

NightProbe

Version 2.9 Release Notes (Linux)

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0898465-2.9



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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 2.9 documentation available from Concurrent.

Table 2-1. NightProbe Version 2.9 Documentation

Manual Name	Pub. Number
<i>NightProbe User's Guide</i>	0890480-070
<i>NightProbe Version 2.9 Release Notes (Linux)</i>	0898465-2.9

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.

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 2.9 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 2.9 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-2.9-000.i386.rpm  
ccur-nprobeserv-2.9-000.i386.rpm  
ccur-nprobe-api-2.9-000.i386.rpm
```

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

iHawk Series 870 (AMD64):

```
ccur-nprobe-2.9-000.x86_64.rpm  
ccur-nprobeserv-2.9-000.x86_64.rpm  
ccur-nprobe-api-2.9-000.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-2.9-000.i386.rpm  
rpm -Uvh ccur-nprobeserv-2.9-000.i386.rpm  
rpm -Uvh ccur-nprobe-api-2.9-000.i386.rpm
```

iHawk Series 870 (AMD64):

```
rpm -Uvh ccur-nprobe-2.9-000.x86_64.rpm  
rpm -Uvh ccur-nprobeserv-2.9-000.x86_64.rpm  
rpm -Uvh ccur-nprobe-api-2.9-000.x86_64.rpm
```

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

```
rpm -Uvh ccur-nprobe*2.9-000*.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-2.9-000.i386.rpm</code> (<i>Intel</i>) <code>ccur-nprobeserv-2.9-000.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 2.9

NightProbe 2.9 contains the following enhancements and known issues.

5.1. Enhancements

5.1.1. Support of Bit Objects

NightProbe can now probe objects whose size is not a multiple of a byte or whose bit offset is not byte-aligned.

The API has changed to reflect the bit size and bit offset of items. As such, previously written API programs will not compile with NightProbe 2.9 without modification.

The `offset` and `size` components of a `np_item` structure have been replaced with `bit_offset` and `bit_size` components. Previously, the units for `offset` and `size` were in bytes; the new components express the values in bits.

When individual bit-size/bit-aligned components are probed, their values are returned via the API as expanded entites; i.e. they are extracted from their bit fields and placed in byte, short, or word sized objects, as defined in their corresponding `np_item` structure. However, when composite objects are probed, their entire content is returned via the API in the packed state. For example, if an array of 3-bit components is probed, the entire array value is returned without modification. But if a single component of an array of 3-bit objects is probed, the value is returned via the API in a byte.

5.1.2. GUI Dialog Modifications

A number of the NightProbe dialogs have undergone redesign, simplifying their presentation while enhancing their usability.

These dialogs include:

- Select Frequency Based Scheduler dialog
 previously the FBS Scheduler Key Selection dialog
- Select Process ID dialog
 previously the Process Selection dialog
- Program Output dialog
 previously the Program Output Specification dialog
- Target Window dialog
 previously the Target System Selection dialog
- Set System Timer dialog
 previously the System Clock Timing Source Configuration dialog
- Set FBS Timer dialog

previously the FBS Timing Source Configuration dialog

- NightTrace Output dialog

previously the NightTrace Specification dialog

- Select IPC Shared Memory Segment dialog
- Select POSIX Shared Memory Segment dialog

In addition, a new dialog has been added:

- Run Time Settings dialog

This dialog allows you to specify the scheduling policy, priority, and CPU bias as well as any applicable NUMA flags for a particular program and can be accessed from either the **Target Server** dialog or the **Program Output** dialog.

5.1.3. Native AMD64 NightProbe Client

NightProbe 2.9 now includes a 64-bit client that runs natively on the AMD64 architecture.

5.1.4. Enhanced Online Help

Context-sensitive help, as well as help for each of the dialogs, has been enhanced in NightProbe 2.9. Context-sensitive help can be obtained by pressing **F1** for the widget having focus or by selecting the **On Context** menu item from the **Help** menu and selecting the item of interest with the mouse.

5.2. Known Issues

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

5.2.1. NightProbe API - Endian Ordering

When calling `np_open()` on a data file that was produced on a target architecture having a different endian order from the host (e.g. big-endian data file/little-endian host, or vice versa), all data returned by `np_read()` will be of the data file's orientation. In order to obtain meaningful information about the probe samples in the file in such situations, you must first convert the format of the data in the sample buffer to the proper endian format for the host before calling `np_format()`.

A new component, `sample_endian`, has been added to the `np_header` structure which indicates the endian order of the data. A new function, `np_host_endian`, returns the endian ordering of the host system where the API program is running.

5.2.2. NightTrace Output Limitation

The NightTrace Output method is not available when targeting an AMD64 system from an Intel host. The 32-bit i386 host is unable to handle the 64-bit trace stream data from the AMD64 target and presents an error dialog in such situations. However, the NightTrace Output method is available natively on either architecture.

5.2.3. Capabilities on a RedHawk Host

When configuring a Program Output and running the program on a RedHawk host rather than the specified target, or when changing the CPU bias of the NightProbe server itself using the **Run Time Settings** dialog, 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.

5.2.4. 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).

5.2.5. PCI Device Memory Base Address Register Files

NightProbe 2.9 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.

5.2.6. 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.

5.2.7. 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 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 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.

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.

