RedHawk NightStar Tools

Version 2.1 Release Notes

September 2004

0898008-2.1

READ ME BEFORE INSTALLING THIS PRODUCT

concurrent

Contents

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; the NightView™ symbolic debugger; the NightTune™ system and application tuner; **shmdefine**, a shared memory configuration aid tool; and the Data Monitoring API (Datamon).

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.

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.

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.

NightTune is a graphical tool for analyzing system and application performance including CPU usage, context switches, interrupts, virtual memory usage, network activity, process attributes, and CPU shielding. NightTune allows you to change the priority, scheduling policy, and CPU affinity of individual or groups of processes using pop-up dialogs or drag-and-drop actions. It also allows you to set the shielding and hyper-threading attributes of CPUs and change the CPU assignment of individual interrupts.

Datamon[1] is a user application interface that allows user programs to monitor, record, and modify variables in independently executing processes in real-time. It includes the ability to scan a program file for eligible variables and obtain detailed information about their attributes, including type name, atomic type, bit size, bit offset, shape, component members, and address. Datamon utilizes a non-intrusive technique for accessing and modifying variables.

Shmdefine aids in the sharing of data between independent programs. While most useful for sharing common blocks between Fortran programs, it helps Fortran, C, and Ada programs to effectively utilize the IPC shared memory services.

Many 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.

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1 Datamon is not yet available on iHawk Series 870 (AMD64) systems. It will be provided in a future update or release.

2.0.   Documentation

Table 2-1 lists the RedHawk NightStar Tools 2.1 documentation available from Concurrent.

Table 2-1. RedHawk NightStar Tools Version 2.1 Documentation

Manual Name	Pub. Number
RedHawk NightStar Tools Version 2.1 Release Notes	0898008-2.1
RedHawk NightStar Tools Tutorial	0898009-030
NightProbe User's Guide	0890465-060
NightProbe Version 2.8 Release Notes (Linux)	0898465-2.8
NightSim User's Guide	0890480-030
NightSim Version 3.4 Release Notes (Linux)	0898480-3.4
NightTrace User's Guide	0890398-120
NightTrace Version 5.4 Release Notes (Linux)	0898398-5.4
NightTune Version 2.0 Release Notes (Linux)	0898515-2.0
NightView User's Guide	0890395-280
NightView Version 5.9 Release Notes (Linux)	0898395-5.9
Data Monitoring Reference Manual	0890493-010
Data Monitoring for RedHawk Linux Version 3.4 Release Notes	0898538-3.4
Quick Reference for shmdefine	0898010-030
shmdefine Version 1.3 Release Notes (Linux)	0898013-1.3

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 2.1 for both the host system and target system are as follows:

3.1. Host System[1]

3.1.1. Software

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

  or

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

3.1.2. Hardware

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

3.2. Target System

3.2.1. 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 "Target Installation" on page 8 for more information)

NOTE

NightTune requires RedHawk Linux 2.1 or later for execution on target systems.

3.2.2. Hardware

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

1 The RedHawk NightStar Tools can also be installed on Red Hat systems whose release matches the Red Hat distribution upon which the RedHawk system is hosted. If cross-compilation and linking is required, additional software installation is necessary. Refer to the section at the end of these release notes for instructions.

4.0. System Installation

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

The following two tables show the RPMs that will be installed for iHawk Series 860 and 870 systems, respectively:

Host iHawk Series 860 systems (32-bit Intel) RPMs

Item	RPM
Scripts	`ccur-HyperHelp-scripts-6.4.2-002.i386.rpm`
Utilities	`ccur-x11progs-6.4.2-008.i386.rpm` `ccur-nstar-compat-1.0-2.i386.rpm`
Élan License Manager	`ccur-elanlm-5.0-9.i386.rpm`
NightProbe	`ccur-nprobe-2.8-000.i386.rpm`
NightProbe server	`ccur-nprobeserv-2.8-000.i386.rpm`
NightProbe API	`ccur-nprobe-api-2.8-000.i386.rpm`
NightSim	`ccur-nsim-3.4-000-1.i386.rpm`
NightSim server	`ccur-nsimserver-3.4-000-1.i386.rpm`
NightStar daemon	`ccur-nstar-1.3-000.i386.rpm`
NightStar tutorial	`ccur-nstar-tutorial-2.1-000.i386.rpm`
NightTrace	`ccur-ntrace-5.4-004.i386.rpm`
NightTrace server	`ccur-ntracelog-5.4-004.i386.rpm`
NightTrace API	`ccur-ntraceapi-5.4-004.i386.rpm`
NightTune	`ccur-ntune-2.0-002.i386.rpm`
NightTune server	`ccur-ntuned-2.0-002.i386.rpm`
NightView	`ccur-NightView-5.9-000.i386.rpm`
NightView server	`ccur-Nviewp-5.9-000.i386.rpm`
Datamon API	`ccur-datamon-3.4-001.i386.rpm`
shmdefine	`ccur-shmdefine-1.3-000.i386.rpm`

Host iHawk Series 870 systems (AMD64) RPMs

Item	RPM
Scripts	`ccur-HyperHelp-scripts-6.4.2-002.i386.rpm`
Utilities	`ccur-x11progs-6.4.2-008.i386.rpm`
Élan License Manager	`ccur-elanlm-5.0-9.x86_64.rpm`
NightProbe	`ccur-nprobe-2.8-000.i386.rpm`
NightProbe server	`ccur-nprobeserv-2.8-000.x86_64.rpm`
NightProbe API	`ccur-nprobe-api-2.8-000.x86_64.rpm`
NightSim	`ccur-nsim-3.4-000-1.x86_64.rpm`
NightSim server	`ccur-nsimserver-3.4-000-1.x86_64.rpm`
NightStar daemon	`ccur-nstar-1.3-000.x86_64.rpm`
NightStar tutorial	`ccur-nstar-tutorial-2.1-000.x86_64.rpm`
NightTrace	`ccur-ntrace-5.4-004.x86_64.rpm`
NightTrace server	`ccur-ntracelog-5.4-004.x86_64.rpm`
NightTrace API	`ccur-ntraceapi-5.4-004.x86_64.rpm`
NightTune	`ccur-ntune-2.0-002.x86_64.rpm`
NightTune server	`ccur-ntuned-2.0-002.x86_64.rpm`
NightView	`ccur-NightView-5.9-000.x86_64.rpm`
NightView server	`ccur-Nviewp-5.9-000.x86_64.rpm`
shmdefine	`ccur-shmdefine-1.3-000.i386.rpm`

NOTE

As mentioned in "Documentation" on page 2, release notes are provided for each of the RedHawk NightStar Tools. Those 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 Night-Star 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 following two tables show the RPMs that are required to be installed on target iHawk systems:

Target iHawk Series 860 RPMs (32-bit Intel)

NightStar Tool	RPM
Scripts	`ccur-HyperHelp-scripts-6.4.2-002.i386.rpm` `ccur-nstar-compat-1.0-2.i386.rpm`
Utilities	`ccur-x11progs-6.4.2-008.i386.rpm`
Élan License Manager	`ccur-elanlm-5.0-9.i386.rpm`
NightStar server	`ccur-nstar-1.3-000.i386.rpm`
NightProbe server	`ccur-nprobeserv-2.8-000.i386.rpm`
NightSim server	`ccur-nsimserver-3.4-000-1.i386.rpm`
NightTrace server	`ccur-ntracelog-5.4-004.i386.rpm`
NightTune server	`ccur-ntuned-2.0-002.i386.rpm`
NightView server	`ccur-Nviewp-5.9-000.i386.rpm`

Target iHawk Series 870 RPMs (AMD64)

NightStar Tool	RPM
Scripts	`ccur-HyperHelp-scripts-6.4.2-002.i386.rpm`
Utilities	`ccur-x11progs-6.4.2-008.i386.rpm`
Élan License Manager	`ccur-elanlm-5.0-9.x86_64.rpm`
NightStar server	`ccur-nstar-1.3-000.x86_64.rpm`
NightProbe server	`ccur-nprobeserv-2.8-000.x86_64.rpm`
NightSim server	`ccur-nsimserver-3.4-000-1.x86_64.rpm`
NightTrace server	`ccur-ntracelog-5.4-004.x86_64.rpm`
NightTune server	`ccur-ntuned-2.0-002.x86_64.rpm`
NightView server	`ccur-Nviewp-5.9-000.x86_64.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/i386** and **RPM/x86_64** subdirectories and may be installed individually. See **rpm(8)** for more detailed information on installing individual RPMs.

5.0.   iHawk Series Interoperability

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

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

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

6.0.   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.

6.1.   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.

6.2.   Datamon

The Data Monitoring API is not yet available on iHawk 870 Series systems (AMD64).

It will be provided in a future update or release.

7.0.   Additional Considerations

7.1.   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 License Manager Information sheet that accompanies the installation CD) 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 License Manager Information sheet. Note that it is necessary to place double-quotes around the *key*.

7.2.   DWARF Debug Info - NightProbe, NightView, and Datamon

NightProbe, NightView, and Datamon 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 Item Browser window. In such cases, you can define artificial variables, which are views into the address space, using the Item Definition window, specifying their address and atomic type.

If the user application is not built with the proper debug option, Datamon will be unable to locate or evaluate any variables by their name.

Similarly, NightView will be unable to evaluate any variables by name or control execution via source file and line number, but can otherwise still debug the process using addresses and assembly mode.

Both NightView and NightProbe support specification of an alternate executable file built with proper debug information when the actual executable image has been stripped of debug information.

7.3. 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

7.4. New Program Icons

Program icons for each of the RedHawk NightStar Tools as well as the RedHawk NightStar Tools documentation will be installed on the system.

NightProbe

NightSim

NightTrace

NightTune	
NightView	
NightStar (documentation)	

User accounts created after installation of the tools will automatically have the icons installed on their desktop.

For users with pre-existing accounts, install the icons by running the following command, while logged in with your username:

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

The script will prompt you and ask if you wish the icons installed for Gnome or KDE desktops.

8.0.   Installation on Host Red Hat Systems

The RedHawk NightStar Tools can be installed on a Red Hat system if the Red Hat release number matches the release of the Red Hat version upon which the target RedHawk system is hosted.

For RedHawk 1.4, the appropriate Red Hat version is **Red Hat 8.0**.

For RedHawk 2.1 and 2.2, the appropriate Red Hat version is **Red Hat Enterprise Linux WS 3.0**.

Since the tools provide for remote system operation, the host processing can be done on a Red Hat system while the target system runs the user applications and real-time servers for remote tool operation.

If cross-compilation and linking is desired, additional software files are required from the software installation CDs shipped with your RedHawk system.

8.1.   Installing RedHawk Include Files and Libraries

If you intend to cross-compile and cross-link applications from a Red Hat system, follow these instructions.

1. Copy the following RPMs from the "RedHawk Linux OS" installation CD shipped with your RedHawk system to a directory on the Red Hat system:

    ```
    cp /mnt/cdrom/.redhawk/rpm/ccur-rcim-*.rpm /tmp
    cp /mnt/cdrom/.redhawk/rpm/ccur-rt-*.rpm /tmp
    cp /mnt/cdrom/.redhawk/rpm/ccur-kernheaders-*.rpm /tmp
    ```

2. Copy the following RPMs from the "RedHawk Linux Frequency-Based Scheduler" installation CD shipped with your RedHawk system to a directory on the Red Hat system:

    ```
    cp /mnt/cdrom/.redhawk/rpm/ccur-fbsched-*.rpm /tmp
    cp /mnt/cdrom/.redhawk/rpm/ccur-fbsched-fortran-*.rpm /tmp
    ```

    ### NOTE

    The **ccur-fbsched-fortran** RPM is available with RedHawk 2.2 and higher.

3. Create a directory on the Red Hat system which will serve as a pseudo-root directory for all required RedHawk files

    ```
    mkdir /redhawk_root
    ```

4. Extract the files

    ```
    cd /redhawk_root
    rpm2cpio /tmp/ccur-rcim-*.rpm | cpio -iBcdum
    rpm2cpio /tmp/ccur-rt-*.rpm | cpio -iBcdum
    rpm2cpio /tmp/ccur-kernheaders-*.rpm | cpio -iBcdum
    rpm2cpio /tmp/ccur-fbsched-*.rpm | cpio -iBcdum
    ```

8.2. Cross-Compiling and Cross-Linking

When building programs on a Red Hat system for use on RedHawk systems, supply the appropriate **-I** and **-L** compile and link flags to locate the RedHawk files as installed above.

For example:

```
cc -I/redhawk_root/usr/include -L/redhawk_root/usr/lib prog.c
```

9.0. Direct Software Support

Software support is available from a central source. If you need assistance or information about your system, please contact the Concurrent Software Support Center at 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.