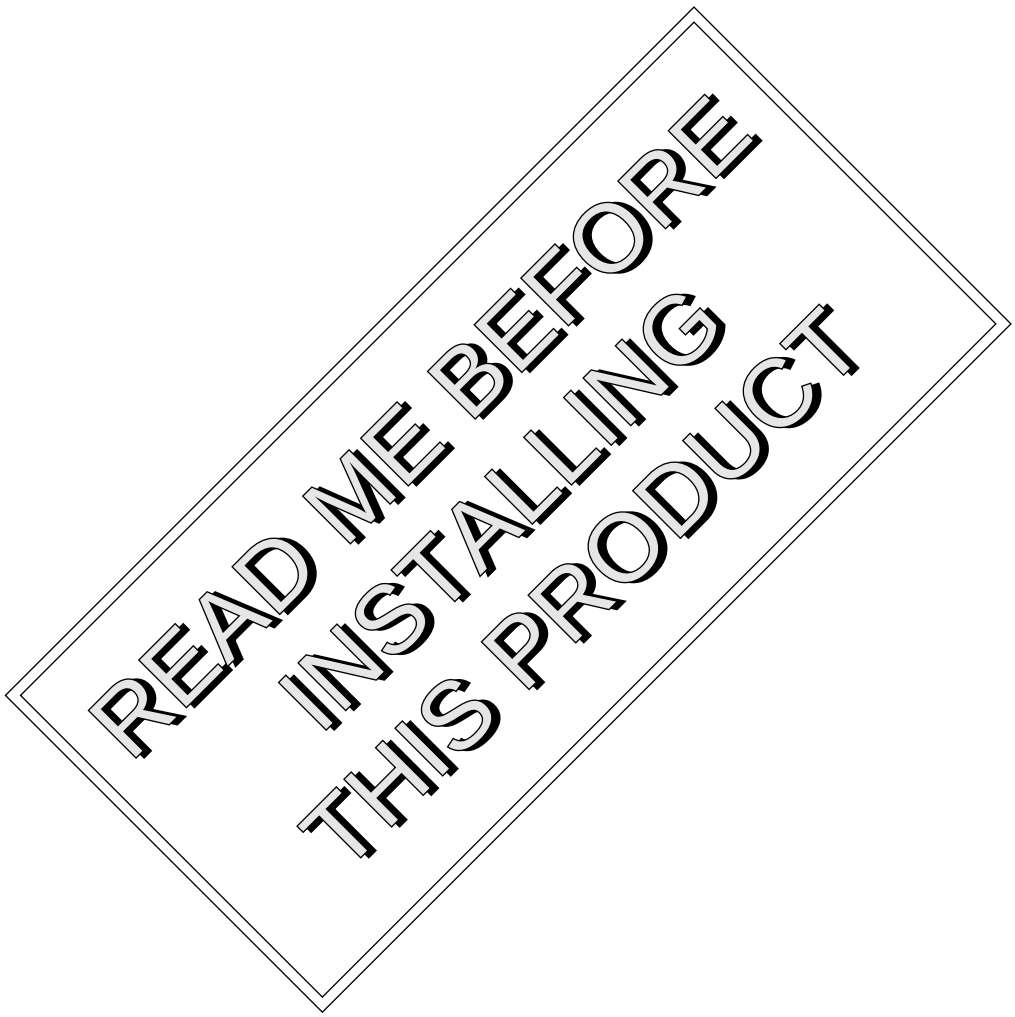
MAXAda for RedHawk Linux

Version 3.4 (Update 2) Release Notes

April 2004

0898537-3.4a



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1.0. Introduction

MAXAda™ for RedHawk™ Linux® supports development of Ada95 programs running under Concurrent Computer Corporation's RedHawk Linux real-time operating system. MAXAda for RedHawk Linux processes the Ada language as specified by the *Reference Manual for the Ada Programming Language, ANSI/ISO/IEC-8652:1995*, referred to in this document as the *Ada 95 Reference Manual* or RM.

MAXAda for RedHawk Linux 3.4 (Update 2) is a production release based on MAXAda 3.1 which was certified using Version 2.1 of the Ada Conformity Assessment Test Suite (certificate #A981215E2.1-047).

In addition, MAXAda for RedHawk Linux 3.4 (Update 2) includes POSIX® 1003.5, a complete implementation of the Institute of Electrical and Electronic Engineers (IEEE) standard IEEE-Std-1003.5-1992.

See "Implementation-dependent Issues" on page 7 and "Known Issues" on page 10 for more information.

2.0. Documentation

Table 2-1 lists the MAXAda for RedHawk Linux 3.4 (Update 2) documentation available from Concurrent.

Table 2-1. MAXAda for RedHawk Linux Version 3.4 (Update 2) Documentation

Manual Name	Pub. Number
MAXAda for RedHawk Linux Reference Manual	0898537-110
MAXAda for RedHawk Linux Version 3.4 (Update 2) Release Notes	0898537-3.4a

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 MAXAda for RedHawk Linux 3.4 (Update 2) Installation CD
- on the Concurrent Computer Corporation web site at www.ccur.com

3.0. Prerequisites

Prerequisites for MAXAda for RedHawk Linux Version 3.4 (Update 2) for both the host system and target system are as follows:

3.1. Host System

3.1.1. Software

- RedHawk Linux *or* Red Hat® Linux*

3.1.2. Hardware

- any Pentium®-based PC

3.2. Target System

3.2.1. Software

- RedHawk Linux 1.4 or 2.1

3.2.2. Hardware

- any Concurrent iHawk system

* This product has been tested on RedHawk Linux 1.4 and 2.1; Red Hat Linux 8.0 and 9.0; and Red Hat Enterprise Linux WS v.3. However, this product has not been tested with versions of Linux supplied by other vendors or on other versions of Red Hat Linux.

4.0. System Installation

The MAXAda for RedHawk Linux Installation CD contains all RPMs specifically required for operation of the MAXAda compiler, linker, and utilities.

However, to get the full benefit of MAXAda, the latest version of the NightStar tools should be loaded on your system.

Item	RPM
NightProbe 2.6	**ccur-nprobe-2.6-4.i386.rpm** **ccur-nprobeserv-2.6-4.i386.rpm** **ccur-nprobeapi-2.6-4.i386.rpm**
NightTrace 5.4	**ccur-ntrace-5.4-001.i386.rpm** **ccur-ntracelog-5.4-001.i386.rpm**
NightView 5.8	**ccur-NightView-5.8-000.i386.rpm** **ccur-Nviewp-5.8-000.i386.rpm**

These RPMs are available to customers with maintenence contracts on the RedHawk website at: http://redhawk.ccur.com. They are not provided on the MAXAda for RedHawk Linux Installation CD. You can load these updated tool RPMs before or after installing MAXAda.

RedHawk 1.4 is required for proper execution and debugging of MAXAda-built programs. You can compile and link programs on a Red Hat system, but execution of those programs requires RedHawk. Specifically, RedHawk 1.4 contains bug fixes and enhancements for correct execution of Ada tasking programs. Non-tasking programs may execute without detected problems on earlier versions of RedHawk.

A single command installs (or uninstalls) all of the RPMs needed to support MAXAda for RedHawk Linux 3.4 (Update 2), but does not address the installation of RedHawk 1.4.

The following table shows the RPMs that will be installed.

Item	RPM
MAXAda	**ccur-MAXAda-invoker-3.4-8.i386.rpm** **ccur-MAXAda-i86_3.4-002-1.i386.rpm** **ccur-MAXAda-rm-3.4-1.i386.rpm**
NightBench	**ccur-nbench-2.3.1-000.i386.rpm** **ccur-nbench-ada-2.3.1-000.i386.rpm** **ccur-nbench-c-2.3.1-000.i386.rpm**
Scripts	**ccur-HyperHelp-scripts-6.4.2-002.i386.rpm**
RedHawk libraries	**ccur-fbsched-1.4-1.i386.rpm** **ccur-rt-1.4-1.i386.rpm**
Utilities	**ccur-x11progs-6.4.2-006.i386.rpm**

NOTE

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

To install MAXAda for RedHawk Linux 3.4 (Update 2), issue the following commands on your RedHawk Linux system:

1. Insert the MAXAda for RedHawk Linux 3.4 (Update 2) 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 MAXAda for RedHawk Linux 3.4 (Update 2) installation scripts

   ```
   cd /mnt/cdrom
   ```

4. Invoke the MAXAda for RedHawk Linux 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 MAXAda for RedHawk Linux 3.4 (Update 2) Installation CD from the CD-ROM drive)

   ```
   umount /mnt/cdrom
   ```

To uninstall the MAXAda for RedHawk Linux RPMs, follow the steps above to mount the CD and issue the following command:

```
./ccur-uninstall
```

from the **`/mnt/cdrom`** directory.

4.1. Getting Started

MAXAda provides a command-line interface as well as graphical interface to the compilation process. Refer to "Using NightBench with Ada" section in the *NightBench User's Guide* (0890514) (**`nhelp nbench`**) or the "Using MAXAda" section in the *MAXAda Reference Manual* (0890516) (**`nhelp maxada`**).

5.0. Overview of MAXAda for RedHawk Linux 3.4 (Update 2)

MAXAda for RedHawk Linux 3.4 (Update 2) is based on MAXAda 3.1 which was certified using Version 2.1 of the Ada Conformity Assessment Test Suite (certificate #A981215E2.1-047).

MAXAda for RedHawk Linux 3.4 (Update 2) supports the Ada95 standard, ANSI/ISO/IEC-8652:1995 as indicated in the following table:

Sections 1 - 13	SUPPORTED
Annex A - Predefined Language Environment	SUPPORTED
Annex B - Interfaces to Other Languages	SUPPORTED
Annex C - Systems Programming	SUPPORTED (*with exceptions**)
Annex D - Real-Time Systems	SUPPORTED (*with exceptions**)
Annex E - Distributed Systems	NOT SUPPORTED
Annex F - Information Systems	NOT SUPPORTED
Annex G - Numerics	NOT SUPPORTED
Annex H - Safety and Security	NOT SUPPORTED
Annex J - Obsolescent Features	SUPPORTED

* The following features are not supported by this implementation:

Feature	RM Reference
Recommended representation support for the following clauses: 13.1(22) - support of non-static constant expressions 13.3(19) - inhibit optimizations based on assumptions of no aliases 13.3(35) - page alignment of standalone library-level objects	C.2
Preelaboration requirements	C.4
Atomic objects are not always moved indivisibly	C.6(15)
Not all storage associated with attributes of a task is reclaimed upon task termination	C.7.2(17)
`Ada.Asynchronous_Task_Control` package not provided or supported	D.11

Details regarding support for Annex C, Annex D, and all implementation-dependent portions of the language can be found in Appendix M of the *MAXAda Reference Manual* (0890516).

5.1. Implementation-dependent Issues

5.1.1. Support for RedHawk 2.1

MAXAda for RedHawk Linux Version 3.4 (Update 2) provides support for MAXAda on RedHawk 2.1 systems. Due to dependencies in the `GLIBC` library implementations, the underlying thread-of-control used to execute an Ada task is now a pthread; previously, the thread-of-control was a direct clone. Thus use of the **`pthreads`** library is required for tasking programs under RedHawk 2.1.

This should not be of concern; it is automatically linked into such programs by the MAXAda toolset.

Threads primitives are not used for tasking synchronization; the same high-performance, real-time mechanisms continue to be used as in the past (e.g. RedHawk 1.4).

5.1.2. Threads and Ada Programs

Ada programs built for RedHawk 1.4 systems cannot use the **`pthreads`** library; that version of the **`pthreads`** library is incompatible with the Ada runtime system.

For RedHawk 2.1 and beyond, threads programming can be mixed with Ada tasking; however, this is not generally recommended within the Ada community. Care should be taken to avoid any task-related activities in threads explicitly created by user code.

5.1.3. Default Link Rule

MAXAda for RedHawk Linux Version 3.4 (Update 2) changes the default link rule from:

`obj,ar,so`

to:

`obj,ar-system,so`

This has the effect of linking Ada programs in a manner such that the system support libraries are dynamic libraries.

This is the default behavior of GNU compilers.

Existing enivronment and partition definition are not affected by this change; however, any environments created after installation of the update will reflect this change.

To set the link rule for a partition, invoke **`a.partition`** in the following manner:

`a.partition -rule obj,ar,so` *partition_name*

or modify the settings in the Link Control tab of the NightBench Development tool.

5.1.4. Priorities

The Ada95 language defines priorities in terms of the discrete subtypes defined in the package `System`. The subtype `any_priority` spans the entire priority range supported by the implementation while the subtypes `priority` and `interrupt_priority` divide that range into standard user-level priorities and interrupt priorities (those which require the blocking of one or more interrupts).

For Ada tasking programs, the default Task Dispatching Policy is `FIFO_Within_Priorities`. The Ada priority values of `system.priority'first` (1) .. `System.priority'past` (98), map directly to the RedHawk Linux SCHED_FIFO 1..98 priorities.
`System.interrupt_priority'first` (99), maps directly to RedHawk Linux SCHED_FIFO priority 99.

Use of `System.interrupt_priority'last` (100) is reserved for Protected Actions. All external maskable machine interrupts are masked during such actions. Programs which use this priority value must lock their address space in memory (e.g. `pragma Pool_Lock_State(default,locked)`) and must exercise extreme care inside protected actions. Misuse of this priority value can cause system panics and/or have significant effects on system performance and determinism.

See the section titled "Priorities" in the "Run-Time Concepts" chapter of the *MAXAda Reference Manual* (0890516) for more information on priorities and scheduling classes.

5.1.5. Capabilities

RedHawk Linux provides a means to grant otherwise unprivileged users the authority to perform certain privileged operations. The **`pam_capability(8)`** (Pluggable Authentication Module) is used to manage sets of capabilities, called roles, required for various activities.

RedHawk systems should be configured with an `adauser` role which provides the capabilities required by MAXAda for RedHawk Linux. In order to run MAXAda tasking programs on a RedHawk target, each MAXAda for RedHawk Linux user must be configured to use (at a minimum) the capabilities specified below. In addition, the **`/etc/pam.d`** configuration files associated with the **`rsh`** and **`login`** services must be modified.

To configure user capabilities, edit the **`/etc/pam.d/rsh`** and **`/etc/pam.d/login`** files as `root`, adding the following line to each, if it is not already present:

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

Then edit **`/etc/security/capability.conf`** and define the `adauser` role (if it is not already defined) in the "ROLES" section:

```
role adauser cap_sys_admin cap_sys_nice cap_sys_rawio cap_ipc_lock
```

and, for each MAXAda for RedHawk Linux user on the target system, add the following line at the end of the file:

```
user   username     adauser
```

where *username* is the login name of the user.

If the user requires capabilities not defined in the `adauser` role, add a new role which contains `adauser` and the additional capabilities needed, and substitute the new role name for `adauser` in the text above.

In order for the above changes to take effect, the user should log off and log back onto the target system.

Note:

The **`/etc/pam.d/rsh`** and **`/etc/pam.d/login`** files, if edited as shown above, will allow capabilities to be granted to users who log into the system via **`telnet`**, **`rlogin`**, and **`rsh`**. Other methods of accessing the system may require that additional files in **`/etc/pam.d`** have similar modifications. For example, **`/etc/pam.d/gdm`**, **`/etc/pam.d/kde`**, and **`/etc/pam.d/ssh`**. To check to see if you have been granted capabilities, issue the following command:

`cat /proc/self/status`.

The last three lines labelled `CapInh`, `CapPrm`, and `CapEff` should have non-zero values if you have been granted capabilities.

See the section titled "Capabilities" in the "Introduction to MAXAda" chapter of the *MAXAda Reference Manual* (0890516) for more information.

5.1.6. Bit Numbering

Bit numbering on Pentium systems is different from that on PowerPC systems due to endian differences. These facts must be taken into consideration when interfacing to devices or using `Ada.Unchecked_Conversion`:

- `'Bit_Order` is `Low_Order_First`
- `System.Default_Bit_Order` is `Low_Order_First`
- In representation clauses (RM 13.5.1 & 13.5.2), the `first_bit` is the low-order bit and the `last_bit` is the high-order bit.
- In packed arrays, the low-order bit of a component appears in a lower byte number, or in the same byte number but lower bit number, than the component's high-order bit (assuming a component larger than 1 bit).

5.1.7. 'alignment max

`'alignment max` is 4 bytes for stack objects

5.1.8. Deprecated Math Package

The deprecated `math` package's handling of error conditions is different on Linux than on PowerMAX OS. For many errors, an exception is raised immediately while performing the math operation instead of merely setting `errno` and postponing the exception until `math.check_errno` is called.

See the comments in the specification of the `math` package in **`/usr/ada/i86_3.4/deprecated/math.a`** for more information.

5.1.9. Debug Level

The name of the debug level associated with the compile option **`-g2`** is now `simple`, not `full`.

In addition, the *debug_level* parameter `FULL` is not valid when using pragma `DEBUG`. The user should use *debug_level* `SIMPLE` instead.

5.2. Known Issues

MAXAda for RedHawk Linux 3.4 (Update 2) lacks some features that are planned for subsequent releases. These include:

- Position Independent Code - currently MAXAda for RedHawk Linux only supports statically linked Ada code. Support for Ada shared libraries is anticipated in a future release.
- Specification of a machine address in pragma `SHARED_PACKAGE` is supported Red Hawk Linux 2.1 and beyond.
- MAXAda programs will not operate with the Linux threads library in RedHawk Linux 1.4. However, this is no longer an issue in RedHawk Linux 2.1 and beyond.
- Specification of "restricted interrupt handling" has no effect in this release.
- Pragma `FAST_INTERRUPT_TASK` has no effect in this release.
- **`a.monitor`** is under development. Additional functionality will be added in subsequent updates and releases.
- **`a.rtm`** is not available in MAXAda for RedHawk Linux 3.4 (Update 2). The NightProbe tool (**`nprobe`**) is recommended in its place. See the *NightProbe User's Guide* (0890465) for more information.

The following tools are not currently planned for MAXAda for RedHawk Linux:

- **`a.analyze`**
- **`a.report`**
- **`a.slinker`**

The following packages are not available in MAXAda for RedHawk Linux 3.4 (Update 2):

- `Userdma_Support`

  RedHawk Linux does not currently support a **`userdma(2)`** service.

- `User_Level_Interrupts`

  RedHawk Linux does not currently support user-level interrupts.

- `RT_Interface`

The `RT_Interface` package has been moved to the **`deprecated`** environment. It has been replaced in this release with the package `FBSched` which is available in the **`vendorlib`** environment.

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.