform. See “Architecture Interoperability” on page 26 for more details.

See “Overview of NightStar LX” on page 21 for a more complete description of NightStar LX.

#### 1.2.1. New Features In NightView

The following new features were added to NightView 7.4, which is part of this release.

- Added support for debugging 32-bit programs on 64-bit systems.
- Added Smart Printing support which allows users to customize how variables of complex types are shown in the debugger.
- Added support for debugging CUDA code executed by an NVIDIA GPU.

#### NOTE

This feature requires CUDA version 4.3 or higher. The CUDA API, runtime libraries, and required NVIDIA drivers are readily available from NVIDIA.

### 1.2.2. New Features In NightTrace

The following new features were added to NightTrace 7.3, which is a part of this release.

- Extended the range of trace ID numbers to a much larger number space; this is especially useful when using Application Illumination on large amounts of code.
- Added support for analyzing and capturing 32-bit trace data on 64 bit systems.
- Allow analysis of data captured from multiple systems w/o RCIM synchronization. The systems must be synchronized by some means; typically PTP or NTP.
- Search and Summary panels are now dialogs, providing less distraction to timeline and event analysis.
- Added support for Application Illumination function calls summaries in the graphical interface as well as in batch mode. You can obtain a summary of all function calls including their count, their minimum, maximum, and average duration. You can also obtain a detailed table of all the calls for a single function.
- Formalized the Auxiliary API which allows you to translate any data into NightTrace format for subsequent analysis with `ntrace`; see `/usr/include/ntrace_aux.h`.
- Added the ability to graph condition gaps.

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## 2.0. Installing NightStar LX

This section provides instructions for Installing NightStar LX, organized by the packaging mechanism used by the various supported Linux distributions.

- Instructions for Debian and Ubuntu
- Instructions for Red Hat, Fedora, and CentOS
- Instructions for SUSE Systems

### 2.1. Instructions for Debian and Ubuntu

Two installation methods are available:

- Network Installation on Debian and Ubuntu Systems
- CD Installation on Debian and Ubuntu Systems

#### 2.1.1. Network Installation on Debian and Ubuntu Systems

- Download the bootstrap package file and install it via the following commands:

```
wget http://redhawk.ccur.com/nightstar-lx/\
    ccur-nstar-lx-repo-4.3-1.all.deb
sudo dpkg -i ccur-nstar-lx-repo-4.3-1.all.deb
```

- Ensure that the standard Debian or Ubuntu repositories are included in `/etc/apt/sources.list`. They may look similar to one of the following:

```
deb http://archive.ubuntu.com/ubuntu/gutys main universe
deb http://ftp.debian.org/debian/ etch main
```

NightStar LX requires installation of the `compat-libstdc++` package, which will be accessible (if not already installed) if the appropriate line shown above is present in `/etc/apt/sources.list`.

#### NOTE

The distribution code names (e.g. `gutys`, `etch`, `lenny`, etc.) will vary, depending on your version of Ubuntu or Debian.

- Complete the installation via the following commands:

```
sudo apt-get update
sudo apt-get install ccur-nightstar-lx
```

- Optionally place NightStar icons on your desktop by executing the following command, **as your normal user, not root**:

```
/usr/lib/NightStar/bin/install-icons
```

If you do not wish to place these icons on your desktop, you can launch the tools via the Gnome or KDE “Programming” menu, or run the following commands:

```
/usr/bin/nhelp # (Documentation)
/usr/bin/ntune # (System & Process Activity Monitor)
/usr/bin/nview # (Application Debugger)
/usr/bin/nprobe # (Application Data Monitor and Recorder)
/usr/bin/ntrace # (Application Trace & Analysis)
```

Installation of NightStar LX is now complete.

## 2.1.2. CD Installation on Debian and Ubuntu Systems

- Obtain the NightStar CD from Concurrent’s Software Distribution center (see “Direct Software Support” on page 29 for contact information) or simply download it from Concurrent’s web site:

<http://redhawk.ccur.com/nightstar-lx/download.html>

- Ensure that the standard Debian or Ubuntu repositories are included in `/etc/apt/sources.list`. They may look similar to one of the following:

```
deb http://archive.ubuntu.com/ubuntu/gutys main universe
deb http://ftp.debian.org/debian/ etch main
```

### NOTE

The distribution code names (e.g. gutys, etch, lenny, squeeze, etc.) will vary, depending on your version of Ubuntu or Debian.

- Mount the CD or ISO9660 CD Image (e.g. if mounting the CD image)

```
sudo mkdir /mnt/nstar-lx
sudo mount -o loop nstar-lx-4.3.iso /mnt/nstar-lx
```

- Change the current working directory to the mount point of the CD or CD image:

```
cd /mnt/nstar-lx # or the actual mount point of the CD
```

- Run the install script as the root user:

```
sudo ./install-nstar
```

- Optionally place NightStar icons on your desktop by executing the following command, as your normal user, not root:

```
/usr/lib/NightStar/bin/install-icons
```

If you do not wish to place these icons on your desktop, you can launch the tools via the Gnome or KDE “Programming” menu, or run the following commands:

```
/usr/bin/nhelp # (Documentation)
/usr/bin/ntune # (System & Process Activity Monitor)
/usr/bin/nview # (Application Debugger)
```



```
/usr/bin/nprobe # (Application Data Monitor and Recorder)
/usr/bin/ntrace # (Application Trace & Analysis)
```

Installation of NightStar LX is now complete.

## 2.2. Instructions for Red Hat, Fedora, and CentOS

Two installation methods are available:

- Network Installation on Red Hat, Fedora, and CentOS Systems
- CD Installation on Red Hat, Fedora, and CentOS Systems

### 2.2.1. Network Installation on Red Hat, Fedora, and CentOS Systems

- Download the bootstrap package file and install it via the following commands:

```
wget http://redhawk.ccur.com/nightstar-lx/\
    ccur-nstar-lx-redhat-repo-4.3-1.noarch.rpm
sudo rpm -Uvh ccur-nstar-lx-redhat-repo-4.3-1.noarch.rpm
```

Installation of that RPM requires that you have YUM installed. YUM comes standard with Red Hat, Fedora, and CentOS distributions so you likely have it installed or can locate it on your distribution installation media. If you do not have YUM or cannot locate it, use the CD installation method instead.

- Complete the installation via the following commands:

```
sudo yum install ccur-NightStar-LX
```

- Optionally place NightStar icons on your desktop by executing the following command, **as your normal user, not root**:

```
/usr/lib/NightStar/bin/install-icons
```

If you do not wish to place these icons on your desktop, you can launch the tools via the Gnome or KDE “Programming” menu, or run the following commands:

```
/usr/bin/nhelp # (Documentation)
/usr/bin/ntune # (System & Process Activity Monitor)
/usr/bin/nview # (Application Debugger)
/usr/bin/nprobe # (Application Data Monitor and Recorder)
/usr/bin/ntrace # (Application Trace & Analysis)
```

Installation of NightStar LX is now complete.

### 2.2.2. CD Installation on Red Hat, Fedora, and CentOS Systems

- Obtain the NightStar CD from Concurrent’s Software Distribution center (see “Direct Software Support” on page 29 for contact information) or simply download it from Concurrent’s web site:

<http://redhawk.ccur.com/nightstar-lx/download.html>

- Mount the CD or ISO9660 CD Image (e.g. if mounting the CD image)

```
sudo mkdir /mnt/nstar-lx
sudo mount -o loop nstar-lx-4.3.iso /mnt/nstar-lx
```

- Change the current working directory to the mount point of the CD or CD image:

```
cd /mnt/nstar-lx # or the actual mount point of the CD
```

- Ensure that the compat-libstdc++ RPM is installed:

```
rpm -qa 'compat-libstdc++'
```

If your system does not have a version of **compat-libstdc++** installed, locate the RPM on your installation media, or if you have network repositories defined for your distribution, you may be able to find an RPM using the following command:

```
yum search compat-libstdc++
```

If you do locate the RPM using that **yum** command, install it with **yum**, replacing the package name below with the most recent of the packages found by the previous search command; e.g.:

```
sudo yum install compat-libstdc++-33
```

If you located the RPM on your installation media, install it with the following command:

```
sudo rpm -Uvh ${path_to}/compat-libstdc++*.rpm
```

- Run the install script as the root user:

```
sudo ./install-nstar
```

## NOTE

On some systems that automatically mount CD media, the CD is mounted without execute permission. If that is the case, execution of the above command will fail immediately (likely with an error similar to “*not found*”). You can remount the CD with execute permissions via a command similar to the following (replacing **/media/cdrom** with the actual mount point):

```
sudo mount -o remount,exec /media/cdrom
```

- Optionally place NightStar icons on your desktop by executing the following command, **as your normal user, not root**:

```
/usr/lib/NightStar/bin/install-icons
```

If you do not wish to place these icons on your desktop, you can launch the tools via the Gnome or KDE “Programming” menu, or run the following commands:

```
/usr/bin/nhelp # (Documentation)
/usr/bin/ntune # (System & Process Activity Monitor)
/usr/bin/nview # (Application Debugger)
/usr/bin/nprobe # (Application Data Monitor and Recorder)
```

```
/usr/bin/ntrace # (Application Trace & Analysis)
```

Installation of NightStar LX is now complete.

## 2.3. Instructions for SUSE Systems

Two installation methods are available:

- Network Installation on SUSE Systems
- CD Installation on SUSE Systems

### 2.3.1. Network Installation on SUSE Systems

The instructions for installing NightStar LX on SUSE depend on the version of SUSE you have. Select the most appropriate section below based on your SUSE version (which you can determine via: `cat /etc/SuSE-release`).

#### 2.3.1.1. Versions SLES/SLED 11, openSUSE 11.1 or later

- Download the bootstrap package file and install it via the following commands:

```
http://redhawk.ccur.com/nightstar-lx/ccur-nstar-lx-suse.repo
```

```
sudo zypper ar --repo=ccur-su-nstar-lx-suse.repo
```

- Complete the installation via the following command:

```
sudo zypper install -t package ccur-su-NightStar-LX
```

- Optionally place NightStar icons on your desktop by executing the following command, **as your normal user, not root**:

```
/usr/lib/NightStar/bin/install-icons
```

If you do not wish to place these icons on your desktop, you can launch the tools via the Gnome or KDE “Programming” menu, or run the following commands:

```
/usr/bin/nhelp # (Documentation)
```

```
/usr/bin/ntune # (System & Process Activity Monitor)
```

```
/usr/bin/nview # (Application Debugger)
```

```
/usr/bin/nprobe # (Application Data Monitor and Recorder)
```

```
/usr/bin/ntrace # (Application Trace & Analysis)
```

Installation of NightStar LX is now complete.

#### 2.3.1.2. All Other SUSE Versions

- Ensure YUM is installed on your system:

```
rpm -q yum
```

If **yum** is not installed, you may be able to install it via the following command:

```
sudo zypper install yum
```

If **yum** is not installed and you cannot install it, use the CD installation method instead.

- Download the bootstrap package file and install it via the following commands:

```
wget http://redhawk.ccur.com/nightstar-lx/\
    ccur-su-nstar-lx-suse-repo-4.3-1.noarch.rpm
sudo rpm -Uvh ccur-su-nstar-lx-suse-repo-4.3-1.noarch.rpm
```

- Complete the installation via the following command:

```
sudo yum install ccur-su-NightStar-LX
```

- Optionally place NightStar icons on your desktop by executing the following command, **as your normal user, not root**:

```
/usr/lib/NightStar/bin/install-icons
```

If you do not wish to place these icons on your desktop, you can launch the tools via the Gnome or KDE “Programming” menu, or run the following commands:

```
/usr/bin/nhelp # (Documentation)
/usr/bin/ntune # (System & Process Activity Monitor)
/usr/bin/nview # (Application Debugger)
/usr/bin/nprobe # (Application Data Monitor and Recorder)
/usr/bin/ntrace # (Application Trace & Analysis)
```

Installation of NightStar LX is now complete.

### 2.3.2. CD Installation on SUSE Systems

Obtain the NightStar CD from Concurrent’s Software Distribution center (see “Direct Software Support” on page 29 for contact information) or simply download it from Concurrent’s web site:

<http://redhawk.ccur.com/nightstar-lx/download.html>

- Mount the CD or ISO9660 CD Image (e.g. if mounting the CD image)

```
sudo mkdir /mnt/nstar-lx
sudo mount -o loop nstar-lx-4.3.iso /mnt/nstar-lx
```

- Change the current working directory to the mount point of the CD or CD image:

```
cd /mnt/nstar-lx # or the actual mount point of the CD
```

- Run the install script as the root user:

```
sudo ./install-nstar
```

## NOTE

On some systems that automatically mount CD media, the CD is mounted without execute permission. If that is the case, execution of the above command will fail immediately (likely with an error similar to “*not found*”). You can remount the CD with execute permissions via a command similar to the following (replacing `/media/cdrom` with the actual mount point):

```
sudo mount -o remount,exec /media/cdrom
```

- Optionally place NightStar icons on your desktop by executing the following command, **as your normal user, not root**:

```
/usr/lib/NightStar/bin/install-icons
```

If you do not wish to place these icons on your desktop, you can launch the tools via the Gnome or KDE “Programming” menu, or run the following commands:

```
/usr/bin/nhelp # (Documentation)
/usr/bin/ntune # (System & Process Activity Monitor)
/usr/bin/nview # (Application Debugger)
/usr/bin/nprobe # (Application Data Monitor and Recorder)
/usr/bin/ntrace # (Application Trace & Analysis)
```

Installation of NightStar LX is now complete.

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## 3.0. Product Updates

You must have purchased a commercial license or a support contract in order to download product updates.

After installation, you can keep your NightStar LX product up to date interactively by referencing Concurrent's software repositories which are updated as product updates become available.

To configure your system for NightStar LX software updates via the network, follow the "Network" installation procedure that matches your system in the previous chapter. Once the network repository definition is added to your system, stay up to date using one of the following techniques.

### Debian and Ubuntu Systems

The network repository location has changed since the last CD was released. Please update your `/etc/apt/source.list` file with the new location by installing this package:

```
wget http://redhawk.ccur.com/nightstar-lx/\
    ccur-nstar-lx-repo-4.3-1.all.deb
sudo dpkg -i ccur-nstar-lx-repo-4.3-1.all.deb
sudo apt-get update
```

#### NOTE

Alternatively, you can update the repository location manually in `/etc/apt/sources.list` or use **synaptic** or **adept**. The proper entry is "deb http://redhawk.ccur.com/debian/nightstar 4.3 lx", without the quotes. Make sure you reload the repository database before proceeding below (e.g. press the **Reload** button or run **apt-get update**).

Using **synaptic** or **adept**, search for all packages matching the pattern `ccur-*` and mark them for *upgrade* and *Apply* the action.

Alternatively, you can use **apt-get** to update all NightStar LX packages with the following command:

```
apt-get install '^ccur-*
```

### Red Hat, Fedora, and CentOS Systems

You can use **yum** to update all NightStar LX packages with the following command:

```
yum --disablerepo=* --enablerepo=ccur-nstar-lx update
```

## SUSE Systems

You can use **zypper** to update all NightStar LX packages with the following command:

```
zypper update -t package --repo ccur-nstar-lx
```

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## 4.0. Documentation

The following table lists the NightStar LX Version 4.3 documentation available from Concurrent.

**Table 4-1. NightStar LX Version 4.3 Documentation**

Manual Name	Pub. Number
<i>NightStar LX Installation Guide (Version 34.3)</i>	0897008-4.3
<i>NightStar LX Tutorial (Version 4.3)</i>	0897009-080
<i>NightProbe User's Guide (Version 4.2)</i>	0897465-108
<i>NightTrace User's Guide (Version 7.3)</i>	0897398-180
<i>NightTune User's Guide (Version 3.5)</i>	0897515-043
<i>NightView User's Guide (Version 7.4)</i>	0897395-350

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://redhawk.ccur.com/docs>

and, after installation:

- using the NightStar integrated HTML online help from the **Help** menu of any NightStar tool
- in PDF format in the directory **/usr/share/doc/NightStar/pdf**
- in HTML format in the directory **/usr/share/doc/NightStar/html**



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## 5.0. NightStar LX GUI Features

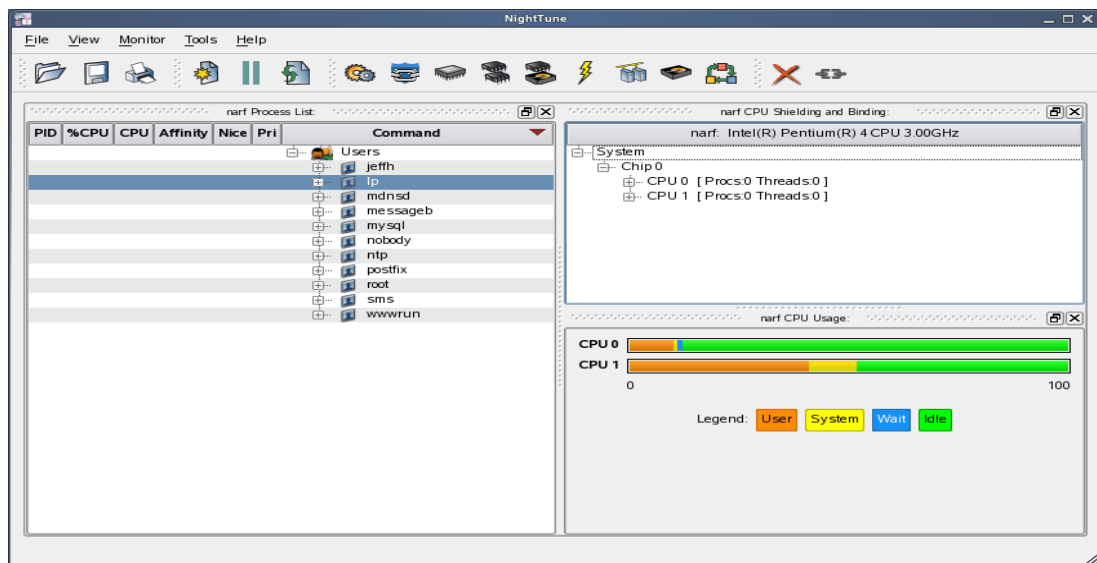
Some of the common features of the NightStar LX Tools graphical user interface include:

- movable and resizable panels
- tabbed pages
- context menus

### 5.1. Movable and Resizable Panels

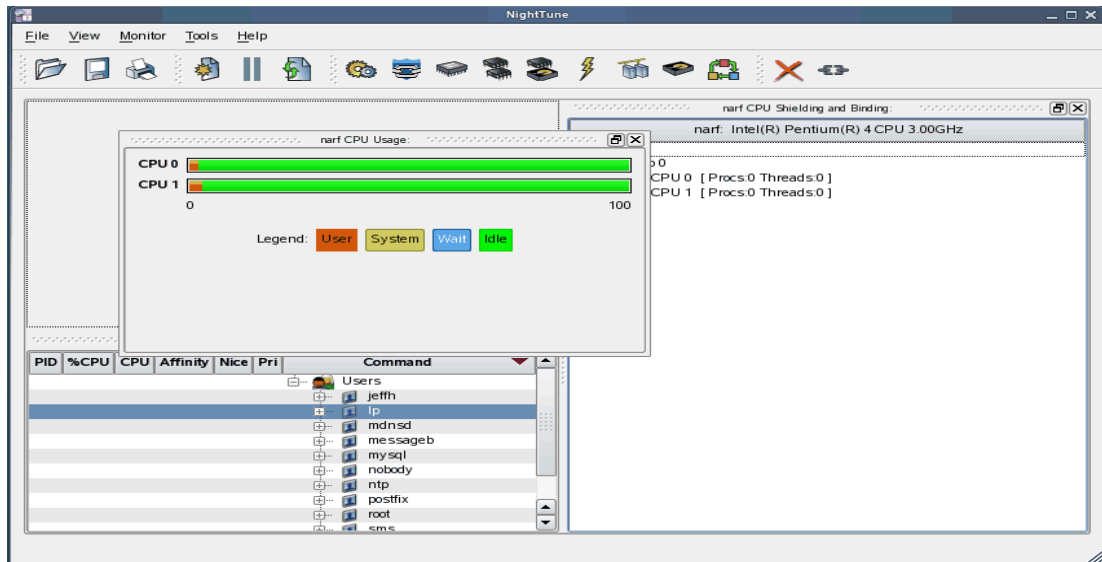
The NightStar LX Tools allow the user flexibility in configuring the graphical user interface to suit their needs through the use of resizable and movable panels.

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

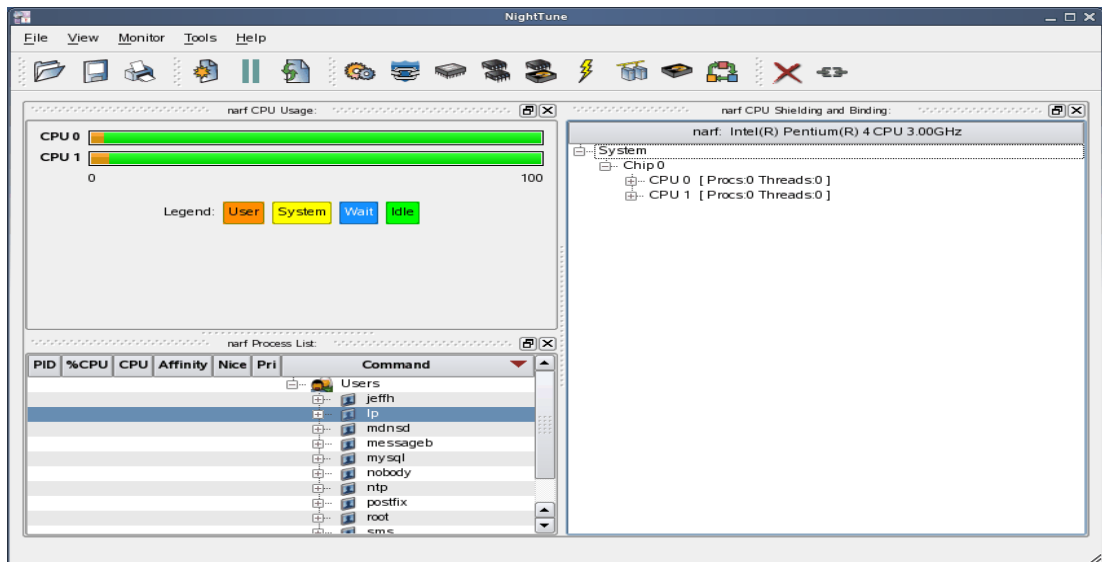


To move one of the panels in the current page, left-click on the title bar for the panel you wish to move and begin to drag the panel to the desired location. The application will respond by creating space on the page based on where you move the panel while resizing and moving the other panels accordingly.

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:

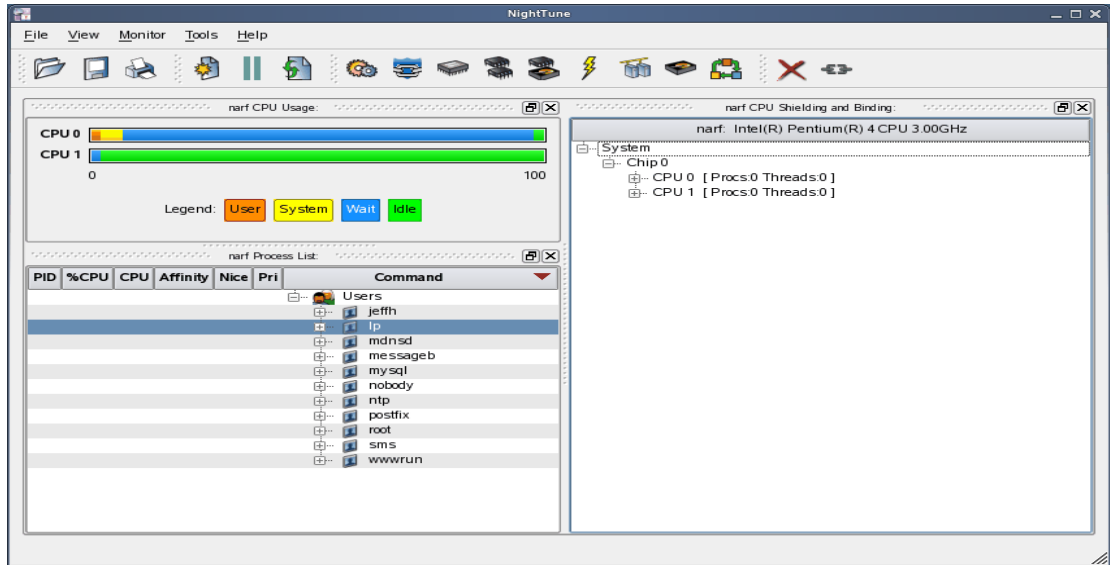


Release the mouse button when NightTune has opened a space where you desire and NightTune will place the panel in that location. The CPU Usage panel now resides in the upper left corner of the NightTune display:



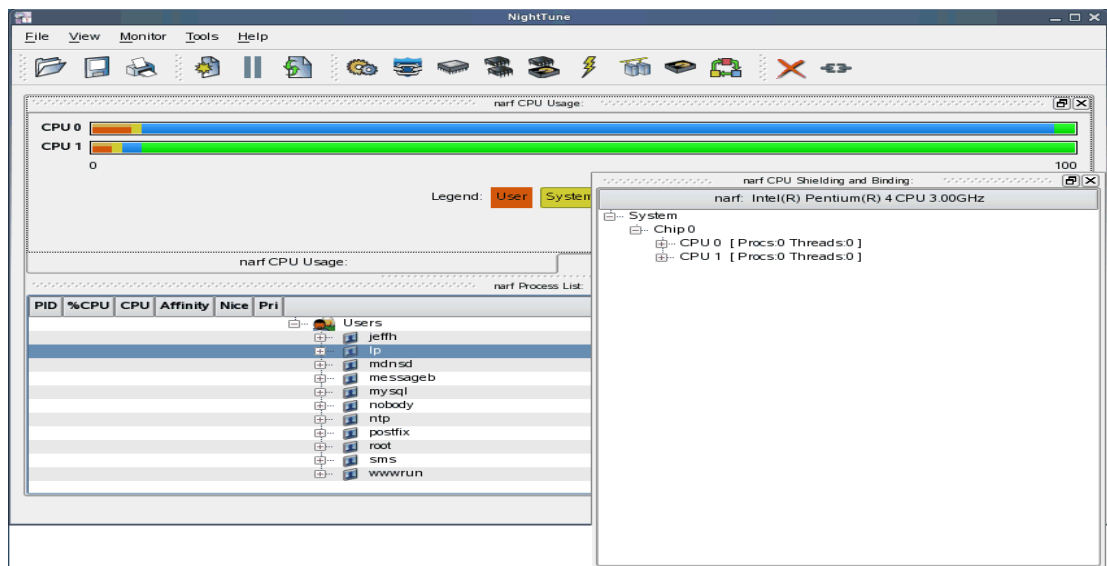
If an empty space does not appear where you desire it, try increasing the size of the main window, decreasing the size of the undocked panel, and moving an alternative edge of the undocked panel near where you want to place it.

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.

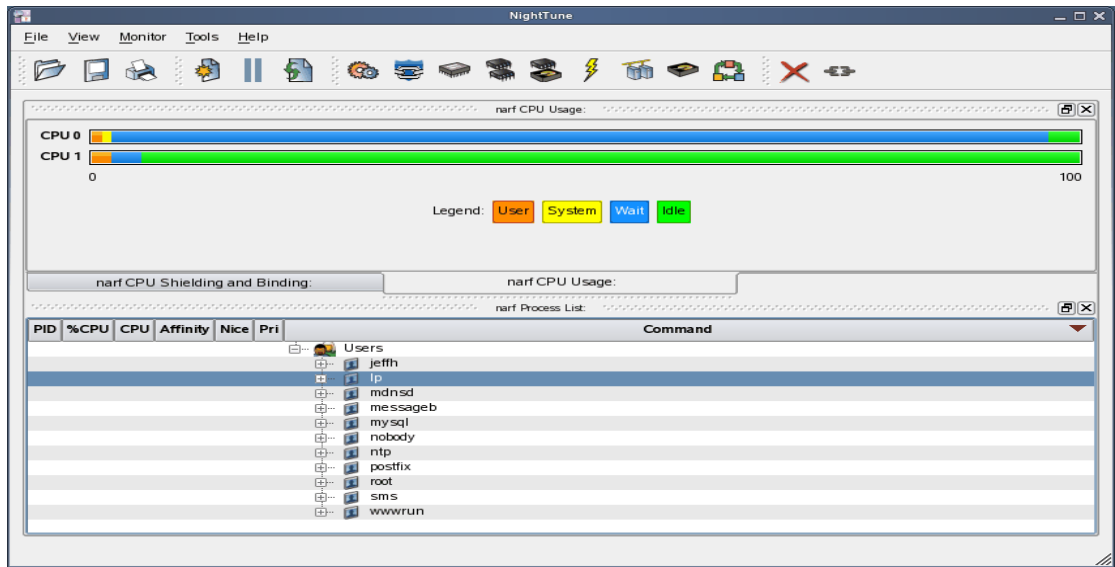


Another feature of the NightStar LX Tools graphical user interface is the use of tabbed panels. Tabbed panels allow you to maximize your GUI real estate by placing two or more panels in the same location. You can then switch between the panels using the tabs created.

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:

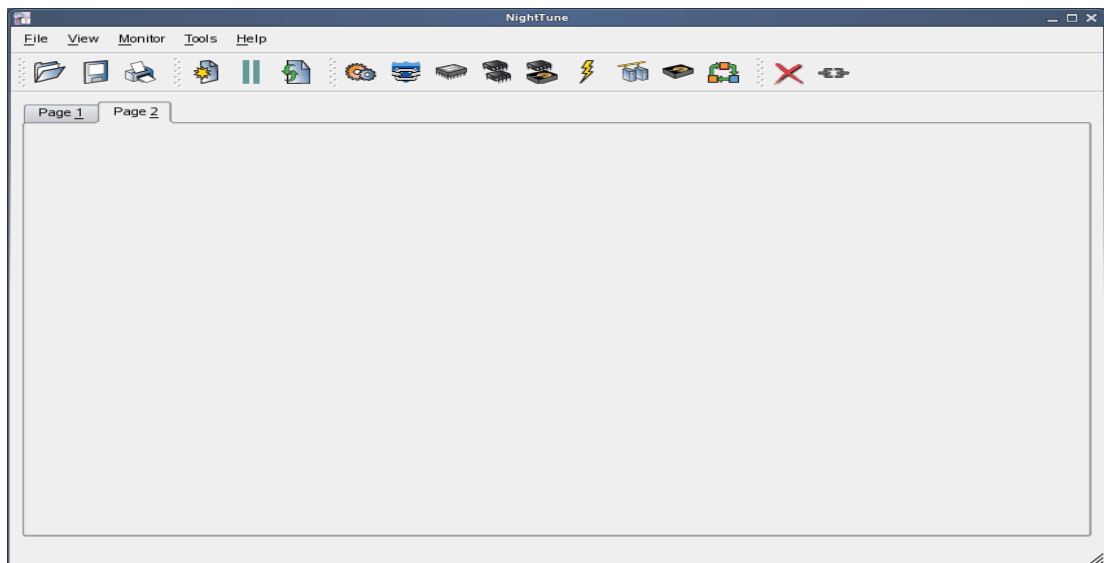


## 5.2. Tabbed Pages

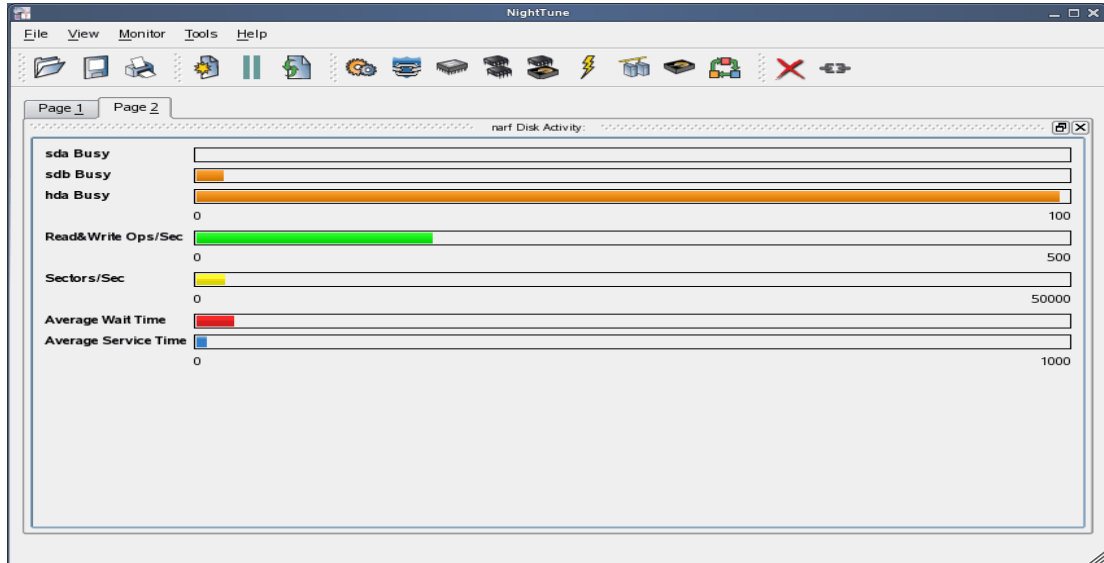
The NightStar LX Tools allow the user to maintain multiple views of data and the mechanisms that manipulate that data within each application through the use of tabbed pages. By default, only one page is displayed when the tool is invoked.

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.

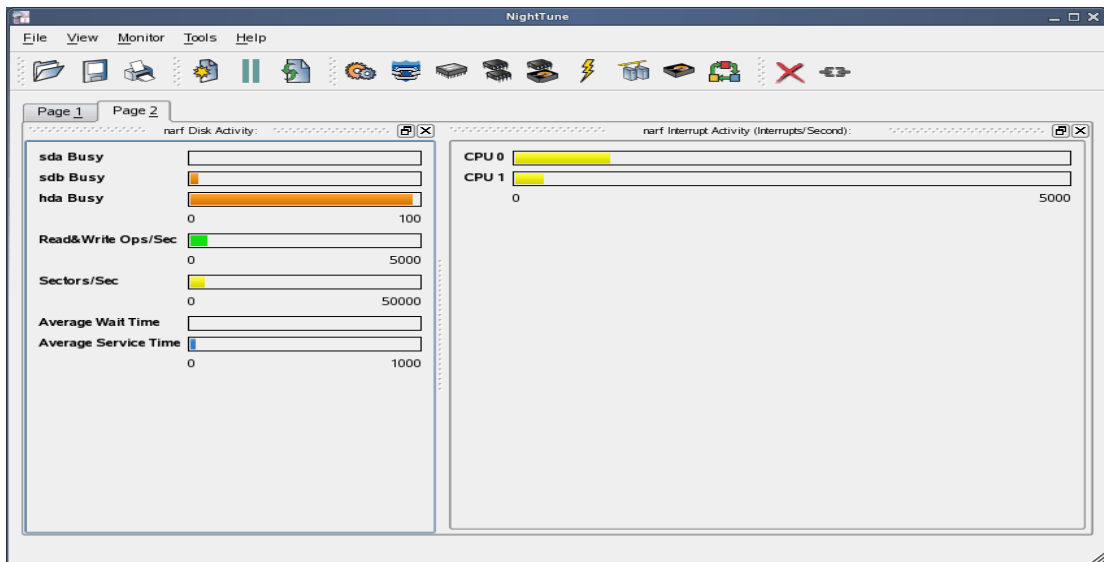
Select **Add Page** from the **View** menu. NightTune will create two tabbed pages; our original page is placed under the first tab and a new empty page will be presented under the second:



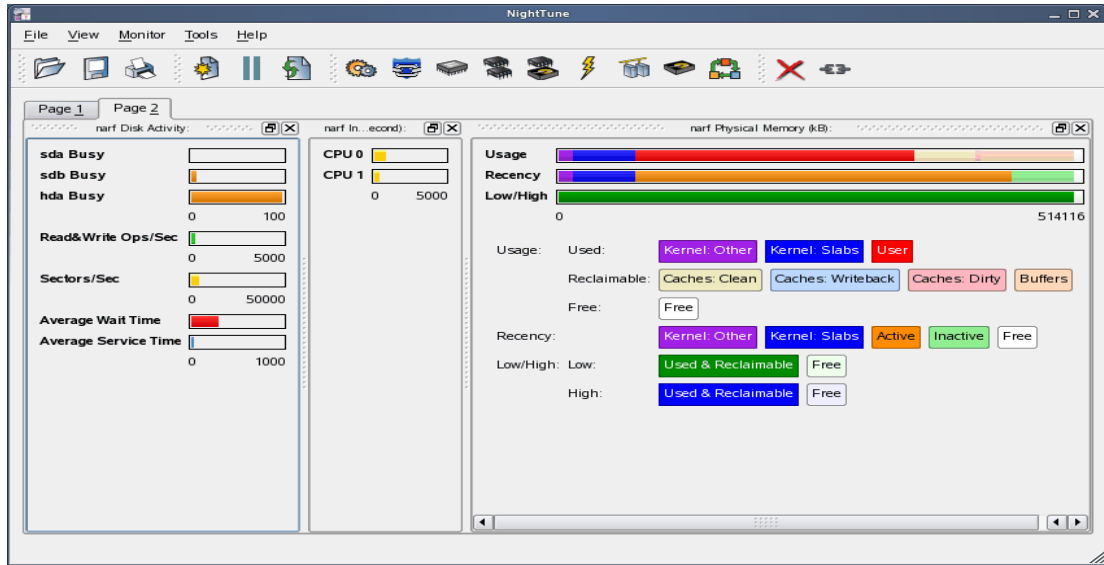
To add the desired NightTune panels, click on the Monitor menu item. You will be presented with a menu of panels to choose from. Select the Disk Activity menu item and then select Bar graph pane from the sub-menu. The Disk Activity panel displaying the information in bar graph format is added to our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



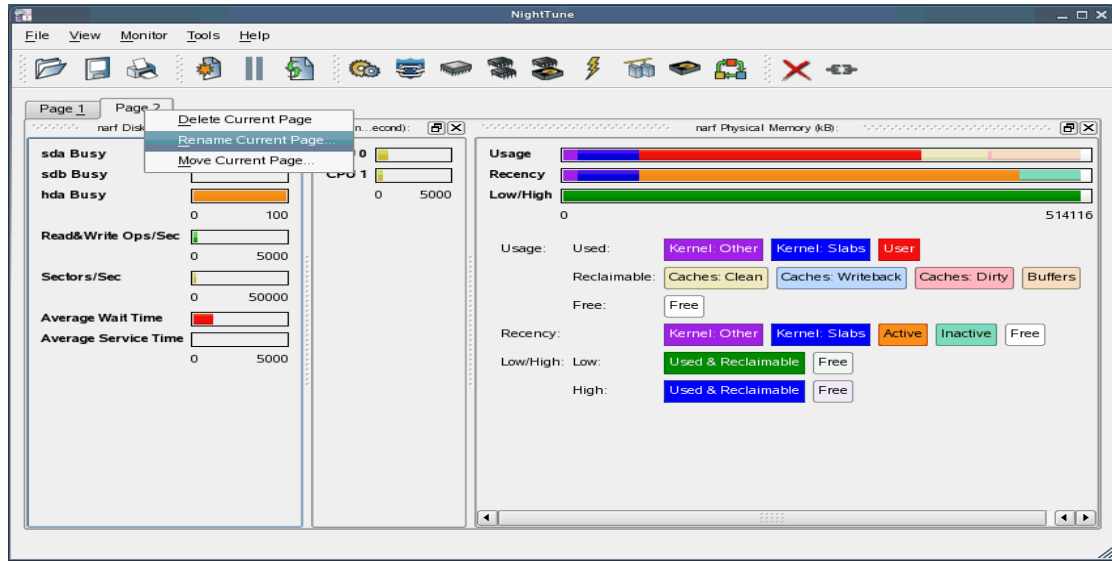
Our new page now contains the Disk Activity, Interrupt Activity, and Physical Memory panels all displaying their information in bar graph format. We can switch back to our first page by clicking on the tab labeled “Page 1” and return to our new page by clicking on the tab labeled “Page 2”.

### 5.3. Context Menus

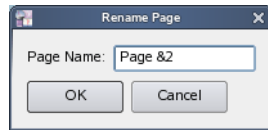
The NightStar LX Tools provide extensive use of context menus. Right-clicking in any of the NightStar LX Tools will provide the user with a menu containing items related to the location of the mouse in the tool.

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 16 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:

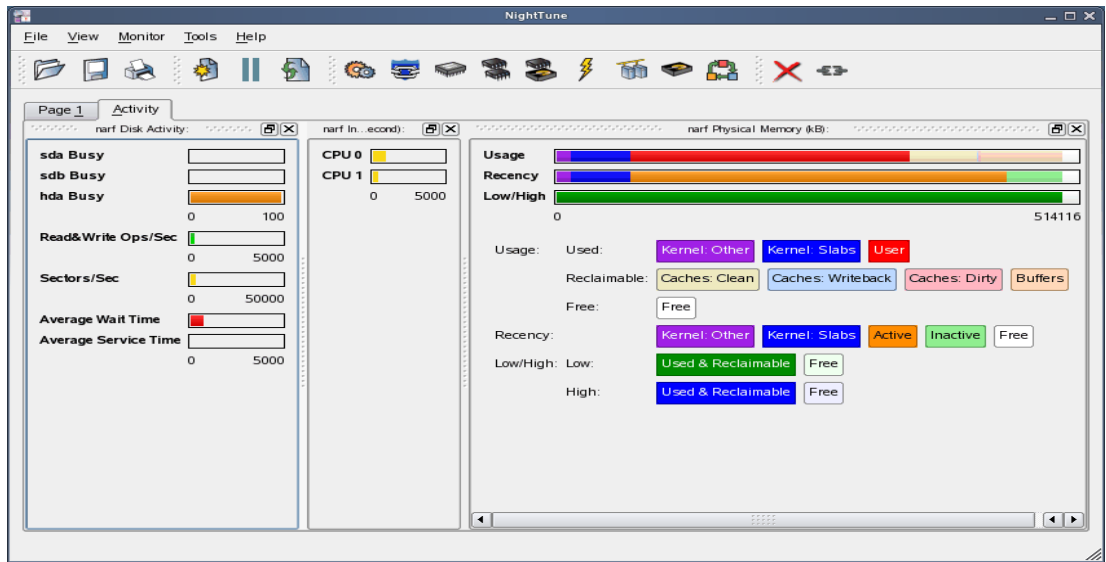


Change the **Page Name** to “&Activity”.

### 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:





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## 6.0. Overview of NightStar LX

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

- NightProbe
- NightTrace
- NightTune
- NightView

### 6.1. 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.

## 6.2. 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.

## 6.3. 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.

## **6.4. 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.

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## 7.0. 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, you can access the tutorial from the **Help** menu of any NightStar tool, or by typing the following command: `/usr/bin/nhelp`.

After installation, 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.

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## 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 sections describes the interoperability of each tool between systems of different word-size architectures in the Intel x86 and AMD64 families.

### NightProbe

No limitations.

As of this release, the NightProbe Trigger API may be used by a 32-bit program on a 64-bit system. Additionally, playback of either data previously recorded by NightProbe from either architecture is supported on either architecture.

### NightSim

No limitations within NightSim itself, however, RedHawk does not support 32-bit programs that use the Frequency Based Scheduler (FBS) services on a 64-bit system.

### NightTune

No limitations.

### NightTrace

#### Limitations

- NightTrace cannot interact with a NightTrace server on a different architecture (thus you cannot remotely capture trace data on a 64-bit system from a 32-bit system, and vice versa).
- NightTrace and programs using the NightTrace Analysis API on a 32-bit system cannot analyze data from a 64-bit system.

#### New Capabilities in this Release

- 32-bit applications can use the NightTrace Logging API and execute on a 64-bit system. The 64-bit NightTrace can capture and analyze data from such programs via `ntraceud` and `ntrace`. The 32-bit applications must be linked with the version of NightTrace Logging API from this release (or newer).
- NightTrace running on a 64-bit system can analyze data files generated on a 32-bit system; both user and kernel data. The 32-bit applications must be linked with the version of the NightTrace Logging API from this release (or newer).

## NOTE

Kernel trace data can only be generated on Concurrent RedHawk systems.

- 64-bit applications using the NightTrace Analysis API can analyze data, either in stream or file mode, generated from 32-bit applications (or 32-bit kernel data).

## NOTE

Kernel trace data can only be generated on Concurrent RedHawk systems.

### User Responsibility

- When analyzing 32-bit data on a 64-bit system, be aware that NightTrace will evaluate argument expressions as per the type of the function as they would be evaluated on the 64-bit system. Thus, explicitly specifying `arg_long()` in a NightTrace expression will result in 8 bytes of data being extracted from the trace event, even though only 4 bytes were logged. The data types of concern are `long` and all `pointer` types.

## NOTE

NightTrace automatically prints the arguments in **Timelines** and **Event** panels with the correct data type.

- When unpacking block arguments within NightTrace, you must unpack them as a 32-bit compiler would have laid out the structure. In addition to the differing sizes of `long`, `long double`, and all `pointer` types, 64-bit compilers pad structures differently. Use care. This includes using the information generated from a 32-bit Application Illumination session; references to `long` will extract 8 bytes even though it expects only 4.

## NOTE

In reality, there is no problem using `arg_long_dbl()` in a 64-bit NightTrace session when the actual `long double` item was generated from a 32-bit program. Even though there are 4 extra bytes of data at the end of a `long double` on 64-bit systems, those extra bytes are completely ignored (currently) by the instructions that operation on such values.

## NightView

### Limitations

Obviously, NightView running on a 32-bit system cannot debug 64-bit programs on that system (since they can't execute!).

### New Capabilities in this Release

- NightView can debug 32-bit applications on a 64-bit system with the following caveats:
  1. Start NightView with the `--arch=i386` command line option, or, create a Remote Shell and check the **Debug 32-bit applications on the x86\_64 target** check-box in the Remote Shell dialog.
  2. When debugging 32-bit applications on a 64-bit system, a new 32-bit shell is launched within NightView in order to debug the application. If the 32-bit program (or the implicit 32-bit shell) execs a 64-bit program, that program cannot be debugged.

You can debug both 32-bit and 64-bit programs from the same NightView session (using a 32-bit Remote Shell as described in the previous caveat), but all 32-bit programs to be debugged must be launched from that shell, and all 64-bit programs to be debugged must be launched from a normal shell. It is recommended that you add a **Shells** item to a data panel (via the **Data** menu) in NightView to facilitate such debugging.



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## 9.0. Direct Software Support

Software support is available from a central source. If you need assistance or information about NightStar LX, 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://real-timeccur.com/support> or by sending an email to [support@ccur.com](mailto:support@ccur.com).

