

MAXAda for RedHawk Linux (x86_64)

Version 3.5-beta Release Notes

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0898537-3.5-beta



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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	3
3.2 Target System	3
3.2.1 Software	3
3.2.2 Hardware	3
4.0 System Installation	4
4.1 Getting Started	6
5.0 Overview of MAXAda for RedHawk Linux (x86_64) 3.5-beta	7
5.1 Implementation-dependent Issues	9
5.1.1 a.monitor	9
5.1.2 Sizes of Common Types	9
5.1.3 System.addresses Utility Functions	10
5.1.4 Priorities	10
5.1.5 Capabilities	10
5.1.6 Bit Numbering	11
5.1.7 'alignment max	12
5.1.8 Deprecated Math Package	12
5.2 Known Issues	13
6.0 Direct Software Support	14

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 (x86_64) 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 (x86_64) 3.5-beta is a pre-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 (x86_64) 3.5-beta 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 9 and “Known Issues” on page 13 for more information.

2.0. Documentation

Table 2-1 lists the MAXAda for RedHawk Linux (x86_64) 3.5-beta documentation available from Concurrent.

Table 2-1. MAXAda for RedHawk Linux (x86_64) Version 3.5-beta Documentation

Manual Name	Pub. Number
<i>MAXAda for RedHawk Linux Reference Manual</i>	0898537-120
<i>MAXAda for RedHawk Linux (x86_64) Version 3.5-beta Release Notes</i>	0898537-3.5-beta

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 RedHawk Linux utility, **nhelp**
- in PDF format in the **documentation** directory of the *MAXAda for RedHawk Linux (x86_64) 3.5-beta Installation CD*
- on the Concurrent Computer Corporation web site at **www.ccur.com**

3.0. Prerequisites

Prerequisites for MAXAda for RedHawk Linux (x86_64) Version 3.5-beta for both the host system and target system are as follows:

3.1. Host System

3.1.1. Software

- RedHawk Linux *or* Red Hat® Enterprise Linux WS 3.0

3.1.2. Hardware

- any x86_64-based PC

3.2. Target System

3.2.1. Software

- RedHawk Linux 2.2

3.2.2. Hardware

- any Concurrent iHawk Series 870 system (x86_64)

4.0. System Installation

The *MAXAda for RedHawk Linux (x86_64) 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 2.8	<code>ccur-nprobe-2.8-001.i386.rpm</code> <code>ccur-nprobeserv-2.8-001.x86_64.rpm</code> <code>ccur-nprobeapi-2.8-001.x86_64.rpm</code>
NightTrace 5.4	<code>ccur-ntrace-5.4-007.x86_64.rpm</code> <code>ccur-ntracelog-5.4-007.x86_64.rpm</code>
NightView 6.0-beta	<code>ccur-NightView-5.9-900.x86_64.rpm</code> <code>ccur-Nviewp-5.9-900.x86_64.rpm</code>

NightView 6.0-beta is required in order to debug Ada programs built with this release of MAXAda. It will be installed on the system automatically. The other RPMs are available to customers with maintenance 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 2.2 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.

A single command installs (or uninstalls) all of the RPMs needed to support MAXAda for RedHawk Linux (x86_64) 3.5-beta, but does not address the installation of RedHawk 2.2.

The following table shows the RPMs that will be installed.

Item	RPM
MAXAda	<code>ccur-MAXAda-x86_64_3.5-beta-002-1.x86_64.rpm</code> <code>ccur-MAXAda-invoker-3.5-1.x86_64.rpm</code> <code>ccur-MAXAda-rm-3.5-1.x86_64.rpm</code>
NightBench	<code>ccur-nbench-2.3.1-000.i386.rpm</code> <code>ccur-nbench-ada-2.3.1-000.i386.rpm</code>
Scripts	<code>ccur-HyperHelp-scripts-6.4.2-002.i386.rpm</code>
RedHawk libraries	<code>ccur-fbsched-2.2-1.x86_64.rpm</code> <code>ccur-rt-2.2-1.x86_64.rpm</code>
Utilities	<code>ccur-x11progs-6.4.2-009.i386.rpm</code> <code>ccur-elanlm-5.0-9.x86_64.rpm</code>

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 (x86_64) 3.5-beta, issue the following commands on your RedHawk Linux system:

1. Insert the *MAXAda for RedHawk Linux (x86_64) 3.5-beta 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 (x86_64) 3.5-beta installation scripts

```
cd /mnt/cdrom
```

4. Invoke the MAXAda for RedHawk Linux (x86_64) 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 (x86_64) 3.5-beta Installation CD* from the CD-ROM drive)

```
umount /mnt/cdrom
```

To uninstall the MAXAda for RedHawk Linux (x86_64) 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**).

To utilize the command-line interface, add the following to your `PATH`:

```
/usr/ada/bin
```

5.0. Overview of MAXAda for RedHawk Linux (x86_64) 3.5-beta

MAXAda for RedHawk Linux (x86_64) 3.5-beta 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 (x86_64) 3.5-beta 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 (<i>with exceptions*</i>)
Annex D - Real-Time Systems	SUPPORTED (<i>with exceptions*</i>)
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. a.monitor

The graphical interface to **a.monitor** has been redesigned using the Qt graphical toolkit.

As such, the executable file:

```
/usr/ada/x86_64_3.5-beta/bin/a.monitor-x
```

is released in accordance with Q Public License v1.0 and the GNU GPL.

All other files released with MAXAda for RedHawk Linux (x86_64) are licensed solely in accordance with the Concurrent Computer Corporation Software License Agreement which can be found at <http://www.ccur.com/info/stc.html>.

The files in:

```
/usr/ada/x86_64_3.5-beta/sup/license
```

describe these licenses in detail.

a.monitor operates with or without the GUI interface; issue:

```
a.monitor -H
```

for more information.

NOTE

Use of **a.monitor-x** during the development and debug of applications with MAXAda does not affect the licensing of such applications. Such applications are not derived works from **a.monitor-x** or the Qt toolkit, thus the Q Public License and the GNU GPL do not apply to such applications unless they specifically incorporate use of **a.monitor-x** as part of their functionality.

5.1.2. Sizes of Common Types

Due to the requirements of the x86_64 architecture, types involving addresses and access types as well as some commonly-used types have changed in size:

<code>long_integer</code>	64 bits
<code>system.address</code>	64 bits
<code>duration</code>	64 bits
<code>access types</code>	64 bits

5.1.3. System.addresses Utility Functions

The interface for the "+" and "-" operations involving `system.address` and an integer addend in **system.addresses** has changed such that the addend must now be `long_integer` instead of `integer`.

For example,

```
function "+" (left : in address; right : in integer)
return system.address
```

changes to

```
function "+" (left : in address; right : in long_integer)
return system.address
```

Similarly, the instantiations of `unchecked_conversion` in the package **system.addresses** between `system.address` and `integer` has been changed to `system.address` and `long_integer`.

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 (x86_64). In order to run MAXAda tasking programs on a RedHawk target, each MAXAda for RedHawk Linux (x86_64) 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 (x86_64) 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 16 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/x86_64_3.5-beta/deprecated/math.a
```

for more information.

5.2. Known Issues

MAXAda for RedHawk Linux (x86_64) 3.5-beta lacks some features that are planned for subsequent releases. These include:

- Documentation of implementation-dependent x86_64 features and attributes is incomplete; the final documentation will be shipped with the production version of MAXAda for RedHawk Linux 3.5.
- **a.monitor** is still under development and as such its operation is susceptible to various bugs. However, the tool is useful in its current state. Please report any problems you may encounter or requests for enhancement (see “Direct Software Support” on page 14).
- The **strace** facility in **a.monitor** is not currently functional due to a defect in the RedHawk operating system; it will be corrected in a future update to RedHawk.
- **a.pcllookup** is not available in MAXAda for RedHawk Linux (x86_64) 3.5-beta. It will be shipped with the production version of MAXAda for RedHawk Linux 3.5.
- Position Independent Code - currently MAXAda for RedHawk Linux (x86_64) only supports statically linked Ada code. Support for Ada shared libraries is anticipated in a future release.
- Specification of "restricted interrupt handling" has no effect in this release.
- Pragma `FAST_INTERRUPT_TASK` has no effect in this release.
- **a.rtm** is not available in MAXAda for RedHawk Linux (x86_64) 3.5-beta. 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 (x86_64):

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

The following packages are not available in MAXAda for RedHawk Linux (x86_64) 3.5-beta:

- `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 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.

