RedHawk NightStar Tools

Version 1.2 Release Notes

October 2002

0898008-1.2

CONCURRENT COMPUTER CORPORATION

Copyright

Copyright 2002 by Concurrent Computer Corporation. All rights reserved. This publication or any part thereof is intended for use with Concurrent Computer Corporation products by Concurrent Computer Corporation personnel, customers, and end–users. It may not be reproduced in any form without the written permission of the publisher.

Disclaimer

The information contained in this document is subject to change without notice. Concurrent Computer Corporation has taken efforts to remove errors from this document, however, Concurrent Computer Corporation's only liability regarding errors that may still exist is to correct said errors upon their being made known to Concurrent Computer Corporation.

License

Duplication of this manual without the written consent of Concurrent Computer Corporation is prohibited. Any copy of this manual reproduced with permission must include the Concurrent Computer Corporation copyright notice.

Trademark Acknowledgments

RedHawk, iHawk, NightProbe, NightSim, NightStar, NightTrace, and NightView are trademarks of Concurrent Computer Corporation.

Red Hat is a registered trademark of Red Hat, Inc.

Linux is a registered trademark of Linus Torvalds.

Contents

1.0 Introduction 1

2.0 Documentation 2

3.0 Prerequisites 3

3.1 Host System 3

3.1.1 Software 3

3.1.2 Hardware 4

3.2 Target System 5

3.2.1 Software 5

3.2.2 Hardware 5

4.0 System Installation 6

4.1 Target Installation 8

5.0 Known Deficiencies 9

5.1 NightSim 9

5.2 NightTrace 9

6.0 Additional Considerations 11

6.1 License Activation 11

6.2 DWARF Debug Information - NightProbe and NightView 11

6.3 Too Many Open Files 12

7.0 Direct Software Support 13

1.0. Introduction

The RedHawk™ NightStar™ Tools allow users on an iHawk™ system running RedHawk Linux® to schedule, monitor, debug and analyze the run time behavior of their real-time applications as well as the RedHawk Linux operating system kernel.

The RedHawk NightStar Tools consist of the NightTrace™ event analyzer, the NightSim™ frequency-based scheduler, the NightProbe™ data monitoring tool, and the NightView™ symbolic debugger.

NightView is a graphical source-level debugging and monitoring tool specifically designed for real-time applications. NightView can monitor, debug, and patch multiple real-time processes running on multiple processors with minimal intrusion.

NightTrace is a graphical tool for analyzing the dynamic behavior of single and multiprocessor applications. NightTrace can log application data events from simultaneous processes executing on multiple CPUs or even multiple systems. NightTrace combines application events with RedHawk Linux kernel events, presenting a synchronized view of the entire system.

NightSim is a tool for scheduling and monitoring real-time applications that require predictable, repetitive process execution. With NightSim, application builders can control and dynamically adjust the periodic execution of multiple coordinated processes, their priorities, and their CPU assignments.

NightProbe is a real-time graphical tool for monitoring, recording, and altering program data within one or more executing programs without intrusion. It can be used in a development environment as a tool for debugging, or in a production environment to create a “control panel” for program input and output.

Each of the tools include a small run-time agent that executes on the RedHawk Linux target system in a non-intrusive manner, preserving the deterministic characteristics of the application.

2.0. Documentation

Table 2-1 lists the RedHawk NightStar Tools 1.2 documentation available from Concurrent.

Table 2-1. RedHawk NightStar Tools Version 1.2 Documentation

Manual Name	Pub. Number
RedHawk NightStar Tools Version 1.2 Release Notes	0898008-1.2
RedHawk NightStar Tools Tutorial	0898009-000
NightProbe User's Guide	0890465-040
NightProbe Version 2.5.1 Release Notes (Linux)	0898465-2.5.1
NightSim User's Guide	0890480-030
NightSim Version 3.3.1 Release Notes (Linux)	0898480-3.3.1
NightTrace Manual	0890398-090
NightTrace Version 5.1.2 Release Notes (Linux)	0898398-5.1.2
NightView User's Guide	0890395-240
NightView Version 5.5 Release Notes (Linux)	0898395-5.5

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 RedHawk Linux utility, **`nhelp`**
- in PDF format in the **`documentation`** directory of the RedHawk NightStar Tools Installation CD
- on the Concurrent Computer Corporation web site at www.ccur.com

3.0. Prerequisites

Prerequisites for RedHawk NightStar Tools Version 1.2 for both the host system and target system are as follows:

3.1. Host System

3.1.1. Software

- RedHawk Linux™ 1.1
- Required capabilities

NOTE

The following capabilities are normally installed as part of the standard installation of RedHawk Linux. During installation of the RedHawk NightStar Tools, the user will be notified if required capabilities do not exist on the RedHawk Linux system.

- RedHawk Linux

Capabilities	RPMs providing these capabilities
/bin/bash **/bin/sh** **ld-linux.so.2** **libc.so.6** **libc.so.6(GLIBC_2.0)** **libc.so.6(GLIBC_2.1)** **libc.so.6(GLIBC_2.1.2)** **libc.so.6(GLIBC_2.1.3)** **libc.so.6(GLIBC_2.2)** **libdl.so.2** **libdl.so.2(GLIBC_2.0)** **libdl.so.2(GLIBC_2.1)** **libICE.so.6** **libm.so.6** **libm.so.6(GLIBC_2.0)** **libnsl.so.1** **libpam.so.0** **libresolv.so.2** **libSM.so.6** **libstdc++-libc6.2-2.so.3** **libX11.so.6** **libXext.so.6** **libXm.so.2** **libXmu.so.6** **libXp.so.6** **libXt.so.6** **rpmlib(CompressedFileNames) <= 3.0.4-1** **rpmlib(PayloadFilesHavePrefix) <= 4.0-1**	*RedHawk Linux 1.1:* **bash-2.05b-3** **compat-libstdc++-7.3.2.96.110** **glibc-2.2.90-24** **glibc-debug-2.2.90-24** **pam-0.75-40** **XFree86-libs-4.2.0-65** **rpm-4.1.0-81** **openmotif21-2.1.30-4**

3.1.2. Hardware

- any iHawk Series 860 system

3.2. Target System

3.2.1. Software

- RedHawk Linux 1.1
- Required RedHawk Linux RPMs (see “Target Installation” on page 8 for more information)

3.2.2. Hardware

- any iHawk Series 860 system

4.0. System Installation

A single command installs (or uninstalls) all of the RedHawk NightStar Tools.

The following table shows the RPMs that will be installed.

Item	RPM
Scripts	**ccur-HyperHelp-scripts-6.4.2-002.i386.rpm**
Utilities	**ccur-x11progs-6.4.2-006.i386.rpm**
Élan License Manager	**ccur-elanlm-5.0-6.i386.rpm**
NightProbe	**ccur-nprobe-2.5.1-001.i386.rpm**
NightProbe server	**ccur-nprobeserv-2.5.1-001.i386.rpm**
NightSim	**ccur-nsim-3.3.1-002.i386.rpm**
NightSim server	**ccur-nsimserver-3.3.1-002.i386.rpm**
NightStar daemon	**ccur-nstar-1.2-000.i386.rpm**
NightStar	**ccur-nstar-1.2-000.i386.rpm**
NightStar tutorial	**ccur-nstar-tutorial-1.2-1.i386.rpm**
NightTrace	**ccur-ntrace-5.1.2-002.i386.rpm**
NightTrace server	**ccur-ntracelog-5.1.2-002.i386.rpm**
NightView	**ccur-NightView-5.5-000.i386.rpm**
NightView server	**ccur-Nviewp-5.5-000.i386.rpm**

NOTE

As mentioned in “Documentation” on page 2, release notes are provided for each of the RedHawk NightStar Tools. These release notes include individual installation instructions for each respective component; however, separate installation of components is rarely required. The preferred method is to utilize the installation scripts described below which install ALL of the RedHawk NightStar Tools.

NOTE

The user must be root in order to install the RedHawk NightStar Tools.

NOTE

If a previous version of the RedHawk NightStar Tools is already installed on the system, the following commands will only automatically update the appropriate RPMs from this release.

You do not need to uninstall the previous installation of the RedHawk NightStar Tools before proceeding.

To install the RedHawk NightStar Tools:

1. Insert the RedHawk NightStar Tools 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 RedHawk NightStar Tools installation scripts

   `cd /mnt/cdrom`
4. Invoke the RedHawk NightStar Tools installation script

   `./ccur-install`

   You may see messages similar to the following during an install (or uninstall):

   `failed to stat /`*`nfsfilesystem`*`: Stale NFS file handle`

   where *nfsfilesystem* may be any NFS filesystem. These messages may be ignored.
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 RedHawk NightStar Tools Installation CD from the CD-ROM drive)

   `umount /mnt/cdrom`

NOTE

If any of the required capabilities listed in “Prerequisites” on page 3 are not installed, the RedHawk NightStar Tools installation script will issue warnings. Run the **`ccur-uninstall`** script (ignoring any diagnostic messages that result) and then install the necessary capabilities before issuing the **`ccur-install`** script.

After installing the software, please read the RedHawk NightStar Tools Tutorial. The tutorial is available in the **documentation** directory on the RedHawk NightStar Tools Installation CD and as well as via the following command:

```
$ /usr/bin/X11/nhelp rh-nstar-tutorial &
```

The RedHawk NightStar Tools require that certain RPMs are installed on the RedHawk Linux target systems. See “Target Installation” on page 8 for more information.

To uninstall the RedHawk NightStar Tools, execute the following script:

```
ccur-uninstall
```

found on the RedHawk NightStar Tools Installation CD. (Follow the installation instructions above for mounting the CD-ROM drive, maneuvering to the correct working directory, unmounting the CD-ROM drive, etc.)

4.1. Target Installation

The RedHawk NightStar Tools require that the following RPMs are installed on the RedHawk Linux target systems:

NightStar Tool	RPM
Scripts	**ccur-HyperHelp-scripts-6.4.2-002.i386.rpm**
Utilities	**ccur-x11progs-6.4.2-006.i386.rpm**
Élan License Manager	**ccur-elanlm-5.0-6.i386.rpm**
NightStar server	**ccur-nstar-1.2-000.i386.rpm**
NightTrace server	**ccur-ntracelog-5.1.2-002.i386.rpm**
NightSim server	**ccur-nsimserver-3.3.1-002.i386.rpm**
NightProbe server	**ccur-nprobeserv-2.5.1-001.i386.rpm**
NightView server	**ccur-Nviewp-5.5-000.i386.rpm**

These RPMs may be installed on the target system by installing the RedHawk NightStar Tools on the target system. However, the individual RPMs can be found on the RedHawk NightStar Tools Installation CD in the **RPM** subdirectory and may be installed individually. See **rpm(8)** for more detailed information on installing individual RPMs.

5.0. Known Deficiencies

The following sections detail the known deficiencies with each of the listed NightStar products.

Separate release notes are provided for each of the RedHawk NightStar Tools containing details with respect to the enhancements and deficiencies of each tool. See “Documentation” on page 2 for a list of these release notes.

5.1. NightSim

The following are known deficiencies with the NightSim Application Scheduler:

- NightSim normally only requires **`rsh`** access between the host and target systems when the host and target systems differ. However, if the user selects Schedule program within an Xterm window, NightSim requires rsh access to the host system as well.
- The statistics for min and max cycle and frame number may be off by +/- 1.
- NightSim may fail with a memory fault during initialization when launched the first time after a reboot. Reinvoking NightSim will correct this problem.

5.2. NightTrace

The following are known deficiencies with the NightTrace Analyzer:

- NightTrace offers a streaming output method. When streaming, trace data is sent directly to the NightTrace display buffer for immediate analysis even while additional trace data is being collected.

  In the current implementation, streaming relies heavily on temporary external files. These files are written to **`/tmp`** (or to the location specified by the `TMPDIR` environment variable) and are named:

  `stream`_*identifier*

  where *identifier* is a randomly-generated alphanumeric string.

  The name of this file is listed in the NightTrace main window when streaming is activated. For example, when streaming user trace data, a line similar to the following would appear in the NightTrace main window:

  ```
  User trace event log file: /tmp/stream_OdOISs
  ```

  When streaming kernel data, a vectors file of the form:

  `stream`_*identifier*`.vec`

  is generated in addition to the kernel trace event log file.

  Data captured while streaming can be viewed on subsequent invocations of NightTrace by specifying the **`stream`**_*identifier* file as an argument.

  Note that for large amounts of data (or for streams left active for long periods of time), NightTrace may appear to be sluggish and utilize large amounts of disk space. A more efficient and flexible implementation is underway and will be available in a future release of NightTrace.

- Due to a kernel limitation, cloned and forked processes do not have symbolic process names associated with them in kernel trace data (although processes that have been forked and subsequently `exec` will have the `exec`'d process name even during the fork activities). In the kernel display pages, such processes will be identified solely by the PID.

  This limitation will be addressed in a future release.

- The NightTrace API is not fully functional with multi-threaded applications.

  By default, the NightTrace daemons and API utilize rescheduling variables to control preemption during spin-lock operations required to protect critical sections. See **`resched_cntl(2)`**.

  RedHawk Linux does not currently allow processes that use rescheduling variables to call the **`clone(2)`** system service. The clone service is used by the threads library to create threads. The calling process will receive a SIGABRT signal in this case when thread creation is attempted.

  Two solutions are available:

  1. Restrict all NightTrace API calls to a single thread AND delay all such calls until all threads have been created.

  or

  2. Turn off rescheduling variables in each of the following ways:

     a. Ensure that "`None`" is selected as the `Spin Lock Protection` mechanism on the `User Trace` tab in the `Daemon Definition Dialog` for user applicaiton trace daemons.

     b. Ensure that user daemons initiated with the **`ntraceud`** command line tool use the **`-ipldisable`** option

     c. Ensure that user programs calling `trace_begin`() supply a non-null configuration pointer in which the members *ntc_use_spl* and *ntc_use_resched* have the value `FALSE`.

  Without rescheduling variable protection, it is possible that the user application or user daemon might preempt the other while a spin lock was held. This could cause the preempting process to spin forever. Binding the user application and the user daemon to differing CPUs can aleviate this problem.

- When specifying a process ID value in NightTrace dialogs, use the following syntax:

  `0'`*PID*

  where *PID* is the process ID value.

6.0. Additional Considerations

6.1. License Activation

Use of the RedHawk NightStar Tools requires a license key.

The license key authorizes use of the tools on a specific machine with a specific maximum number of simultaneous users.

At the end of the installation process, a server code will be displayed. You must contact Concurrent Computer Corporation via email at `softdist@ccur.com` and include your server code, site-id, product name and model number to obtain your permanent license key. A response will be emailed to you containing your permanent key.

Your site-id, product name and model number are supplied on a License Manager Information sheet accompanying the installation CD.

If you forget your server code, you may obtain it by executing the following command:

```
/usr/bin/elmcode
```

During the installation, you will be prompted to enter the license key. You may respond with any of the following:

1. Your permanent license key,
2. The temporary license key (printed on the installation CD case) which allows a single user to use the tools for a short period of time until the permanent license key is received, or
3. <Enter> which will bypass installation of the license key. Note, however, that bypassing license activation will render the RedHawk NightStar Tools ineffective until either the temporary or permanent license key is installed.

To install the permanent license key (or the temporary key if license activation was bypassed), enter the following command on the system where the RedHawk NightStar Tools are installed:

`/usr/bin/elmadmin -c -r1/"`*key*`"`**

where *key* is either the permanent license key obtained from Concurrent or the temporary license key printed on the installation CD case. Note that it is necessary to place double-quotes around the *key*.

6.2. DWARF Debug Information - NightProbe and NightView

Both NightProbe and NightView read symbol table information from user application program files. Therefore, they both require that the user application is built with DWARF debugging information. This is done by specifying the **`-g`** compile option when building the user application.

When compiling with releases prior to **`gcc`** 3.2 using **`gcc`**, **`g++`**, and **`g77`**, however, it is necessary to use the **`-gdwarf-2`** option in place of the **`-g`** option.

If the user application is not built with the proper debug option, NightProbe will not show any symbols in the Variable Browser window. However, the name of an external symbol may be entered into the Selection text field in the Symbols pane of the Variable Browser window and will be considered to be a 4-byte integer. Also, hexadecimal addresses may be entered in this field as well; NightProbe will probe four bytes from the specified address. Neither of these methods are recommended, however.

Additionally, if the user application is not built with the proper debug option, NightView will be unable to evaluate any symbols.

6.3. Too Many Open Files

If failures occur with the following error message:

```
errno = 23 (Too many open files in system)
```

you may edit the **/etc/sysctl.conf** file, adding lines similar to the following:

```
# Increase the maximum number of files on the system
fs.file-max = 16384
```

The default value for the `fs.file-max` kernel configurable is 4096, so a fourfold increase should be sufficient in most cases. However, you may choose a value that is appropriate for your particular system.

With the entry in **/etc/sysctl.conf**, the configurable will take effect on all subsequent reboots. To have it take effect immediately, issue the following command:

```
sysctl -p /etc/sysctl.conf
```

7.0. 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.