

NightProbe

Version 2.8 Release Notes (Linux)

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0898465-2.8



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1.0. Introduction

NightProbe™ provides a graphical user interface that permits real-time recording, viewing, and modification of data within one or more resources, including executing programs, PCI devices, shared memory, or memory mapped files on the target system. It can be used during development and operation of applications, including simulations, data acquisition, and system control.

The features and capabilities of NightProbe include:

- An X Window System™ and OSF/Motif™ graphical user interface provides data sampling control and a spreadsheet interface for data recording, monitoring, and modification.
- Several timing sources, including the system clock and the frequency-based scheduler, are provided for controlling the sampling rate. The user may explicitly start, suspend, and stop sampling using the graphical user interface.
- Any static memory location of any Ada, C, or Fortran process on any processor may be sampled by NightProbe. The Item Browser Window's Interactive Variable Browser supports scalar, discrete, and composite types in those programming languages.
- Data may be sampled from PCI Device Base Address Register Memory regions, POSIX or IPC shared memory regions, or any file on the target which can be accessed using **mmap (2)**.
- Sampled data may be monitored interactively, written to a file for later analysis, logged via the NightTrace™ daemon, or streamed directly to a user-specified application.
- NightProbe can be run on a different processor from the target program, which minimizes NightProbe's impact on the target program's performance.
- NightProbe allows data locations to be specified using logical addresses or the symbolic names that appear in the program source code. The data addresses and data types are then located by searching the symbol table in the executable program file. NightProbe can present lists of the static variables in programs, and the user may select the variables of interest using the graphical user interface.
- Configuration files can be created, edited, and saved to retain target selections and display layout, allowing for fast start-up.
- No modifications to source code or recompilations are required for use with NightProbe.

2.0. Documentation

Table 2-1 lists the NightProbe 2.8 documentation available from Concurrent.

Table 2-1. NightProbe Version 2.8 Documentation

Manual Name	Pub. Number
<i>NightProbe User's Guide</i>	0890480-060
<i>NightProbe Version 2.8 Release Notes (Linux)</i>	0898465-2.8

Copies of the Concurrent documentation can be ordered by contacting the Concurrent Software Support Center. The toll-free number for calls within the continental United States is 1-800-245-6453. For calls outside the continental United States, the number is 1-954-283-1822 or 1-305-931-2408.

Additionally, the manuals listed above are available:

- online using the **nhelp** utility
- in PDF format in the **documentation** directory of the installation CD
- on the Concurrent Computer Corporation web site at www.ccur.com

3.0. Prerequisites

Prerequisites for NightProbe Version 2.8 for both the host system and target systems are as follows:

3.1. Host System

3.1.1. Software

- RedHawk™ Linux® *or* Red Hat® Linux *
- Required capabilities **

NOTE

The following capabilities are normally installed by the installation script on the CD containing the NightStar tools. The user will be notified if required capabilities do not exist on the Linux system.

- NightStar™ Tools

Capabilities	RPMs providing these capabilities
<code>ccur-nstar-compat</code> <code>ccur-HyperHelp</code> <code>ccur-ktalk</code> <code>ccur-HyperHelp-scripts</code> <code>ccur-elanlm</code>	<code>ccur-nstar-compat-1.0-2</code> <code>ccur-x11progs-6.4.2-008</code> <code>ccur-x11progs-6.4.2-008</code> <code>ccur-HyperHelp-scripts-6.4.2-002</code> <code>ccur-elanlm-5.0-9</code>

3.1.2. Hardware

- an Intel®-based PC - 300Mhz or higher (recommended minimum configuration)

or

any iHawk™ Series 860 *or* iHawk Series 870 system

* This product has been extensively tested on RedHawk Linux 1.4, 2.1, and 2.2; Red Hat Linux 8.0; and Enterprise 3.0 WS. However, this product has not been tested with versions of Linux supplied by other vendors.

** The “Capabilities” listed may be found in those versions of the RPMs listed under “RPMs providing these capabilities” or in later versions.

3.2. Target Systems

3.2.1. RedHawk Systems

3.2.1.1. Software

- RedHawk Linux 1.4 or later (*iHawk Series 860 systems*)

or

RedHawk Linux 2.2 or later (*iHawk Series 870 systems*)

- Required RedHawk Linux RPMs (see “RedHawk Target Installation” on page 8 for more information)

3.2.1.2. Hardware

- any iHawk Series 860 *or* iHawk Series 870 system

4.0. System Installation

Installation of the host portion of NightProbe is normally done as part of the general installation of either the RedHawk NightStar Tools or the PowerWorks Linux Development Environment. A single command installs (or uninstalls) all required software components. See the *RedHawk NightStar Tools Release Notes* (0898008) or *PowerWorks™ Linux Development Environment Release Notes* (0898000) for more information.

The following section describes how to install (or uninstall) NightProbe independently for those rare cases when this is necessary.

NOTE

NightProbe requires that certain packages are installed on the target systems. See “Target Installation” on page 8 for more information.

4.1. Separate Host Installation

At times, it may be necessary to install (or uninstall) NightProbe independent of the installation of the software suite in which it is normally distributed. This may be done using the standard Linux product installation mechanism, **rpm** (see **rpm (8)**).

The RPM names associated with NightProbe 2.8 are:

ccur-nprobe	the NightProbe GUI application - this application runs on the host system and communicates with the NightProbe server on the target. The host and target systems may be the same.
ccur-nprobeserv	the NightProbe server - this application runs on the target system and performs real-time data recording services on the probed user application.
ccur-nprobe-api	the NightProbe Application Programming Interface (API) - these libraries and include file may be used to implement your own applications which consume data provided by the NightProbe application using the To File or To Program output methods.

and the files associated with these RPMs are:

iHawk Series 860 (Intel):

```
ccur-nprobe-2.8-000.i386.rpm  
ccur-nprobeserv-2.8-000.i386.rpm  
ccur-nprobe-api-2.8-000.i386.rpm
```

which can be found in the **RPM/i386** directory on the installation CD.

iHawk Series 870 (AMD64):

```
ccur-nprobe-2.8-000.i386.rpm  
ccur-nprobeserv-2.8-000.x86_64.rpm  
ccur-nprobe-api-2.8-000.x86_64.rpm
```

which can be found in the **RPM/x86_64** directory on the installation CD.

NOTE

The user must be root in order to use the **rpm** product installation mechanism on the Linux system.

To install the NightProbe RPM, issue the following commands on your Linux system:

1. Insert the installation CD in the CD-ROM drive
2. Mount the CD-ROM drive (assuming the standard mount entry for the CD-ROM device exists in **/etc/fstab**)

```
mount /mnt/cdrom
```

3. Change the current working directory to the directory containing the NightProbe RPMs:

iHawk Series 860 (Intel):

```
cd /mnt/cdrom/RPM/i386
```

iHawk Series 870 (AMD64):

```
cd /mnt/cdrom/RPM/x86_64
```

4. Install the required RPMs

iHawk Series 860 (Intel):

```
rpm -Uvh ccur-nprobe-2.8-000.i386.rpm  
rpm -Uvh ccur-nprobeserv-2.8-000.i386.rpm  
rpm -Uvh ccur-nprobe-api-2.8-000.i386.rpm
```

iHawk Series 870 (AMD64):

```
rpm -Uvh ccur-nprobe-2.8-000.i386.rpm  
rpm -Uvh ccur-nprobeserv-2.8-000.x86_64.rpm  
rpm -Uvh ccur-nprobe-api-2.8-000.x86_64.rpm
```

All three RPMs may be installed at once using wildcard notation similar to:

```
rpm -Uvh ccur-nprobe*2.8-000*.rpm
```

NOTE

The RPMs **ccur-nprobeserv** and **ccur-nprobe-api** are required for target systems or systems that intend to use the NightProbe API.

5. Change the current working directory outside the **/mnt/cdrom** hierarchy

```
cd /
```

6. Unmount the CD-ROM drive (otherwise, you will be unable to remove the installation CD from the CD-ROM drive)

```
umount /mnt/cdrom
```

To uninstall the NightProbe RPM, use the following command:

```
rpm -e ccur-nprobe
```

4.2. Target Installation

4.2.1. RedHawk Target Installation

When targeting a RedHawk Linux system, NightProbe requires that the following RPMs are installed on that target system:

NightStar Tool	RPM
NightProbe server	<code>ccur-nprobeserv-2.8-000.i386.rpm</code> (<i>Intel</i>) <code>ccur-nprobeserv-2.8-000.x86_64.rpm</code> (<i>AMD64</i>)
NightStar daemon	<code>ccur-nstar-1.3-000.i386.rpm</code>
NightStar compatibility libraries	<code>ccur-nstar-compat-1.0-2.i386.rpm</code>
Élan License Manager	<code>ccur-elanlm-5.0-9.i386.rpm</code>

These RPMs may be installed on the target system by installing the RedHawk NightStar Tools on that system. However, the individual RPMs can be found in the **RPM** subdirectory on the installation CD and may be installed separately. See “Separate Host Installation” on page 5 for the procedure to install an individual RPM.

NOTE

For applications that link dynamically with `libnprobe.so` and execute on a RedHawk Linux target system other than the NightProbe host, the `ccur-nprobe-api` RPM must also be installed on the target system.

5.0. Overview of NightProbe 2.8

NightProbe 2.8 is basically a re-release of NightProbe 2.7 with support for iHawk Series 870 systems. The following enhancements and known issues are the same as those that appeared in the *NightProbe Version 2.7 Release Notes (Linux) (0898465-2.7)*.

5.1. Enhancements

5.1.1. Series 870 Support

NightProbe 2.8 supports iHawk Series 870 systems.

5.1.2. NightProbe Main Window

The NightProbe Main Window (known in previous releases as the “Data Recording Window”) has been reorganized and updated.

The NightProbe Main Window features a “Session Overview” area which provides a tree-based graphical representation of each attribute of the current NightProbe session. You can view a menu associated with each of the attributes by clicking the right mouse button on that attribute. In addition, many of the roots of the tree have a corresponding item on the menu bar.

The **Connect**, **Disconnect**, **Start**, **Stop**, and **Sample** buttons have been given accelerator key assignments providing access to their functionality via the keyboard.

5.1.3. Resources

NightProbe now operates on resources instead of programs. A program is just one kind of resource NightProbe has the capability of probing. Other types of resources include:

PCI Devices	NightProbe can probe the Base Address Register files associated with some PCI Devices. See Chapter 13 in the <i>RedHawk Linux 2.x User’s Guide</i> for details on access to PCI devices.
-------------	--

NOTE

RedHawk Linux version 2.1 or higher is required to probe PCI devices.

Shared Memory	NightProbe supports access to IPC and POSIX shared memory regions on the target system. IPC shared memory regions may be located via their Key, ID, or a Key File (see ftok(3))
---------------	---

Mapped Memory	NightProbe supports access to any file on the target system that can be used with mmap(2) , such as /dev/mem or /proc/\${PID}/mem , where <i>\${PID}</i> is the pid number of any process.
---------------	---

The NightProbe Item Definition Window allow users to define artificial variables which are views into the non-program resources (see “Resources” above). A location within the resource can be viewed as a basic integer, real, character or string type, or else an array of such objects.

NightProbe also provides access to more complex data types if you specify a symbol file associated with a non-program resource. You may then create item views which are records or components, or even arrays of records, using the types defined in the symbol file. A symbol file is an executable program containing symbolic and debugging information. Not all types declared in your source code may appear in the debugging information in the symbol file. See the *NightProbe User’s Guide* for details.

5.1.4. Item Browser

The Item Browser has been replaced with a newer, faster, graphical tree browser.

5.1.5. Symbol File Reader

The NightProbe Symbol File reader has been upgraded to one based on the Concurrent Data Monitoring Library, providing better access to data format information encoded in the debugging information of the symbol files.

5.1.6. Displaying Ada Types

In previous versions of NightProbe, Ada95 enumeration values were printed as the underlying integer representation, not the textual image of the corresponding enumeration constant. In NightProbe 2.8, Ada enumeration data can be viewed symbolically.

Also, in previous versions, NightProbe would print Ada95 fixed point types using their underlying integer representation, not as a fractional number. In NightProbe 2.8, Ada fixed point values are now displayed in their proper format.

5.1.7. X Server Resource File Reorganization

All X server resources (i.e. color resources, text messages, widget resources) are now contained in:

`/usr/lib/X11/app-defaults/Nprobe`

The following files:

`Nprobe-mono`
`Nprobe-color`
`NightProbe-help`
`NightProbe-text`

are no longer used by NightProbe.

NOTE

Customized modifications made to X server resources in previous releases may not be valid in this release.

5.1.8. Command-Line Options

NightProbe 2.8 offers all command-line options to **nprobe** in both the GNU style format as well as a single letter abbreviation. For instance, to inform **nprobe** that you would like sampled data displayed in a List Viewer window, you could either use the **--list** option or the **-l** option. The option style from previous releases is maintained for backward compatibility. For our example, the **-list** option would still be accepted by **nprobe**.

There is a new command-line option to **nprobe** in NightProbe 2.8. Its syntax is:

--program=/path/name

This option specifies that data recording is to be activated and that data is to be piped to the program specified by */path/name*.

In addition, the **-autoupdate** option has been deprecated.

5.2. Known Issues

The following items describe NightProbe issues which may be addressed in future patches and releases.

5.2.1. Capabilities on a RedHawk Host

When configuring a Program Output and running the program on a RedHawk host, rather than the specified target, NightProbe is unable to grant capabilities to your program beyond those that the **nprobe** process has already inherited from your login shell.

This will cause failures when you try to connect, if any required capability is unavailable. For example, if you isolate the program on a single CPU, `CAP_SYS_NICE` is required to permit changing your program's CPU bias.

The failure occurs when **nprobe** is run by a user having inadequate capabilities on the NightProbe host. A user cannot grant himself additional capabilities, even if his username appears in `/etc/security/capability.conf` on the host system.

If this happens, schedule the Program Output on the target system. The NightProbe server executes with sufficient authority to grant the capabilities configured for your user on the target. (This works especially well when the host system is also the target system.)

Alternatively, on a RedHawk host, you can configure login to set up your capabilities for your login shell by default. Great care should be taken in configuring capabilities for your login shell, because some capabilities bypass the normal security measures on the system.

To configure capabilities for your user, do the following:

1. Become the root user. See **su (1)** or **sudo (8)**, or simply log in to a console tty as the root user.
2. Append the following text:

```
session required /lib/security/pam_capability.so
```

to the end of the `/etc/pam.d/login` file.

3. To grant capabilities when logging into your system remotely, or using X11, additional files in `/etc/pam.d` may need to be modified. Determining which ones depends upon the services used to gain access to your system (e.g. **rsh**, **rlogin**, **rexec**, **gdm**)
4. Modify the `/etc/security/capability.conf` file and add the following line to the ROLES section if it is not already present:

```
role probeuser cap_sys_rawio cap_sys_nice
```

5. Modify the `/etc/security/capability.conf` file and add the following line to the USERS section:

```
user username probeuser
```

where *username* is your login name.

6. Log out and back in, execute the following command:

```
fgrep Cap /proc/self/status
```


You should see some non-zero digits in the values displayed for the **CapEff** setting. These represent your user's capabilities.

5.2.2. PCI I/O Ports

On Concurrent iHawks, PCI I/O Ports are not accessible via normal memory load and store instructions. As a result, PCI Base Address Register files associated with I/O ports are not mappable.

If you attempt to access I/O ports using a PCI Device Resource, the connect will fail. The target system reports that **mmap (2)** failed with `errno = EINVAL` (Invalid Parameter).

5.2.3. PCI Device Memory Base Address Register Files

NightProbe 2.8 contains a workaround for an OS deficiency regarding small PCI Device Memory Base Address Register (BAR) files (< 4096 bytes). The OS deficiency causes **mmap (2)** to improperly return `EINVAL` when an attempt is made to map a PCI Device Memory BAR file smaller than one page in size. NightProbe detects the presence of this deficiency, and works around it by mapping the appropriate physical address for the BAR file in `/dev/mem`.

This means that for small BAR files, any error messages from the NightProbe server may mention `"/dev/mem"` instead of the PCI Device you selected.

5.2.4. Unavailable Types in Browser Window

Some types appearing in the source code may not be available in the Interactive Type Browser Window. The availability of type information is dependent on the implementation choices made by the compiler which produced the debugging information. Some compiler versions only include type information if an object of that type is linked into your program.

5.2.5. GNU Fortran Compiler

The GNU Fortran compiler incorrectly describes named common blocks as arrays of bytes; however, the Concurrent Fortran compiler generates correct common block debug information.

In addition, the GNU Fortran compiler incorrectly describes multi-dimensional arrays, resulting in the probing of incorrect locations; however, the Concurrent Fortran compiler generates correct multi-dimensional array debug info.

6.0. 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 1-800-245-6453. Our customers outside the continental United States can contact us directly at 1-954-283-1822 or 1-305-931-2408. The Software Support Center operates Monday through Friday from 8 a.m. to 7 p.m., Eastern Standard time.

Calling the Software Support Center gives you immediate access to a broad range of skilled personnel and guarantees you a prompt response from the person most qualified to assist you. If you have a question requiring on-site assistance or consultation, the Software Support Center staff will arrange for a field analyst to return your call and schedule a visit.

