UNICOS® 9.0 Release Overview

RO–5000 9.0

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UNICOS® Release Overview
RO–5000 10.0

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1. Introduction

The *UNICOS 9.0 Release Overview* is a public document that provides an overview of the Cray Research, Inc. UNICOS operating system 9.0 release.

This release overview describes all features that have been released since the UNICOS 8.0 base release (8.0.2), including all 8.0 revision and update releases and the UNICOS 8.3 restricted release.

1.1 Hardware supported by UNICOS 9.0

The UNICOS 9.0 release supports the following series of Cray Research systems:

- CRAY T90 series
- CRAY J90 series
- CRAY C90 series
- CRAY C90D series
- CRAY Y-MP M90 series
- CRAY Y-MP E series
- CRAY EL series

CRAY T90, CRAY C90, CRAY C90D, CRAY Y-MP M90, or CRAY Y-MP E systems running UNICOS 9.0 can be used as the host of a CRAY T3D massively parallel processing (MPP) system.

For a complete list of Cray Research system models supported with the UNICOS 9.0 release, see subsection 1.6, page 1–6.

1.2 Emphasis for the UNICOS 9.0 release

The overall emphasis for the UNICOS 9.0 release is Open Supercomputing. In the evolving world of supercomputing,

environments are increasingly more heterogeneous. UNICOS 9.0 provides an environment where Cray Research tools can be integrated in a variety of different ways to effectively cooperate on networks to solve problems.

The UNICOS 9.0 release focuses on the following themes:

- Reliability, availability, and serviceability
- Support for additional peripherals
- Compliance with additional standards

1.3 Significant enhancements to UNICOS 9.0

The UNICOS 9.0 release provides several major enhancements and many minor ones. The following are the most significant enhancements in UNICOS 9.0; see the specific feature descriptions for users affected and for Cray Research systems supporting the feature:

- Support for the following new series of Cray Research systems:
  - CRAY T90 systems (subsection 2.1, page 2–1)
  - CRAY J90 systems (subsection 2.2, page 2–8)
- Support for additional peripherals, including the following:
  - ESCON channel for all Cray Research systems except CRAY J90 series and CRAY EL series (subsection 2.3.1, page 2–9)
  - IBM 3495 and 3494 Tape Library Dataservers (subsection 2.3.2, page 2–10)
  - SI-3 Small Computer System Interface (SCSI) tape controller for CRAY J90 series and CRAY EL series (subsection 2.3.3, page 2–11)
  - DD-6S disk drive for CRAY J90 series (subsection 2.3.4, page 2–11)
  - Network Disk Array devices for CRAY J90 series and CRAY EL series (subsection 2.3.5, page 2–12)

  - ER90 device for CRAY EL series (subsection 2.3.6, page 2–12)
  - DD-302 disk devices and DA-302 disk arrays for all Cray Research systems except CRAY J90 series and CRAY EL series (subsection 2.3.7, page 2–13)
  - ND40 network disk devices for all Cray Research systems (subsection 2.3.8, page 2–13)
  - IPI-3 attached disk and tape storage devices (subsection 2.3.9, page 2–14)
- Network connectivity and communication enhancements, including the following:
  - Support for the separately licensed NQX 2.0 product (subsection 2.5.1, page 2–19)
  - Kerberos RPC server support (subsection 2.5.4, page 2–21)
  - Distributed File System/Distributed Computing Environment (DFS/DCE) support (subsection 2.5.6, page 2–22)
  - Asynchronous Transfer Mode (ATM) technology support (subsection 2.5.16, page 2–29)
  - Solaris Open Network Computing Plus (ONC+) technology support (subsection 2.5.17, page 2–30)
- Compliance with the XPG4 standard (subsection 2.10, page 2–79)
- X Window System interface to the UNICOS Installation/Configuration Menu System (subsection 2.12.1, page 2–100)
- The UNICOS under UNICOS feature, which lets a site run two copies of the UNICOS operating system concurrently on one machine, allowing the guest system to be used for software testing and system upgrade, but not for production (subsection 2.9.1, page 2–46)
- An X Window System interface through the `xadmin`(8) command to make it easier for administrators to manage user login accounts (subsection 2.9.4, page 2–52)

- The dynamic allocation of file descriptors feature removes the per-process static limit on the number of open files (subsection 2.9.19, page 2–73)
- UNICOS shared file system (SFS) support (subsection 2.9.21, page 2–75)
- Support for an interface based on POSIX 1003.4a threads (Pthreads) (subsection 2.11, page 2–97)

1.4 Content of this release overview

This release overview briefly describes the UNICOS operating system 9.0 release and includes the following sections:

- Section 2, Software Enhancements, provides an overview of the new software features and enhancements.
- Section 3, Compatibilities and Differences, describes user and system administration issues that are involved in upgrading from the UNICOS 8.0 release to the UNICOS 9.0 release. This section includes information about commands, products, and libraries that have changed or that are not provided in the UNICOS 9.0 release. Also included is important early information about UNICOS 10.0 features and end of support for specific systems and products.
- Section 4, Multilevel Security, contains information on the UNICOS multilevel security (MLS) features of this release, including compatibility issues involved in upgrading from the UNICOS 8.0 release to the UNICOS 9.0 release. Also included is important early information about MLS system changes planned for future UNICOS releases.
- Section 5, Documentation, describes printed and online documentation supporting this release.
- Section 6, Customer Services, describes the customer services that Cray Research offers to support your software, including training services, problem reporting services, and general service information.

- Section 7, Release Package, contains the following information about the UNICOS 9.0 release package: a summary of hardware and software requirements including the supported upgrade paths, licensing information, and a list and description of the contents of the release package.

1.5 Electronic access to this release overview

You can access this release overview electronically; ASCII, PostScript, and Docview files are available on the Cray Research CRInform system, which is an online information and problem-reporting system for Cray Research customers and Cray Research personnel. If you do not have access to the CRInform system but would like a copy of the files, contact your Cray Research representative. For more information on CRInform, see subsection 6.3, page 6–2.

For more information on the Docview program, see subsection 5.3.2, page 5–13.

1.6 Definitions of margin note terms used in this release overview

The margin note on each feature subsection lists the types of users most affected by the described feature. The following definitions are used in these margin notes:

Audience	Definition
End user	Those who use the UNICOS operating system, products, applications, or network software
Programmer	Those who write or modify system or application code for the purpose of solving computer system, scientific, or engineering problems
Administrator	Those who perform system administration tasks such as installation, configuration, and basic troubleshooting
System analyst	Those who perform advanced troubleshooting, tuning, and customization
Operator	Those who perform operational functions or administer the Cray Research system through an operator workstation

The margin note on each feature subsection lists the type of hardware that operates with the feature. The following terms are used in these margin notes.

Term	Definition
All Cray Research systems	All systems supported by UNICOS 9.0. These are systems in the CRAY T90 series, CRAY C90 series, CRAY C90D series, CRAY Y-MP M90 series, CRAY Y-MP E series, CRAY J90 series, and CRAY EL series.
All systems with an IOS–E	All systems listed in “All Cray Research systems” excluding the CRAY J90 series and CRAY EL series.
CRAY T90 series	All models in the CRAY T90 series including CRAY T94, CRAY T916, and CRAY T932 systems.
CRAY C90 series	All models in the CRAY C90 series including CRAY C916, CRAY C92A, CRAY C94, CRAY C94A, and CRAY C98 systems.

CRAY C90D series	All models in the CRAY C90D series including CRAY C92AD, CRAY C94D, and CRAY C98D systems.
CRAY Y-MP M90 series	All models in the CRAY Y-MP M90 series including CRAY Y-MP M92, CRAY Y-MP M94, and CRAY Y-MP M98 systems.
CRAY Y-MP E series	All models in the CRAY Y-MP E series including CRAY Y-MP 2E, CRAY Y-MP 4E, CRAY Y-MP 8E, and CRAY Y-MP 8I systems.
CRAY J90 series	All models in the CRAY J90 series including CRAY J916 and CRAY J932 systems.
CRAY EL series	All models in the CRAY EL series including CRAY Y-MP EL, CRAY EL92, CRAY EL94, and CRAY EL98 systems.
CRAY T3D systems or Cray MPP systems	All models of the CRAY T3D series including CRAY T3D MC, CRAY T3D MCA, and CRAY T3D SC systems.

1.7 Reader comments

If you have comments about the technical accuracy, content, or organization of this document, please tell us. You can contact us in any of the following ways:

- Send us electronic mail from a UNICOS or UNIX system, using the following UUCP address:

```
uunet!cray!publications
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- Send us electronic mail from any system connected to the Internet, using the following Internet addresses:

  `pubs5000@timbuk.cray.com` (comments on this document)

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- Contact your Cray Research representative and ask that a Software Problem Report (SPR) be filed. Use `PUBLICATIONS` for the group name, `PUBS` for the command, and `NO-LICENSE` for the release name.

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- Use the postage-paid Reader's Comment Form at the back of this document.

We value your comments and will respond to them promptly.

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2. Software Enhancements

This section describes the new features and enhancements included in the UNICOS 9.0 release. For additional information about upgrading to this release, see the description of compatibilities and differences in section 3.

Because this release overview documents all features introduced since the UNICOS 8.0 base release, each feature includes the UNICOS 8.0 release level in which the feature was introduced. This information is provided to help our customers focus on the features that are new specifically for their upgrade.

Each subsection in this section lists in the margin both the type of user and type of hardware affected. For definitions of the terms used, see subsection 1.6, page 1–6.

For information about UNICOS multilevel security (MLS) system enhancements and changes, see section 4.

Note: The documentation that supports the features listed in this section is available either in print or online. For a description of the documentation provided with this release, see section 5, page 5–1.

2.1 New CRAY T90 series supported

Initial release: UNICOS 8.3

The UNICOS 9.0 release includes support for the CRAY T90 series of mainframes. The CRAY T90 systems use new technology and system organization designed to deliver the benefits of system resiliency, flexible system configuration, and significant performance gains.

The CRAY T90 series is available in three models: the CRAY T94, the CRAY T916, and the CRAY T932 models. CRAY T94 systems have up to 4 CPUs and 128 Mwords of memory; CRAY T916 systems have up to 16 CPUs and 512 Mwords of memory; CRAY T932 systems have up to 32 CPUs and 1 Gword of memory.

CRAY T90 systems use an IOS model E (IOS-E), and the SSD solid-state storage device and peripherals supported on an IOS-E.

The following subsections provide detailed descriptions of features included in the UNICOS 9.0 release to support CRAY T90 systems.

2.1.1 *CRAY T90 basic support*

Users affected

All

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

Changes were made to the UNICOS operating system to provide basic control for the following hardware features of the CRAY T90 series:

- Exchange package format changes
- Size of A register increased to 64 bits
- Number of SB and ST registers increased to 16
- Number of semaphore registers increased to 64
- New logical operations on A registers
- Sparse channel numbering
- Number of channels increased
- Maximum number of CPUs increased to 32
- New Address Multiply Interrupt (AMI) interrupt type
- New I/O instruction for polling channel interrupt status
- New segmented address space hardware (LATs)
- New exchange address management
- New addressing and memory allocation granularity
- CRAY C90 compatibility mode
- Hardware performance monitor changes

Changes were also made in the UNICOS operating system to recognize the CRAY T90 system type, as follows:

- Serial number recognition:
  - 70*xx* are serial numbers for CRAY T94 systems.
  - 71*xx* are serial numbers for CRAY T916 systems.
  - 72*xx* are serial numbers for CRAY T932 systems.

- System target `cray-ts` was added, along with associated machine characteristics.

For more information, see the `target`(1) and `target`(2) man pages.

Fault recovery for CPU and memory-related faults is provided. New status register formats, memory discovery and probing, and new memory organization are all supported. Appropriate error collection, logging, and processing through `errdemon`(8) and `errpt`(8) are supported.

In CRAY T90 mode, the address multiply operands and result are 48 bits wide. If an overflow is detected on an address multiply operation, an Address Multiply Interrupt is generated and the process is sent the new `SIGAMI` signal. For more information on signals, see the `signal`(2) man page.

2.1.2 *CRAY T90 scalar cache support*

Users affected

All

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

CRAY T90 systems contain a 1024-word scalar cache in each CPU. Both native CRAY T90 mode and CRAY C90 compatibility mode can take advantage of the scalar cache.

UNICOS scalar cache support in the kernel provides control for enabling and disabling caching, and maintains cache coherency when asynchronous kernel services are provided to user processes.

Multitasked processes in CRAY C90 mode have scalar caching disabled by the kernel. The scalar cache, as a resource, can be disabled by using the `cpu`(8) command on a per-CPU basis. The `cpu`(8) command can also be used to force a command to execute with cache enabled or disabled.

For more information, see the `cpu`(4) and `cpu`(8) man pages.

2.1.3 *CRAY T90 shared memory*

Users affected

All

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

Support was added for the UNIX System V interprocessor communication (IPC) mechanism. This mechanism introduces three named object types to the UNICOS system: shared memory segments (CRAY T90 series only); semaphores; and message queues. For information about semaphores and message queues, see subsection 2.9.25, page 2–78.

The shared memory feature on CRAY T90 systems allows memory segments to be shared among cooperating processes. The following new system calls support use of shared memory segments:

System call	Description
`shmat`(2)	Attaches shared memory segment
`shmctl`(2)	Provides shared memory control operations
`shmdt`(2)	Detaches shared memory segment
`shmget`(2)	Accesses shared memory identifier

The following configuration parameters have been added to the UNICOS installation and configuration menu system in support of shared memory configuration: `SHMMAX`, `SHMMIN`, `SHMMNI`, and `SHMSEG`.

The new `crash`(8) subcommand `shm` displays information on shared memory segments.

The `shmctl`(2) call provides scalar cache support for shared memory processes. If the kernel list of processes caching each segment becomes corrupted, all processes with that segment attached are sent the new `SIGSMCE` signal. The default action is termination.

> **Note:** Jobs using shared memory segments cannot be checkpointed.

Changes to the following UNICOS subsystems support shared memory:

- Network Queuing System (NQS); see subsection 2.1.4, page 2–5, for information.
- User database (UDB); see subsection 2.1.5, page 2–6, for information.

- Multilevel security (MLS) feature; see subsection 4.2.8, page 4–5, for information.

For more information on this feature, see the following man pages: `ipcrm`(1), `ipcs`(1), `shmat`(2), `shmctl`(2), `shmdt`(2), `shmget`(2), `signal`(2), `stdipc`(3), `ipc`(5), `shm`(5), `ipc`(7), and `crash`(8).

Related publications

- *UNICOS Configuration Administrator's Guide*, publication SG–2303

2.1.4 *NQS shared memory supported*

Users affected

All

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

Users can specify the shared memory requirements of a Network Queuing System (NQS) batch request that will execute on a CRAY T90 series host. Specifying these resources lets administrators and operators manage the execution of these requests.

Users can now specify the following resources by using the `qsub -l` command option:

- `shm_limit` specifies the maximum size of shared memory created by the request.
- `shm_segments` specifies the maximum number of shared memory segments created by the request.

The `qlimit`(1) and `qstat`(1) displays have been enhanced to show the appropriate shared memory information.

The following subcommands were added to the `qmgr`(8) command to support shared memory resources:

- `set per_request shm_limit` queue sets the maximum per-request shared memory size limit for a batch queue.
- `set per_request shm_segments queue` sets the maximum per-request shared memory segment limit for a batch queue.

The `qmgr modify request` command has been enhanced to support modification of the shared memory resources specified by a request.

A request can specify shared memory resources when it is submitted at any UNICOS 9.0 host. The resource limits are valid only when the job executes on a CRAY T90 series host.

For more information, see the `qsub`(1), `qlimit`(1), `qstat`(1), and `qmgr`(8) man pages.

Related publications

- *UNICOS NQS and NQE Administrator's Guide*, SG–2305

2.1.5 *UDB supports CRAY T90 shared memory*

Users affected

Administrator

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

The user database (UDB) has two new fields to support shared memory on CRAY T90 systems: `jshmsegs` and `jshmsize`. For more information, see the `udbgen`(8) and `libudb`(3) man pages.

2.1.6 *CRAY T90 programming support*

Users affected

Administrator, programmer

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

The following operating system support has been provided for programming on CRAY T90 systems:

- The `sim`(1) command supports CRAY T90 system simulation. For more information, see the `sim`(1) man page.
- The system library (`libc`) supports CRAY T90 systems.
- The multiprocessing library and assembler definitions file (`asdef`) support CRAY T90 systems. These include changes to the context exchange package in `asdef` and the corresponding support changes in the multiprocessing library. This feature also includes macrotasking support for the CRAY T90 scalar cache.

- The Cray Assembly Language (CAL) assembler is supplied as an executable on CRAY T90 systems. For customers with sources licenses, the CAL source is not buildable. For nonsource customers, the CAL source is not viewable. The instruction set has been modified to run on CRAY T90 systems, and the new instructions that are necessary are provided. See the as(1) man page for more information.

Related publications

- *Cray Assembly Language (CAL) for Cray PVP Systems Reference Manual*, publication SR–3108
- *UNICOS Macros and Opdefs Reference Manual*, publication SR–2403

2.1.7 *Maintenance interfaces supported*

Users affected

Administrator

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

To support running the UNICOS kernel in CRAY T90 mode, the UNICOS system now provides the ability to evaluate and test a CPU or I/O port by locking the CPU or I/O port into maintenance memory, an area of memory protected from the remainder of memory and used for diagnostics.

The chmem(8) command now supports options that allow an administrator to display and configure the maintenance memory area. The mem(4) file can now be used to change the configuration of physical memory.

For more information, see the chmem(8) and mem(4) man pages.

2.1.8 *CRAY T90 support channel*

Users affected

Administrator

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

The CRAY T90 series has a direct low-speed channel connection between the mainframe and the support system (OWS and MWS). The support channel feature includes an E-packet simple protocol driver that manages packet traffic between the mainframe and the support system.

The support channel is used to permit TCP/IP network access to the OWS. The network connection provides session and file transfer support between the mainframe and the support system. It is also used during the installation process. The support channel is defined in the parameter file.

2.1.9 *CRAY T90 configuration tools on the support system (OWS)*

Users affected

Administrator

Supporting hardware

CRAY T90 series

Initial release: UNICOS 8.3

Configuration of CRAY T90 systems is performed with the aid of the following new software tools:

- `pact`(8) parameter configuration tool
- `fsct`(8) file system configuration tool
- `tconfig`(8) machine environment command

For more information, see the `fsct`(8), `pact`(8), and `tconfig`(8) man pages on the OWS.

Related publications

- *Support System Administrator's Guide*, publication SG–3079
- *Support System Reference Manual*, publication SR–3077

2.2 CRAY J90 series supported

Users affected

All

Supporting hardware

CRAY J90 series

Initial release: UNICOS 8.0.3.2J

Changes were made to the UNICOS operating system to add support for the new CRAY J90 air-cooled supercomputer, which includes an IOS-V. The CRAY J90 series uses standard 50/60 Hz, 200–240 V power, and UNICOS is bundled with it.

UNICOS software is preinstalled on a CRAY J90 system before the system is shipped to a customer. A window-environment tool provides a user-friendly interface for the installation of UNICOS upgrade releases and other Cray Research products.

Related publications

- *UNICOS Installation Guide for the CRAY J90 Series*, publication SG–5271
- *UNICOS Basic Administration Guide for CRAY J90 Series and CRAY EL Series*, publication SG–2416
- *CRAY IOS-V Commands Reference Manual*, publication SR–2170
- *CRAY IOS-V Messages*, publication SQ–2172

2.3 Support for new peripheral devices

The following subsections describe the new hardware, in addition to CRAY T90 and CRAY J90 systems, that is supported by the UNICOS 9.0 release.

2.3.1 *ESCON channel supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems with an IOS-E

Initial release: UNICOS 8.0.4/8.3

The tape subsystem in the UNICOS 9.0 release now supports the ESCON channel. When this channel is added to a tape configuration, it allows a greater number of tape devices to be attached to a Cray Research system and provides a higher bandwidth than is currently possible with a block multiplexer (BMX) channel.

The updated `tapeconfig`(5) file format, `tpbmx`(8) command, and `tpconfig`(8) command allow administrators to define ESCON interfaces. New error messages also have been added.

For more information, see the `tapeconfig`(5), `tpbmx`(8), and `tpconfig`(8) man pages.

The `esconmon`(8), `xesconmon`(8), `etf_escon`(8), and `elf`(8) IOS-E commands have also been updated to reflect ESCON channel support. For more information, refer to the man pages for these commands on the support system. The support system consists of the OWS, the MWS, and (if you have a CRAY T90 system) the CRAY T90 support multiplexer (TSM).

Related publications

- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051
- *Support System Reference Manual*, publication SR–3077

2.3.2 *IBM 3495† and IBM 3494 autoloaders supported*

Users affected

End user, administrator, operator

Supporting hardware

All Cray Research systems except CRAY J90 series and CRAY EL series

Initial release: UNICOS 8.0.3/8.3

The UNICOS 9.0 software recognizes the IBM 3495† and 3494 Tape Library Dataservers as valid loader types. Each of these autoloaders is a linear, self-contained product that manages and automates the retrieval, mount, dismount, and storage of tape cartridges without the intervention of an operator.

The IBM 3495† Tape Library Dataserver uses tape drives from the IBM 3490 Magnetic Tape Subsystem and is available in several models. For all models, the minimum number of tape drives is four; the maximum number of drives differs for each model. For the largest model, the maximum number of tape drives is 64. The tape drives connect to Cray Research systems by using the existing block multiplexer channel or the ESCON channel on CRAY Y-MP systems with an IOS-E.

The IBM 3494 Tape Library Dataserver uses 3490E tape drive models C1A and C2A. These models work only with the IBM 3494 Tape Library Dataserver. The IBM 3494 Tape Library Dataserver is expandable in various ways; you can add on to the basic control unit with a combination of drive and storage units. The minimum number of tape drives is one; the maximum is eight.

For information about configuring this device, see the `tapeconfig`(5) man page.

† Implementation of IBM 3495 Tape Library Dataserver support is deferred.

This software requires a separate license from UNICOS 9.0. For information about licensing this software, see subsection 7.2.3.5, page 7–9, or contact your Cray Research representative.

Related publications

- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051

2.3.3 *SI-3 controller supported on CRAY J90 series and CRAY EL series*

Users affected

End user, administrator, operator

Supporting hardware

CRAY J90 series and CRAY EL series

Initial release: UNICOS 8.0.3

CRAY J90 series and CRAY EL series now support the Small Computer System Interface (SCSI) tape controller type (SI-3). The SI-3 supports the fast and wide SCSI standards. The SI-3 can transfer data up to 20 Mbyte/s.

Related publications

- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307

2.3.4 *DD-6S (9 Gbyte) disk drive support added for CRAY J90 series*

Users affected

End user, administrator, operator

Supporting hardware

CRAY J90 series

Initial release: UNICOS 8.0.3

The DD-6S (9 Gbyte, 5.25 inch) disk drive is now available for the CRAY J90 series. This drive can sustain transfer rates of 7 Mbyte/s for reads and 4 Mbyte/s for writes.

Related publications

- *UNICOS Basic Administration Guide for CRAY J90 Series and CRAY EL Series*, publication SG–2416

2.3.5 *Network Disk Array supported on CRAY J90 series and CRAY EL series*

Users affected

Administrator

Supporting hardware

CRAY J90 series and CRAY EL series

Initial release: UNICOS 8.0.3/8.0.4J

Network Disk Array devices (high-performance, high-capacity, disk storage devices) are supported on the CRAY J90 series and CRAY EL series. Support is provided by using the IPI-3 protocol over the HIPPI physical layer. The UNICOS driver, hdd, was modified to interact with the CRAY J90 or CRAY EL memory HIPPI driver. HIPPI connectivity allows configurations through HIPPI switches and HIPPI fiber-optic channel extenders. For more information, see the hdd(4) man page.

2.3.6 *CREMS/ER90 device supported on CRAY EL series*

Users affected

End user, administrator, operator

Supporting hardware

CRAY EL series

Initial release: UNICOS 8.0.3

The CRAY EL series now supports the ER90 helical-scan tape drive and its associated autoloader. All currently supported tape operations are supported on ER90 devices, and additional features unique to ER90 devices are provided for the first time on CRAY EL series systems. (ER90 hardware was previously supported only on CRAY Y-MP systems that had an IOS model E.)

The ER90 is a high-speed, helical-scan tape device. It uses a tape format based on the D-2 standard for digital composite video recording. The D-2 format consists of helical-scan tracks and longitudinal tracks. Data is recorded on the helical-scan tracks, and positioning information is stored on the longitudinal tracks. You can group multiple ER90 tape devices in a DataTower.

Tape operations unique to ER90 devices include multiple partitions (logical volumes) per physical volume, volume verification using a format identifier, non-BOT (beginning-of-tape) loads and unloads, and a fast-positioning feature.

Prior to UNICOS 9.0, users of the ER90 device product and of the ER90 device product had to special order these products. With UNICOS 9.0, both products are included in the UNICOS release materials.

The functionality is accessible only to licensed customers who have a separate Cray FLEXlm license key. For more information about licensing this product, see subsection 7.2.3.6, page 7–10, or contact your Cray Research representative.

Related publications

- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051

2.3.7 *DD-302 disk device and DA-302 disk array support*

Users affected

End user, administrator, operator

Supporting hardware

All Cray Research systems with an IOS-E

Initial release: UNICOS 8.0.4

DD-302 disk devices and DA-302 disk arrays are now supported. These devices are the final generation of 3.5-in., IPI-2 disk devices to be supported on systems with an IOS model E. Performance and capacity are improved over the previous generation product, which is the DD-301/DA-301.

for information on the physical characteristics of DD-302 and DA-302 disk devices, see the `diskspec`(7) man page.

Related Publications

- *General UNICOS System Administration*, publication SG–2301

2.3.8 *ND40 network disk support*

Users affected

End user, administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.4

The UNICOS operating system now supports the ND40 network disk device. The ND40 is the next-generation network disk product based on the Maximum Strategy GEN-5 product. This product offers increased capacity, increased performance, and improved resiliency features over the previous models, ND12 and ND14.

The hddmon(8) command provides a display that includes an `els` selection, that allows you to monitor and control disk devices on CRAY J90 and CRAY EL systems. For information about the hddmon(8) command, see subsection 2.9.14, page 2–69.

This software requires a separate license from UNICOS 9.0. For information about licensing this product, see subsection 7.1.5.2, page 7–4, or contact your Cray Research representative.

2.3.9 *Support for IPI-3-attached disk and tape storage devices*

Users affected

Administrator, system analyst

Supporting hardware

CRAY J90 series and CRAY EL series

Initial release: UNICOS 8.0.4

UNICOS features have been added to support the IPI–3/HIPPI tape K-packet driver on CRAY J90 and CRAY EL systems. The hpi3(4) man page describes the format of the configuration file for this packet driver when it is used with CRAY J90 and CRAY EL systems.

When you use the mknod(8) command to configure hdd device nodes, you can now use the *iopath* and the *flags* fields to allow for dynamic HIPPI channel selection. The new implementation of these fields is described in the hdd(4) man page.

The hddmon(8) command provides a display that includes an `els` selection, that allows you to monitor and control HIPPI disk devices on CRAY J90 and CRAY EL systems.

The hpi3(4), `hpi3_config`(8), `hpi3_stat`(8), `hpi3_start`(8), hdd(4), and hddmon(8) man pages have been updated to document these features.

2.4 CRAY T3D series support enhancements

The UNICOS 9.0 release supports the UNICOS MAX 1.2.0.5 release. The following subsections describe enhancements made to the UNICOS 9.0 release to support CRAY T3D massively parallel processing (MPP) systems.

2.4.1 *CRAY T3D Phase II I/O enhancements supported*

Users affected

Administrator, programmer

Supporting hardware

CRAY T3D systems

Initial release: UNICOS 8.0.3/8.3

The UNICOS 9.0 release includes changes to support Phase II I/O enhancements on CRAY T3D systems and Cray Research host systems.

Phase II I/O allows a direct high-speed (HISP) channel I/O connection between a Cray Research host system I/O subsystem model E (IOS-E) and a CRAY T3D system I/O gateway (IOG). This allows additional CRAY T3D bandwidth for Cray Research host systems that have no additional Phase I I/O connections due to a limited number of CPUs or shared modules in the host system.

The `open`(2) and `fcntl`(2) system calls support a new status flag. The new `O_T3D` status flag lets you control memory usage when the HISP channel connects the IOS and CRAY T3D system. Setting this flag means that subsequent I/O is performed from the CRAY T3D memory, rather than from secondary data segments (SDS) or from the main memory of the Cray Research host system. For more information, see the `fcntl`(2) and `open`(2) man pages.

The `t3d` target value has been added to the `hcon`(8) utility on the support system (OWS). For more information, see the `hcon`(8) man page on the support system.

Current HISP channel targets now include `mainframe`, `SSD`, and `T3D`. The UNICOS parameter file has an added flag, `T3D`, within the `ios_e` section. The UNICOS Installation/Configuration Menu System item `UNICOS parameters for MPP` has a new submenu called `I/O gateway (HISP)`, which allows the user to input parameters for the Phase II connection.

For more information about administering Phase II I/O on a CRAY T3D system, see the *CRAY T3D Administrator's Guide*, publication SG–2507.

Related publications

- *UNICOS Configuration Administrator's Guide*, publication SG–2303

2.4.2 *CRAY T3D Phase III I/O enhancements supported*

Users affected

Administrator

Supporting hardware

CRAY T3D systems

Initial release: UNICOS 8.0.4

UNICOS now includes support for Phase III I/O enhancements on CRAY T3D systems and Cray Research host systems. In support of Phase III I/O, the UNICOS parameter file now has an added entry in the `ios_e` section, as follows:

```
ios_e {
    cluster 0 {
       miop; eiop 0; eiop 1; eiop 2; eiop 3;       channel
010 is hisp 0 to mainframe, mode YMP;
       channel 014 is hisp 1 to T3D      , mode c200d200;
  boot miop with "/home/ice-ows/cri/os/ios/iopmux";
       boot eiop 0 with "/home/ice-ows/cri/os/ios/eiop.comm";
       boot eiop 1 with "/home/ice-ows/cri/os/ios/eiop.hpi";
       boot eiop 2 with "/home/ice-ows/cri/os/ios/eiop.dca2";
       boot eiop 3 with "/home/ice-ows/cri/os/ios/eiop.dca3";

phase_III;
     }
}
```

The UNICOS Installation/Configuration Menu System menu item `UNICOS parameters for MPP` has a new submenu called `Phase III I/O gateway` that allows a user to input parameters for the Phase III connection. The following two entries are associated with this menu item:

`CLUSNUM` The number of the IOS cluster that has the Phase III connection (for example, 0).

`PHASE_III` Indicates if there is a connection [YES or NO].

UNICOS MAX support for Phase III I/O is planned for the UNICOS MAX 1.3 release.

Related publications

- *UNICOS Configuration Administrator's Guide*, publication SG–2303

2.4.3 *MPP system activity monitoring added*

Users affected

Administrator

Supporting hardware

CRAY T3D systems

Initial release: UNICOS 8.0.4/8.3

The new `mppview`(8) command displays the activity occurring on a CRAY T3D system attached to a Cray Research host; `mppview`(8) receives data from the `sam`(8) daemon on the local Cray Research host or on a remote host if specified. The tool uses display routines based on `curses`(3) for line mode terminals. For more information about `curses`-based displays, see the `csam`(8) man page.

A graphical user interface is available through the `xmppview`(8) command. The display graphically represents usage of processing elements according to criteria you select and gives system performance statistics in tables accessible through pull-down menus. `xmppview`(8) uses the X Window System and contains a tutorial. For more information about `xmppview`(8), see the `xmppview`(8) man page. For availability of `xmppview`, contact your Cray Research service representative or Software Product Support.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.5 Network connectivity and communication enhancements

The following subsections describe enhancements made to the UNICOS 9.0 release to improve Cray Research systems network connectivity and communications.

2.5.1 *NQX 2.0 (NQE on UNICOS) supported*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

> **Note:** The initial NQX support was provided with the UNICOS 8.0.3 and 8.3 releases. Until the UNICOS 9.0 release, NQX 1.1 was supported and available with UNICOS.

The Network Queuing Environment (NQE) is a batch queuing system that automatically balances job loads across heterogeneous systems on a network. NQE contains the Network Queuing System (NQS), the File Transfer Agent (FTA), and the Network Queuing EXtensions (NQX) components. NQS and FTA are bundled with UNICOS and provide basic NQS and FTA services for UNICOS systems.

NQX adds components and functionality beyond NQS and FTA, such as a collector that provides system load and job status information to a Network Load Balancer (NLB) database. NQX also supports NQE clients on the server side and lets you take advantage of other NQE features, such as load balancing, application programming interfaces (APIs), and job dependency.

NQE on UNICOS systems consists of the following components:

- NLB (part of NQX)
- NQE client (part of NQX)
- NQS (bundled with UNICOS)
- FTA (bundled with UNICOS)

The following enhancements are included in NQX 2.0:

- The job dependency feature lets users or operations staff specify which job events should be posted and which job events should wait. The mechanism is implemented separately from NQS, which lets both NQS jobs and other applications use this batch complex event-posting mechanism.

- Support for submitting jobs as an alternate user has been extended. If you know the username/password pair, you can now run jobs as different users on any NQX server on which you have authorized access.
- Additional data objects in the NLB provide more information about NQE servers and jobs.

Cray NQX 2.0 is not supported on systems that have enabled UNICOS multilevel security (MLS). For more information, see subsection 4.3.2, page 4–10.

This software requires a separate license from UNICOS 9.0. For information about licensing this product, see subsection 7.2.3.1, page 7–8, or contact your Cray Research representative.

Related publications

- *UNICOS NQS and NQE Administrator's Guide*, publication SG–2305
- *NQE User's Guide*, publication SG–2148
- *NQE Ready Reference*, publication SQ–2149
- *NQE Administration*, publication SG–2150
- *Introducing NQE*, publication IN–2153

2.5.2 *NQS/URM scheduling*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

In UNICOS 8.0, additional NQS scheduling modes were introduced. In UNICOS 9.0, the description of these commands has been enhanced to provide more guidance on how to use the various options.

With the Unified Resource Manager (URM) scheduling modes, NQS works with URM before initiating jobs. URM scheduling is available only on UNICOS systems. To use URM for job scheduling, you must be running URM. By default, URM listens on port 606.

The `qmgr set job scheduling` options are as follows:

Option	Description
`nqs normal`	Traditional NQS scheduling; the default scheduling type. NQS does not use URM. It is the only mode that uses the NQS scheduling weighting factors.
`nqs resource_management`	Combines traditional NQS scheduling (`nqs normal`) with SDS management. It uses URM instead of the `qfdaemon` process, which is no longer available, and URM manages SDS preemption for NQS jobs.
`nqs superqueues`	This is `nqs normal` scheduling, with the following addition: jobs in batch queues of equal priority are scheduled as though they are members of a common queue. Individual queue limits continue to be enforced.
`urm limited`	Provides NQS limits coupled with URM scheduling. In this mode, URM determines which jobs will run, but it stays within NQS limits. This option is useful for sites that need to use their current NQS-style queue and scheduling structure, but want URM to take a more active part in job initiation.
`urm unlimited`	NQS registers all incoming jobs with URM and allows URM to make job initiation decisions. NQS starts all jobs as recommended by URM. URM evaluates its target load by examining the system load, including all work on the system. This includes non-NQS work, such as interactive sessions. As a result, NQS may start jobs in excess of NQS limits if it is recommended by URM.

For additional information about configuring and running the UNICOS URM, about URM targets and NQS limits, and for an explanation of the additional parameters URM uses in its job initiation logic, see *UNICOS Resource Administration*, publication SG–2302, or the NQS `qmgr` online help information.

For compatibility information, see subsection 3.4.1.4, page 3–10, and subsection 3.4.1.5, page 3–10.

2.5.3 *NQS superqueues*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

This release adds the new `Nqs Superqueues` job scheduling type to the `qmgr set job scheduling` command. This option lets you schedule jobs that are in queues of equal priority as though they are members of a common superqueue. For more information, see the `qmgr`(8) man page or the `qmgr` online help information.

Related publications

- *UNICOS NQS and NQE Administrator's Guide*, publication SG–2305

2.5.4 *Kerberos RPC server for multiple IP addressed hosts now supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.3/8.3

This UNICOS release supports an optional Remote Procedure Call (RPC)-based server, `krbipd`(8). For Cray Research systems that have more than one Internet Protocol (IP) address configured, `krbipd`(8) checks possible mismatched IP interface addresses against the list of IP addresses configured for a specific machine. For more information, see the `krbipd`(8) man page.

Related publications

- *Kerberos Administrator's Guide*, publication SG–2306

2.5.5 *Kerberized* `ftp/ftpd` *security extensions*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

Kerberized `ftp/ftpd` implements the `ftp`(1B) security extensions documented in the Internet draft document *FTP Security Extension*, April 1994. This feature extends `ftp`(1B) and `ftpd`(8) to provide strong authentication, integrity, and confidentiality on the control and data channels by introducing new, optional commands, replies, and file transfer encodings.

For more information, see the `ftp`(1) and `ftpd`(8) man pages.

Related publications

- *Kerberos Administrator's Guide*, publication SG–2306
- *Kerberos User's Guide*, publication SG–2409

2.5.6 *Cray DCE Client Services and Cray DCE DFS Server support*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.3

This UNICOS release supports the Cray Distributed Computing Environment (DCE) Client Services and the Cray DCE Distributed File System (DFS) Server. DCE is a set of services and tools that provide for distributed computing in a heterogeneous computing environment. The Cray DCE Client Services product provides client services such as Call Directory Services (CDS), Remote Procedure Call (RPC), Security Services, and Threads. The Cray DCE Distributed File System (DFS) Server product allows the UNICOS system to act as a DFS file server.

For information about checkpointing and restarting DFS files, see subsection 2.7.6, page 2–42. For information about DFS/SFS enhancements, see subsection 2.9.21, page 2–75. For information about `crash`(8) enhancements for DFS, see subsection 2.9.11, page 2–66. For DCE login differences with this UNICOS release, see subsection 3.4.5, page 3–12.

This software requires a separate license from UNICOS 9.0. For information about licensing these products, see subsection 7.1.5.2, page 7–4, or contact your Cray Research representative.

Related publications

- *Cray DCE Client Services 1.0.2.1 / Cray DCE DFS Server 1.0.3.1 Release Overview*, publication RO–5225

2.5.7 *File Transfer Agent (FTA) IBM block mode support enhanced*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.3/8.3

IBM MVS support was added to File Transfer Agent (FTA) functionality. Users can now transfer binary-blocked UNICOS files to and from record-oriented MVS files for use on IBM platforms. For more information, see the `fta`(8), `fta.conf`(5), and `ftua`(1) man pages.

Related publications

- *FTA User and Administrator Manual*, publication SG–2144

2.5.8 *File locking supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Remote file systems now support file locking, provided the new daemons `lockd`(8) and `statd`(8) are running. However, file systems can still be mounted without file locking.

The `lockd`(8) daemon processes file lock requests. The `statd`(8) daemon provides crash and recover functions for NFS locking services. For more information, see the `lockd`(8) and `statd`(8) man pages.

Related publications

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.9 `gated` *OSPF supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

A new version of the `gated`(8) daemon supports the Open Shortest Path First (OSPF) routing protocol as well as a new version of the `ripquery`(8) command. The 9.2.1 software version of Cisco routers is interoperable with the OSPF protocol.

The following commands have been added:

- `gdc`(8) provides a user-oriented interface for the operation of `gated`(8).
- `ospf_monitor`(8) queries OSPF routers to provide detailed information on I/O statistics, error logs, link-state databases, autonomous system (AS) external databases, the OSPF interfaces, and OSPF neighbors.

For more information, see the `gated`(8), `gdc`(8), and `ospf_monitor`(8) man pages. For important compatibility information, see subsection 3.4.1.7, page 3–11, and subsection 3.4.4, page 3–12.

Related publications

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.10 *New options for* `route` *command support* `gated` *routing daemon*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The following options and directives have been added to the `route`(8) command to support the `gated`(8) routing daemon:

Option	Definition
`-t`	Processes routing directives, but makes no changes to the kernel routing table
`-d`	Specifies debug mode, which prints the route message that would have been sent to the kernel when manipulating the route tables manually

Directive	Definition
`change`	Changes the gateway or metrics of a route
`get`	Looks up and displays the route for a destination

Also, the `-C` option has been removed from the `route`(8) command. For more information on this removal, see subsection 3.4.3, page 3–12.

For more information about this enhancement, see the `route`(8) man page.

Related publications

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.11 `spnet` *command enhanced*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Enhancements were made to the `spnet`(8) command, including a new system call, `nsecctl`(2), to improve the performance, maintainability, extensibility, and user interface of `spnet`(8). Now, a single network access list (NAL) or workstation access list (WAL) definition can have several addresses associated with it in the kernel as well as in the `spnet.conf` file, resulting in potential memory savings in the kernel.

The `spnet.conf` file has changed. In the UNICOS 9.0 release, the `spnet`(8) command reads the `spnet.conf` file more efficiently, resulting in a reduction in system time equivalent to approximately 30% of total execution time. In addition, the `name` field declared in the `spnet.conf` file is loaded into the kernel for administrator convenience.

The following are new options in `spnet`(8):

- `-d[efault]` lists all the NAL field values, including defaults.
- `-n[umeric]` lists Internet Protocol (IP) addresses in dotted-decimal form.

For more information, see the `nsecctl`(2) and `spnet`(8) man pages.

Related publications

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304
- *General UNICOS System Administration*, publication SG–2301

2.5.12 *IP multicasting support added*

Users affected

Administrator, programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release supports multicasting, which enables an application to send a single packet to a group of hosts. The new `igmp`(4P) protocol is used by hosts and routers to identify the multicast groups to which a host currently belongs.

Multicast routers use this information to forward multicast datagrams to the appropriate interfaces. For information about the new IP-level multicast options added to the protocol, see the `ip`(4P) man page.

A new IP multicast routing daemon, `mrouted`(8), forwards a multicast datagram along the shortest path tree that is rooted at the subnet on which a datagram originates. The following administrative commands were added:

- `map_mbone`(8) obtains routing information from multicast routers and builds a topological map from the information.
- `mrinfo`(8) obtains routing information from a multicast router and prints a description of the router and the virtual interface list.

For more information, see the `igmp`(4P), `mrouted`(8), `map_mbone`(8), and `mrinfo`(8) man pages.

Related publications

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.13 `rcp` *command enhanced*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `rcp`(1) command has been enhanced in functionality and performance.

The `-T` option lets users display transfer times and rates.

To provide better performance over HIPPI connections, the `rcp`(1) command now uses asynchronous double-buffered disk I/O and larger network buffer sizes.

For more information, see the `rcp`(1) man page.

Related publications

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.14 *BIND 4.9.3.beta9 supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release supports Version 4.9.3.beta9 of the Berkeley Internet name domain (BIND). Updated commands include `dig`(8), `host`(1B), `named`(8), `named-xfer`(8), `nslookup`(1), and the resolver library. Additional debugging aids have been added to the resolver library. ANSI C compatibility and portability are enhanced.

The `named`(8) daemon provides negative caching of invalid names and addresses, and improved error checking. The new resolver library supports multiple default domains, address sorting, and improved error handling.

For more information, see the `dig`(8), `host`(1B), `named`(8), `named-xfer`(8), `nslookup`(1), `gethost`(3), `resolver`(3), `masterfile`(5), `named.boot`(5), and `resolv.conf`(5) man pages.

Related publications

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.15 `crash` *enhancements for NFS*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3/8.0.3

The `crash`(8) administrator command has been enhanced to display information about the following networking features:

- Network file system (NFS) client handles
- NFS client handle tables
- NFS `svc_data` structures
- Remote Procedure Call (RPC) `SVCXPRT` structures

The following new subcommands support these features:

- `ch`
- `chtable`
- `svc_data`

- `svc_xprt`

For more information, see the `crash`(8) man page.

2.5.16 *Asynchronous Transfer Mode (ATM) technology supported*

Users affected

All

Supporting hardware

Cray Research systems with an IOS-E and HIPPI channel (BBG); CRAY EL and J90 series (Native ATM)

Initial release: UNICOS 8.0.4

Asynchronous Transfer Mode (ATM) is transmission technology that allows voice, data, and video transmission across a single connection. ATM technology offers a universal network connection for supercomputers, and also enables new applications for multimedia user interfaces, geographic independence of client-server resources, and ease of relocatable network modes. The Cray Research product name *ATM* is derived from and is used interchangeably with the transmission technology Asynchronous Transfer Mode.

Because off-the-shelf ATM hardware components do not fit into traditional Cray Research architectures, Cray Research has developed an external network adapter, a Bus Based Gateway (BBG), for these systems. CRAY EL series systems and CRAY J90 series systems use a traditional VME interface for ATM technology.

Man pages for the BBG interface are as follows: `bbg`(4), `bbgatmstat`(8), `bbgconfig`(8), `bbghwconfig`(8), `bbgoc3config`(8), and `bbgstart`(8).

Man pages for the VME interface are as follows: `atmarp`(8) and `atmadmin`(8).

ATM support for the CRAY EL series is available with the UNICOS 8.0.4 release and later.

For more information about this product, contact your Cray Research representative.

Related publications

- *Asynchronous Transfer Mode (ATM) Administrator's Guide*, publication SG–2193

2.5.17 *ONC+ technology supported*

Support for ONC+ technology has been added, as described in the following subsections.

For information about ONC+ licensing or to purchase an ONC+ license, see subsection 7.2.3.2, page 7–9, or contact your Cray Research representative.

2.5.17.1 *Network Information Service Plus (NIS+) supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

Network Information Service Plus (NIS+) is a new network information service that enables administrators to administer domains and network information access more efficiently. This service stores and manages administrative information required by programs, such as searching for a password, validating a user ID, or finding the address of a server host. It is one of SunSoft's Open Network Computing Plus (ONC+) technologies that is now available in the UNICOS system. The advantages of NIS+ include the following:

- Distributed and remote administration of network domains
- Support of multiple administrative domains
- Automatic updates of network information from master and slave servers
- Easier access to naming service information
- User authentication and permission control of NIS+ information

The `nis`(4) man page provides a brief overview of the product.

Cray Research continues to provide the Network Information Service (NIS) product with the UNICOS operating system under the UNICOS set license.

Related publications

- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169
- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.17.2 AUTH_KERB *RPC authentication supported*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

AUTH_KERB is a new Remote Procedure Call (RPC) authentication that uses MIT's Kerberos Version 4 authentication mechanism. AUTH_KERB RPC technology enables programmers to write client-server applications that can securely request services on remote servers over untrusted networks.

AUTH_KERB RPC authentication is hardly noticeable by the end user. End users must only request a Kerberos ticket-granting ticket to access a Kerberos RPC server and Kerberized RPC applications.

For more information about remote RPC authentication, see the `kerberos_rpc`(3) man page.

Related publications

- *Kerberos User's Guide*, publication number SG–2409
- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169
- *Remote Procedure Call (RPC) Reference Manual*, publication SR–2089

2.5.17.3 AUTH_KERB *Kerberized NFS supported*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

AUTH_KERB NFS is a new feature that uses MIT's Kerberos Version 4 authentication mechanism for network file system (NFS) protocol transactions. The UNICOS kernel calls a user level daemon, `kerbd`(8), to generate and validate Kerberos RPC requests.

The following example of a Kerberized NFS transaction between client and server using the change directory command, cd(1), illustrates the use of AUTH_KERB.

1. A client makes an NFS request to obtain access to a mounted file system with the cd(1) command. The UNICOS kernel on the client machine makes a request to kerbd to get Kerberos credentials on behalf of the user. Having obtained and encrypted those credentials, the UNICOS kernel makes a Kerberized (AUTH_KERB) RPC call to the server machine with a request for access.
2. The UNICOS kernel running on the server machine receives the request. It calls the kerbd daemon on the server to decrypt and verify the the AUTH_KERB RPC request. If the request is decrypted successfully, it is passed to the server's nfsd(8) daemon and serviced. nfsd is unaware that the message came in using AUTH_KERB RPC.

For more information about AUTH_KERB NFS, see the exportfs(8), kdestroy(1), kerbd(8), klist(1), mount(8), and nfsd(8) man pages.

Related publications

- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169

2.5.17.4 *New version of NFS supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

NFS version 3 is a new version of the network file system (NFS), a protocol and distributed file system. It supports larger files, and allows improved permission checking and computing environment scalability. NFS code version 3 contains a revised collection of procedures, but it can run concurrently with NFS version 2. NFS version 3 contains a new file system type named NFS3.

NFS version 3 is largely transparent to UNICOS users and administrators. With this new protocol and file system type, users share enhanced file system access across large and complex networks.

Using the enhanced functionality of NFS version 3 and other components of Open Network Computing Plus (ONC+) technology, customers can link Cray Research machines with other machines in multiplatform enterprise networks.

The new NFS3 file system type supports file locking. If your system is licensed for ONC+, the `lockd`(8) daemon registers for version 4 of the `nlockmgr` protocol.

For additional information, see the `automount`(8), `lockd`(8), and `mount`(8) man pages.

Related publications

- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169
- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304

2.5.17.5 *New RPC program number mapper* `rpcbind`(8) *supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

This UNICOS release includes the new `rpcbind`(8) daemon, which maps universal addresses to RPC program numbers and specific ports.

The `rpcbstart`(8) daemon starts the `rpcbind` daemon. If your site does not have an ONC+ license, the `rpcbstart`(8) daemon starts the `portmap`(8) daemon by default.

For more information, see the `rpcbind`(8) and `rpcbstart`(8) man pages.

Related publications

- *Remote Procedure Call (RPC) Reference Manual*, publication SR–2089

2.5.18 *NFS ID mapping conversion*

Users affected

Programmer, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The network file server (NFS) ID mapping domains have been converted to a radix tree structure. The benefits of this feature are as follows:

- The radix tree structure for NFS ID mapping domains permits faster worst-case lookups because the maximum lookup time is based on the depth of the radix tree, and there is a known maximum depth to the tree. The previous structure was a linked list, so the look-up operation was linear; this was potentially much slower (because the length of the list is limited only by kernel mbuf memory).
- Commands that are used to add ID mapping domains to the kernel are now order-independent.

2.5.19 *Increased network connectivity on CRAY J90 and CRAY EL systems*

Users affected

Administrator

Supporting hardware

CRAY J90 systems and CRAY EL systems

Initial release: UNICOS 8.0.4

To support greater connectivity, the maximum number of Ethernet and FDDI interfaces (controllers) on CRAY J90 systems and CRAY EL systems has been increased from 4 Ethernet and 2 FDDI interfaces to 8 Ethernet and 8 FDDI interfaces. The limit on the number of controllers on a CRAY EL IOS or on a CRAY J90 IOS-V remains at 4 Ethernet and 2 FDDI controllers per IOS.

2.6 User interface, tools, and utilities enhancements

The following subsections describe enhancements to the user interface, tools, and utilities in the UNICOS 9.0 release.

2.6.1 *New* `chkpnt_util` *utility added to aid in determining job restartability*

Users affected

End user, administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `chkpnt_util`(1) utility has been added to allow users to examine a restart file. The utility performs most of the tests that are performed within the kernel and provides specific information about the cause of a restart failure. The utility also can copy a restart file and add names for data files referenced within the file.

For more information, see the `chkpnt_util`(1) man page.

2.6.2 *New search options added to* `man` *utility*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The `-s` and `-l` options were added to the `man`(1) utility. Descriptions of the new options follow; the new search options make the `man` *section title* option obsolete. The `man` *section title* option will be removed in a future release.

Option	Description
`-s` *section*	Specifies sections of the directory for `man` to search. The directories searched for title(s) are limited to those specified by *section*(s). *section* is an Arabic number or one of the words `new`, `local`, `old`, `public`, or `quick` (added for `-s` option, not available with obsolete usage `man` *section title* ...). A section may be followed by a one-letter classifier. To specify multiple sections, separate sections with a comma.
`-l` *title*	Lists all pages found matching the *title*(s) given in the search path. The search path is a colon-separated list of directories in which man page subdirectories may be found.

2.6.3 *New option to* `tar` *utility for file extraction with archived permissions*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

A new option has been added to the `tar`(1) utility. The `-p` option restores archived files with the original permissions preserved. When `-p` is specified, the current `umask` of the user is ignored, and the files are extracted with the permissions with which they were archived.

For more information, see the `tar`(1) man page.

2.6.4 `ticksum` *utility added*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The new `ticksum`(1) utility provides a time-independent checksum of a file.

If invoked with one argument, `ticksum`(1) calculates a checksum of the named file and writes this sum, in hexadecimal format, to standard output. For the specific kinds of binary files `ticksum`(1) recognizes, information such as the time of compilation and the version of the generating product is ignored in calculating the checksum.

If `ticksum`(1) is invoked with two arguments, `ticksum`(1) compares the two files by comparing their checksums. A zero exit status indicates that the checksums were the same; a nonzero exit status indicates that the checksums differed.

For more information, see the `ticksum`(1) man page.

2.6.5 *GNU Emacs upgraded to version 19*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Full X Window System support is now provided for the GNU Emacs editor (version 19.28). This version provides menu support for the X Window System and adds the `ispell`(1) spell checking function. For more information, see the `/usr/lib/emacs/README2` file. For information about important differences between the previous and the new versions of Emacs, see subsection 3.5.11, page 3–22.

2.6.6 `define` *utility added to Docview*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Support for the `define`(1) utility has been added to the X Window System version of Docview. This capability allows a user to obtain the definitions of Cray Research and site glossary terms from within Docview. This feature depends on the UNICOS `define`(1) utility being installed.

For more information, see the `docview`(1) and `define`(1) man pages.

2.6.7 `help` *command improved*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `help`(1) command has been modified so that when it cannot find help for a specified topic, it executes the `explain`(1) or `man`(1) command to offer further assistance in defining keywords.

For more information, see the `help`(1) man page.

2.6.8 *PE time limit options added to* `limit` *command*

Users affected

End user

Supporting hardware

All Cray Research systems using MPP hardware

Initial release: UNICOS 9.0

The `limit`(1) command has been modified so that a user does not need to write a program to change processing element (PE) time limits. A user can now change PE time limits on the command line by using the `-t pe_time_limit` and `-e pe_limit` options.

For more information, see the `limit`(1) man page.

2.6.9 *UNICOS source manager (USM) enhanced*

Users affected

Programmer, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Several enhancements have been made to the UNICOS source manager (USM). A summary of the changes is as follows:

- Increased support for sideline branches allows for branches to be named.
- A new command, `unget`(1), was developed to replace the functionality of the `get -u` subcommand.
- A new program library (PL) type was added to allow additional sequence numbers per mod ID, as well as increasing line lengths to 2047 characters. This new PL type cannot be processed by earlier versions of USM, but specifying the `-o` option on the `create` subcommand line will create an *old type* PL. This new version of USM can process either type of PL.
- A more robust recovery mechanism was added to make recovery safer.
- Error messages were reorganized.
- The `bmerge` subcommand was added to the UNICOS source manager (USM) to merge sideline branches into the main line. The main purpose of this subcommand is to facilitate the merging of site-created local sideline branches back into the main line after the main line has been updated. The local sideline branch can then be built from the new main-line node.

  For more information, use the `sm`(1) `help` subcommand.
- The `-m` option was added to the `sm`(1) command line to allow suppression of informational, caution, or warning USM messages.
- The `-f` option has been added to the USM `get` subcommand to force the return of a file even if a writable copy exists in the user's directory.
- The addition of three options to the `sm`(1) command: `-a` lists all defined attributes; `-n` lists all named branches; and `-x` *ids* exits if all IDs are known.

- The ability to set time-based attributes and named branches; query whether attributes or named branches are known within a PL; and see all mod IDs that occurred between two attributes.

For more information, see the get(1) and sm(1) man pages.

2.6.10 bc *utility from the Free Software Foundation supported*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The bc(1) utility uses source code ported from the Free Software Foundation (FSF). The FSF bc(1) utility replaces the standard UNIX bc(1) utility issued with previous UNICOS releases because the FSF utility provides reliable calculations. Existence of problems in many implementations of the UNIX bc(1) utility is documented and relatively widely known.

The bc(1) and the dc(1) utilities included in previous UNICOS releases were renamed to be obc(1) and odc(1), respectively, in the UNICOS 9.0 release.

For information about the differences between the FSF and UNIX bc utilities, see subsection 3.5.6, page 3–19.

For more information on the FSF utility, see the bc(1) man page.

2.6.11 *New* whoami *utility supported*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release provides the new whoami(1B) utility. This utility displays the login name that corresponds to the current effective user ID. If you use su(1) to adopt another user temporarily, whoami(1B) reports the login name associated with that user ID.

For more information, see the whoami(1B) man page.

2.6.12 *Standard shell* `setuid/setgid` *script conformance supported*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The standard shell (a POSIX compliant version of the Korn shell) is now consistent with other UNICOS shells and does not honor the `setuid` and `setgid` modes of shell scripts. As a result of this change, the standard shell does not execute shell scripts that do not begin with a line reading `#!` and that are not readable.

For more information, see the `sh`(1) man page. For compatibility information, see subsection 3.5.2, page 3–17.

2.6.13 *New* `tpmnt`(1) *command* `-l` *option argument examines tape contents*

Users affected

End user, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The `tpmnt`(1) command provides a new argument, `ulp`, for the `-l` option. This argument is used primarily by the `tplist`(1) command to examine the contents of a tape, and it eliminates the need for `tplist`(1) to use `blp`.

For additional information, see the `tpmnt`(1) man page. For additional tape subsystem enhancements, see subsection 2.9.16, page 2–70.

2.7 System calls enhancements

The following subsections describe system call enhancements in the UNICOS 9.0 release.

2.7.1 *New* `unlink2` *system call*

Users affected

System analyst, programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.4

The new `unlink2`(2) system call functions like the `unlink`(2) system call with the exception of the return values. Both system calls remove directory entries. In addition, the `unlink2`(2) system call returns the number of bytes of space freed when all links are removed from a file.

For more information, see the `unlink`(2) man page.

2.7.2 *New inode-based system calls for locating files and directories*

Users affected

System analyst, programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.4/8.3

Two new system calls are available for locating files and directories. The `openi`(2) system call opens a file by using the inode number. The `chdiri`(2) system call changes to a directory by using the inode number.

For more information, see the `openi`(2) and `chdiri`(2) man pages.

2.7.3 *New* `lsetattr` *system call*

Users affected

System analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The new `lsetattr`(2) system call improves the speed and functionality of a system restore. The `lsetattr`(2) system call makes available the full generality of the `VOP_SETATTR()` macro.

For more information, see the `lsetattr`(2) man page.

2.7.4 `access` *system call using* `euid` *supported*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Programmers can access the effective user and group IDs by specifying the new `EUID_OK` bit in an `access`(2) system call. With the `EUID_OK` bit specified, the ID substitution (in which the real user and group IDs replace the effective user and group IDs) does not occur.

For more information, see the `access`(2) man page.

2.7.5 `signobdm` *signal masked*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release has been enhanced to allow a programmer to mask the `signobdm` signal in an application and thus block the signal from delivery. However, if an exception signal (such as `signobdm`, `sigfpe`, `sigore`, and so on) is masked, the application may continue to run even though it is failing, making fault isolation difficult. This change makes `signobdm` consistent with other signals.

For more information, see the `signal`(2) and `sigprocmask`(2) man pages.

2.7.6 `chkpnt` *and* `restart` *system calls support DFS files*

Users affected

End user, administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

Processes with open files that reside on Distributed File System (DFS) file systems can be checkpointed and restarted. Credentials would be lost across a system reboot, however.

For additional information, see the `chkpnt`(2) and `restart`(2) man pages.

2.8 UNICOS library enhancements

The following subsections describe library enhancements in the UNICOS 9.0 release.

2.8.1 *String-to-float conversion routine added*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

A new string-to-float conversion routine, `strtof`(3), converts strings to the `float` data type. This is most useful on Cray MPP systems where `float` is a 32-bit data type but `double` is 64 bits.

For more information, see the `strtod`(3) man page.

2.8.2 *User exit available at program start-up*

Users affected

Programmer, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

A user exit has been added to the program start-up routine `$START$`. This user exit gives anyone the ability to link a user-specified routine into a program.

As the last step before calling the main routine of the program, the `$START$` routine checks for the existence of a routine called `sitelocal_start`; if this routine is linked into the program, it is called. This allows site-specific user exit code to be run before the main routine is called. To use this feature, write a `sitelocal_start` function and link it to your program.

For more information and an example of a `sitelocal_start` function, see the `start`(3) man page.

2.8.3 *New routines for word-oriented memory operations*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

UNICOS 9.0 makes available three new routines for word-oriented memory operations: `memwcmp`(3), `memwchr`(3), and `memstride`(3).

For more information, see the `memword`(3) man page.

2.8.4 *Memory manager features*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Several requested memory manager features have been implemented in the UNICOS 9.0 release as follows:

- Initial release: UNICOS 8.3

  The following new routines have been added: `malloc_check` (added in UNICOS 7.0), `malloc_inplace`(3), `malloc_expand`(3), `malloc_extend`(3), `malloc_howbig`(3), `malloc_isvalid`(3), `malloc_space`(3), `malloc_limit`(3), `malloc_stats`(3), `malloc_tron`(3), `malloc_troff`(3), `malloc_etrace`(3), and `malloc_dtrace`(3).

  These routines are similar to the old routines formerly documented on the `memmgr`(3) man page. For information about differences for these routines, see subsection 3.7.2, page 3–28.

- Initial release: UNICOS 8.3

  Added a feature to set all blocks allocated by `malloc`(3) or freed by `free`(3) to the `indef` value. (This is a value that would cause an operand-range error (`ORE`) if used as an address, or a floating-point error (`FPE`) if used in a floating-point operation; see the `segldr`(1) man page for a complete definition.) Users can activate this feature by setting the `MEMINDEF` environment variable to a nonzero value, or by using the `M_INDEF` argument to the `mallopt`() function.

- Initial release: UNICOS 8.3

  Added a feature to cause a program to abort if an `sbreak`(2) call fails (that is, the program has run out of memory). This feature is activated by setting the `MEMABORT` environment variable to a nonzero value, or by using the `M_ABORT` argument to the `mallopt`(3) function.

- Initial release: UNICOS 8.3

  Added the following `mallopt()` commands: `M_BREAKSZ`, `M_MEMCHK`, `M_LOWFIT`, `M_INDEF`, and `M_ABORT`.

- Initial release: UNICOS 8.3

  Enhanced the memory manager tracing feature so that it traces calls to `brk`(2), `sbrk`(2), and `sbreak`(2) in addition to calls to the memory manager routines.

- Initial release: UNICOS 9.0

  The memory manager was changed to be more memory-efficient. This feature changes the memory manager's algorithm so that it uses less memory (a difference from 10% to a high factor, depending on the program), while the call is no more than 25% slower than the default algorithm. The new algorithm, called the `lowfit` algorithm, causes user programs to waste less memory, keeping total program size smaller.

  The reason this feature is needed is that, with certain memory allocation patterns, the heap can grow to a size much larger than the actual memory allocated by the user. The `lowfit` algorithm provides a method for decreasing memory usage while maintaining time efficiency.

  Users can activate this feature by setting the `MEMLOWFIT` environment variable to be `1` or by adding the following call to the beginning of a program:

```
mallopt(M_LOWFIT, 1);
```

For more information about the memory manager enhancements, see the `malloc`(3) man page.

2.8.5 *ER90 block mode support added*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

You can now write to an ER90 tape device in block mode from Fortran or with flexible file I/O (FFIO). Records written to this device must meet its restrictions on block sizes. For more information, see the `assign`(1) and `ffopen`(3) man pages.

Related publications

- *UNICOS Tape Subsystem User's Guide*, publication SG–2051

2.9 Operating system enhancements

The following subsections describe enhancements to the operating system for the UNICOS 9.0 release.

2.9.1 *UNICOS under UNICOS supported*

Users affected

Administrator, system analyst, operator

Supporting hardware

All Cray Research systems except CRAY J90 series and CRAY EL series

Initial release: UNICOS 8.0.3

This subsection briefly describes the UNICOS under UNICOS feature, which was initially supported in the UNICOS 8.0.3 release, and it also describes UNICOS 9.0 enhancements.

The UNICOS under UNICOS feature lets a site run two copies of the UNICOS operating system concurrently on one machine. The *host* UNICOS system boots normally with most of the system resources. Subsequently, a *guest* UNICOS system can be started by an authorized user. The UNICOS under UNICOS feature allows the guest system to be used for software testing and system upgrade, but not for production.

When you are planning to run or configure a guest system, remember the following:

- The UNICOS kernels of both the host and guest systems must contain support for the UNICOS under UNICOS feature.
- The guest system is a complete second operating system and requires the same minimum resources as any stand-alone kernel.

- Your IOS release level must support the higher release level of your guest or host system. For example, if UNICOS 9.0 is running as a guest under UNICOS 8.0.3, you need to run the IOS release level that supports UNICOS 9.0.

  For information about the IOS release level that supports the UNICOS 9.0 release, see subsection 7.1.2, page 7–2.

For information about using this feature to assist in upgrading your UNICOS system to a new release level, see the UNICOS under UNICOS articles in the *Cray Research Service Bulletin* (CRSB) and the *UNICOS under UNICOS Administrator's Guide*, publication SG–2156.

The host system performs the following tasks on behalf of the guest system:

- User exchanges
- Memory error handling
- Register parity error handling
- Physical I/O
- All SSD solid-state storage device and IOS request validation

The following safeguards are provided with this feature:

- Guest kernels can access only the memory allocated to them.
- Guest panics do not create panics on the host system.

With UNICOS 9.0, the following enhancements were made to the UNICOS under UNICOS feature, which was initially provided in the UNICOS 8.0.3 revision release. The features added in the UNICOS 9.0 release are available only when UNICOS 9.0 is used as the host system.

2.9.1.1 *RAM root file systems*

You can now specify that a RAM root file system be loaded in guest memory for use by the guest. The file specified can be either a `/dev/dsk` entry or a `dd`(1) copy. The `guest`(1) command makes cursory checks to ensure that the specified file contains an NC1 file system.

Additional guest parameter file changes are necessary to make use of the RAM file system. See *General UNICOS System Administration*, publication SG–2301, and the *UNICOS Installation Guide*, publication SG–2112, for more information about specifying and using RAM file systems.

Define the following parameter in your `guest.rc` file:

```
RAM_FILESYSTEMS=file
```

2.9.1.2 *Minimum host CPUs*

The administrator can now specify the minimum number of CPUs that are to remain in the host system at all times. Support for this specification has been added to the UNICOS under UNICOS menus in the UNICOS Installation/Configuration Menu System. Users with the `udb`(5) permbit `guestadmn` are also allowed to specify this number at guest boot time by using the `-N` *num* option to the `guest`(1) command. If there is no work to perform in the host, this number of CPUs will idle in the host, even if the guest requires CPU resources. Therefore, a setting of anything except 0 will not provide optimal CPU usage across both systems.

Define the following parameter in your `/usr/guest/Defaults` file:

```
MIN_HOST_CPUS=num
```

2.9.1.3 *Maximum guest CPUs*

The guest user can now request that the number of CPUs sent to the guest be fewer than the number configured in the host. The selection of CPUs begins with CPU 0. Only CPUs successfully started in the host will be selected.

Define the following parameter in your `guest.rc` file:

```
NUM_CPUS=num
```

2.9.1.4 *Guest memory allocation retry count*

On a busy system, the allocation of guest memory may require several incremental attempts. Previously, if the guest user's minimum memory requirements were not met after 10 attempts, the guest command would return any already allocated memory to the host and exit with an error. The user can now specify the number of memory retry attempts to make before failure. There is no limit.

Define the following parameter in your `guest.rc` file:

```
MEMORY_RETRIES=num
```

2.9.1.5 *General feature limitations*

The following are general limitations of this feature:

- The use of a CRAY T3D system from the guest is not supported.
- The guest system is not operated or monitored from the OWS.
- Tape configurations **must** be identical on the host and the guest. That is, all devices must be in the same position (ordinal) in the configuration. ER90 tapes, though unsupported in the guest, should still be used as place holders in the guest configuration.
- SSD space intended for the guest system must not be in use on the host (that is, SSD cannot be dynamically allocated at guest boot time).
- Multiple SSDs are not supported.
- Logical CPU 0 is required for booting a guest; therefore, it must not be down at guest boot time.
- Real-time applications may act differently on a guest or a host that has an active guest.
- Dedicating a CPU to a process (cpu(8)) in the guest or in a host with an active guest may result in sporadic execution of the process.
- If an alternate path is available for a disk device shared by the host and guest, both paths **must** be configured in each system.

For more information, see the new `guest`(1) man page.

Related publications

- *UNICOS under UNICOS Administrator's Guide*, publication SG–2156

2.9.2 *Generic data consolidator and front-end formatter added*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The system accounting generic consolidator and front-end formatter are more flexible versions of the `csacon`(8) and `csacrep`(8) commands. Together they allow you to do the following tasks:

- Consolidate the session file
- Consolidate multiple `pacct` files
- Generate a report or binary file based on the consolidated data

Both the Cray system accounting (CSA) and generic formatters are available. Consider the following factors when deciding which front-end formatter to use:

- The CSA front-end formatters require a source license, but the generic formatter does not.
- The generic front-end formatter output can be either ASCII or Cray binary data, where a binary number is always written as a 64-bit word. The CSA formatter can be modified to write 32-bit numeric values or extended binary coded decimal interchange code (EBCDIC) output.
- Both formatters process session record files created by `csabuild`(8). However, the generic formatter is also capable of processing multiple `pacct` files.

For more information, see the `csagcon`(8) and `csagfef`(8) man pages.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.3 *New accounting features*

Users affected

Administrator

Supporting hardware

All Cray Research systems

The features described in this subsection were added to the accounting software.

Initial release: UNICOS 8.3

- The system accounting feature retrieves, formats, and outputs more complete error messages using the UNICOS message system.
- A new accounting control feature has been added to the UNICOS 9.0 release. The accounting routines in the kernel and in Cray system accounting (CSA) have expanded the daemon accounting control to include record accounting control and command accounting control.
- The new `acctctl`(2) system call enables, disables, and checks the status for process, daemon, and record accounting. The `acctctl`(2) system call may be used instead of the `acct`(2) and `dacct`(2) system calls; it returns more information, including status information, in a more generic format.
- The `csaswitch`(8) command enables, disables, and checks the status of kernel, daemon, and record accounting.

  For more information, see the `acctctl`(2) and `csaswitch`(8) man pages.

Initial release: UNICOS 9.0:

- To improve I/O performance and to facilitate automatic data conversion, an I/O library layer was added to the accounting package. This enhancement also provides a simple way to change the underlying I/O method. For UNICOS 9.0, the underlying I/O method is changed from `fopen/fread/fwrite` to `ffopen/ffread/ffwrite` (FFIO).

  Use of the FFIO routines improved the overall performance of the accounting package; the system time was reduced by 50% to 75%.

  The size of the executable increased due to the additional use of the FFIO routines. The actual program size increased by the number of buffers used by the FFIO routines, which can be controlled by using the `assign`(1) command or a new environment variable (`ACCT_FFIO_OPT`).

For more information, see `ffopens` (on the `ffopen`(3) man page) and the *Application Programmer's I/O Guide*, publication SG–2168.

- To increase compatibility across release changes, all UNICOS 9.0 accounting tools are able to process accounting data generated on systems running UNICOS 8.0 or UNICOS 8.3. As needed, the data is converted automatically to UNICOS 9.0 format. Unlike previous releases, for UNICOS 9.0 you are no longer required to run the `csaconvert`(8) command to convert the prior accounting data to the current release format.

  However, if you access the prior accounting data on a regular basis, for performance reasons you should convert the data once using the `csaconvert`(8) command. This allows you to avoid the overhead of repeatedly converting the data automatically. In this instance, explicit conversion is preferred.

- The UNICOS Installation/Configuration Menu System can now be used when configuring accounting, thereby simplifying installation and upgrades.

  Accounting functionality remains the same, but the configuration file (`/etc/config/acct_config`), which contains configurable parameters used by the accounting commands, is updated by the tool.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.4 *X Window System-based interface added to manage user login accounts*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

An X Window System-based interface that uses the new `xadmin`(8) command provides a graphical user interface that has all the functionality of the `nu`(8) command. `xadmin` was created to make it easier for administrators to manage user login accounts. The X Window System-based interface is self-explanatory and requires no prior knowledge of the `nu` command. `xadmin` contains a tutorial for an overview of the command and context-sensitive help on specific topics.

For more information, see the `xadmin`(8) man page.

2.9.5 *User database (UDB) enhancements*

The user database (UDB) enhancements described in the following subsections are provided with the UNICOS 9.0 release.

2.9.5.1 *Clear-text password added to UDB*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

To improve ease of use, a `cpasswd` field was added to the user database (UDB). This clear text password is encrypted and stored in the user's record. The password content is not validated. This field is used on both UNICOS multilevel security (MLS) and non-MLS systems. On a UNICOS MLS system, only an appropriately authorized user can change this field.

For more information, see the `udbgen`(8) man page.

2.9.5.2 *Per-session sockbuf limit added by using UDB*

Users affected

All

Supporting hardware

All Cray Research systems

Inital release: UNICOS 8.0.4

Changes have been made to the UNICOS release since the UNICOS 8.0 major release. A new per-session `sockbuf` limit has been added to the UNICOS system. This limit is configurable on a per-user basis by using the standard UDB tools. An attempt to open a socket, accept a connection, or increase the per-sockbuf space limit is refused if the additional `sockbuf` space pushes the user's use over the session limit. This is intended to limit `sockbuf` use by any single user. Processes running with an effective UID of 0 are exempt.

For more information, see the `limit`(1), `accept`(2), `limit`(2), `getsockopt`(2), `netvar`(8), and `socket`(2) man pages.

Related publications

- *General UNICOS System Administration*, publication SG–2301
- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304
- Online revision of *UNICOS System Administration*, publication SG–2113 8.0, TCP/IP section

2.9.5.3 `jsocbflim` *supports new per-session* `sockbuf` *limit*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.4

The user database (UDB) includes the new `jsocbflim` field, which supports the new per–session `sockbuf` limit in UNICOS.

For more information about the new UDB field, see the `udbgen`(8) and `udblib`(3c) man pages.

2.9.5.4 *On-the-fly reset of maximum user ID in UDB*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The new `-m` option to the `udbgen`(8) command lets the system administrator reset the user database (UDB) maximum user ID (UID) value without having to rebuild the entire UDB from source.

The UDB maintains a record of the highest UID value assigned. This value is used to determine the UID when a new record is created by using `:uid:next:` syntax. Because this value is never decremented, it is possible to reach large UID values while leaving large ranges of UIDs unused. This option resets the UDB maximum UID value to the highest nondeleted UID.

For more information, see the `udbgen`(8) man page.

2.9.5.5 *Redesign of the UDB*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The user database (UDB) has been substantially rewritten to allow for future enhancements. The UDB now spans several files, and library routines for the UDB have been moved. However, the UDB interface remains substantially the same.

The following interface changes have been made to the UDB:

- The UDB has been extended. There are now extension files in a new subdirectory, `/etc/udb_2`, that physically separate public and private data in the UDB. (Private data includes encrypted passwords, security compartments, permission bits, etc.) Fields added appear in the extension files, with the exception of the user name, UID, group list, and account ID (`acid`) list.

Note: The files `/etc/udb` and `/etc/udb.public` continue to exist for compatibility; however, in a future release they will be removed, and all data will be moved into the new files.

- The `libudb`(3) library replaces the `udblib` library. The library source files have been moved from `libc/gen` to `libc/udb`.
- New fields have been added to support a minimum compartment set (`mincomps` field), shared memory and segments (`jshmsegs` and `jshmsize` fields), and dynamically expandable open file descriptors (`pfdlimit` field). The shared memory feature is supported on CRAY T90 systems only.

  For more information about the `mincomps` field, see subsection 4.2.11, page 4–8.
- The `limflags` field is no longer used, but is maintained for compatibility.
- New UDB permission bits (permbits) have been added to support retrieval of acid information (`askacid` permbit), group administration information (`groupadm` permbit), and the interprocess communication (IPC) persistence facility (`ipc-persist` permbit).
- There are two new library functions, `udb_strerror` and `udb_header_access`. The `udb_strerror` function translates a UDB error (`udb_errno` code) into a message string. The `udb_header_access` function is reserved for use in future releases.

For more information, see the `cll`(8), `getpermit`(2), `passwd`(5), `udb`(5), `udbgen`(8), `libudb`(3) (renamed from `udblib`(3)), and `udbsee`(1) man pages.

Related publications

- *General UNICOS System Administration*, publication SG–2301

2.9.5.6 *UDB fair-share scheduler flag holder enforcement added*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release contains a feature to enforce correct usage of the fair-share flags (the `shrflags` field) in the user database (UDB). If incorrect information in the UDB would cause the creation of an improperly labeled or positioned lnode, the system issues an error, and the user is prevented from logging in or submitting jobs.

The new `shrtree`(8) command can be used to verify the fair-share hierarchy in the UDB. This command produces messages that indicate possible errors.

The major impact of this feature will be felt by sites that run the fair–share scheduler with Share by Account mode enabled. The `SHAREHOLDER` flag must be set in the `shflags` field for UDB records that define account IDs (acids).

For more information, see the `shrtree`(8) and `shradmin`(8) man pages.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.6 *Unified Resource Manager (URM) enhancements*

The Unified Resource Manager (URM) enhancements described in the following subsections are provided in the UNICOS 9.0 release.

2.9.6.1 *URM checkpointing*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

The URM checkpointing enhancements described in this subsection were added to UNICOS.

- Initial release: UNICOS 8.3

  The URM checkpoint feature improves user recoverability by allowing the user to periodically checkpoint an active session. This protects against lost work due to an uncontrolled system shutdown and allows an interactive session to be checkpointed as part of a controlled system shutdown.

The URM configuration parameter set by the system administrator selects whether checkpointing is done only at shutdown, or periodically and at shutdown.

To determine whether a user has any checkpointed sessions, query URM by using the new `restart` subcommand to `rmgr`(1) as follows:

```
rmgr-> view restart username
```

This command returns a numbered list of checkpointed sessions.

To restart a checkpointed session, invoke the `restart` subcommand as follows:

```
rmgr-> restart username chkpnt#
```

- Initial release: UNICOS 8.0.3/8.3

  URM now provides a boost for checkpointed jobs. This boost is added to the URM job rank to provide preferential treatment for jobs that must be restarted. A new selection in the UNICOS Installation/Configuration Menu System allows administrators to change the default boost value.

For more information, see the `chkptint`(1) and `rmgr`(1) man pages.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.6.2 *New URM user job display command*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The new `ustat`(1) command displays session (job) information from the URM, including jobs queued by the Network Queuing System (NQS). This command provides a user-friendly interface to the URM system load information in `rmgr`(1). The display can be organized by job status, session initiator, requested resources, or other categories.

By default, only the super user and authorized administrators can view information for all jobs. However, the system administrator can enable an optional control to let all users on the system view all jobs.

For more information, see the ustat(1) man page.

2.9.6.3 *URM capability to change minimum rank of NQS job priority*

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The URM now has the capability to change the minimum rank of a batch job (called the *job priority* in the Network Queuing System (NQS)). As a result, for systems that use both NQS and URM, the functionality of the following qmgr(8) subcommand has been restored:

```
modify request requestid priority_limit = priority
```

By default, NQS sets the minimum rank of jobs in the job backlog. The new usetjob(8) command lets the URM administrator change the minimum rank of a specific job or jobs to affect the URM rank of those jobs.

The ustat(1) command has a new option, -m, to display the minimum rank of a job. The rmgr(1) directive view can also be used to display minimum rank values.

For more information, see the rmgr(1), usetjob(8), and ustat(1) man pages.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.6.4 *URM smoothing algorithm enhanced*

Users affected

System analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The URM smoothing algorithm was enhanced to smooth only when resource use drops and to show increases in resource consumption immediately.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.6.5 *User exit enhancements to URM*

Users affected

System analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The URM user exit was enhanced to allow URM to manage site-specific information attached to a job. If a user exit creates job-specific information, the URM maintains a pointer to the memory allocated for this information and automatically frees memory when necessary.

To access this capability, the user exit must use the new `uxit` union in the Job data structure as a pointer and set the new `JOBHIST_UXIT` flag in the history field.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.6.6 *Fair-ratio share policy added to URM*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The behavior of the Network Queuing System (NQS) when the URM is enabled has been improved. In previous releases, enabling URM changed the scheduling behavior of NQS slightly.

URM now contains an additional scheduling policy, the fair-ratio share policy, to allow NQS to schedule jobs as expected (that is, as when URM is not enabled).

Administrators can enable this optional policy by setting `Share policy` to `fair_ratio` in the UNICOS Installation/Configuration Menu System. Once the policy is enabled, usage values are calculated by including the usage of the subject node, proportional to the sum of the usage in each level of the fair-share hierarchy. The default policy is `Standard`, which calculates usage based only on the usage of the terminal node in the hierarchy.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.6.7 `rmgr(1)` *command accepts lowercase subcommands*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The `rmgr(1)` command now accepts lowercase commands (such as `view`). The previous form of commands (for example, `View`) is still valid.

For more information, see the `rmgr(1)` man page.

2.9.6.8 *URM capability to move log file directory*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.4

The URM now has the capability to change the default directory used to store log files. As a result, system administrators have more flexibility in the storage of potentially large amounts of information.

The URM daemon, `urmd(8)`, contains the new `-l` option to accomplish this function. In addition, the `rmgr(1)` command contains the new directive `Set Log` directory, which accomplishes this function when the URM is executing.

For more information, see the `rmgr(1)` and `urmd(8)` man pages.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.6.9 *New* `urmsnap` *command for URM*

Users affected

Administrator

Supporting hardware

All Cray Research systems that support UNICOS 8.3/9.0

Initial release: UNICOS 8.3

The new `urmsnap(8)` command captures the current URM configuration and displays it in a readable format. This command allows administrators to examine the current URM configuration when making changes to URM parameters.

For more information, see the `urmsnap(8)` man page.

2.9.7 *Fair-share scheduler enhancements*

The fair-share scheduler enhancements described in the following subsections are provided with the UNICOS 9.0 release.

2.9.7.1 *User-level fair-share scheduler mode added*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The user-level fair-share scheduler feature provides a user exit and duplicates kernel functionality at the user level. The general interface to fair-share remains largely the same, with the following enhancements:

- The fair-share scheduler's calculations can be performed by the fair-share daemon (`shrdaemon`(8)) instead of the kernel. In this user-level fair-share mode, `shrdaemon` replaces the kernel functions that apply the scheduling policy algorithms. This optional mode is enabled by using the `USRLEVLFSS` flag in `shradmin`(8).

  Note: The user-level fair-share mode is optional in the UNICOS 9.0 release. It will be the default in future releases of the UNICOS system, when the kernel will no longer have the capability to apply the scheduling policy algorithms.

- The user exit feature allows sites to customize the CPU scheduling policy. The user exit is available only when the `USRLEVLFSS` flag is enabled in `shradmin`(8).

- The new `policy`(2) system call provides an interface to the kernel for the fair-share daemon and allows access to the fair-share constants structure, `sh_consts`. This system call allows site selection of other CPU allocation policies to be added in future releases.

- The functionality of the `limits`(2) system call is now limited to lnode operations. The `policy`(2) system call handles other fair-share functionality.

Note: The `L_GETCOSTS` and `L_SETCOSTS` functions of the `limits`(2) system call have been removed in the UNICOS 9.0 release. The `policy`(2) system call provides the `GET_COSTS` and `SET_COSTS` actions as a replacement for the `L_GETCOSTS` and `L_SETCOSTS` functions.

For more information, see the `shrdaemon`(8), `shradmin`(8), `policy`(2), and `limits`(2) man pages.

2.9.7.2 *Fair-share* `shradmin`(8) *command functionality changes*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `shradmin`(8) command supports the following new fair-share functionality:

- The new `-c` option sets the maximum number of memory clicks that can be used by the aggregate of user or account processes attached to an lnode.
- The new `-n` option specifies the interval used for updating lnode information in the user database (UDB).
- The new `-p` option sets the maximum number of processes allowed per user or account lnode.
- The `-t` option now reports charges for terminal I/O operations.

For more information about these new options, see the `shradmin`(8) man page.

For more information about changes to the fair-share interface, see subsection 3.8.3, page 3–30.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.7.3 *CPU quotas synchronization added*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The CPU quota synchronization feature allows the administrator to synchronize the CPU quota-used field of the user database (UDB) with the corresponding field in the user's active lnode.

This capability is necessary to successfully alter a user's CPU quota (for example, when clearing the CPU quota-used field in the UDB). Without this synchronization feature the administrator cannot update quotas while the system is in multiuser mode, because the fair-share scheduler daemon overwrites any changes made to the UDB for active users.

The fair-share command `shrsync`(8) is used to synchronize changes in the fair-share information. The `-q` option has been added to synchronize the CPU quota-used information.

For more information, see the `shrsync`(8) man page.

Note: The CPU quota value itself is **not** synchronized. This value is not explicitly stored in the lnode, but rather is used in combination with the user's CPU limits and placed in the user's lnode.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.7.4 `crash` *command displays* `shrconst` *structure*

Users affected

Administrators

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `crash` command supports debugging the fair–share scheduler with the new `shrc` subcommand, which displays the shrconst structure.

For more information, see the `crash`(8) man page.

2.9.8 *System activity monitoring enhancements*

The system activity monitoring enhancements described in the following subsections are provided with the UNICOS 9.0 release.

2.9.8.1 `sam` *enhanced*

Users affected

Administrator, end user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The functionality of the system activity monitoring command, `sam`(8), has been improved to report shared-text segments in the memory map display and swapped-out secondary data segments in the swap map display.

For more information, see the `sam`(8), `csam`(8), and `xsam`(8) man pages.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.8.2 `sar` *and* `tsar` *enhanced*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The system activity reporting commands, `sar`(1) and `tsar`(8), have been enhanced to track and report per-CPU idle time that resulted from processes waiting for I/O to complete. Three new options have been added to the `sar`(1) user command to display the following information:

- Network File System (NFS) server and client activity. (The `-r` option reports output from the `nfsstat`(8) command.)
- Network packet traffic. (The `-n` option reports output from the `netstatd`(8) command.)
- Summary format. (The `-S` option reports raw totals from the last UNIX restart or from a specified interval.)

The following changes have been made to the `sar`(1) command:

- The display of the `-X` option has been altered to show the total abnormal exchanges, rather than a rate that is almost always 0.
- `ldcache` statistics are reset to 0 upon reconfiguration of the system `ldcache` parameters.

For more information, see the `sar`(1) and `tsar`(8) man pages.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.8.3 `diskusg` *command rewritten*

Users affected

Administrator

Supporting hardware

All Cray Research systems except CRAY J90 series and CRAY EL series

Initial release: UNICOS 8.3

The `diskusg`(8) command was rewritten to improve performance by changing the underlying data collection algorithm. Also, it provides site exits that allow you to process data for all inodes or for all file inodes, and to generate a customized report. `diskusg` reads and processes an entire NC1 file system inode region on a single request.

No changes have been made to the `diskusg` command line; accounting scripts will work without changes. No changes are required to use the new `diskusg` command; however, the new algorithm will require more memory because it reads the entire disk inode region into memory rather than accessing each inode with a separate request. `diskusg` resides in a separate subdirectory within the accounting directory structure.

For more information, see the `diskusg`(8) man page.

Related publications

- *UNICOS Resource Administration*, publication SG–2302

2.9.9 `nschedv` *command supports kernel scheduler enhancement*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.3/8.3

The UNICOS kernel scheduler now includes the `small_proc` interactive performance enhancement, which lets an administrator set a size threshold for small processes. Interactive processes below this threshold will be held in memory while there is interaction from a terminal within a specified interactive interval.

Two new parameters were added to nschedv(8) to support this change: the -y option sets the size limit of a small process, and the -Y option specifies the interactive interval.

For more information, see the nschedv(8) man page.

2.9.10 *New options for* dump *and* restore *commands*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

New options were added for the dump(8) and restore(8) commands.

The dump(8) command supports the new -B option, which allows an administrator to specify the number of 32678-byte blocks that are output in a single listio(2) operation. If you are not piping your output, this enables you to tune your output according to the specific needs of your application. The default value of the option is 1 for pipes, which is the only value that pipes support, and 20 for other output files.

The dump(8) command also supports the new -Z option, which causes the dump(8) command to skip all regular nonmigrated files larger than the size you specify. An administrator can use this option to specify that the backup of a migrated file system contain no files larger than the minimum migrated size.

The restore(8) command supports the -T option, which generates a trailing file name list that contains the names of all files that may have changed while dump(8) was running.

For more information, see the dump(8) and restore(8) man pages.

2.9.11 crash *command enhancements*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.3 / 8.3

The crash(8) administrator command has been enhanced to display information about the following features.

- DCE Distributed File Server (DFS) data structures

  The following subcommands were added to support examination and debugging of DCE DFS structures:

  `aggr`, `ccall`, `cct`, `ch`, `chtable`, `cm_conn`, `cm_serv`, `dcache`, `dfsmisc`, `dfsstat`, `fid`, `fshost`, `scache`, `sct`, `tkc`, `tkm`, `tkset`, `tpq`, `volume`

- Fair–share scheduler

  The new `shrc` subcommand displays the fair–share `shrconst` structure.

  For information on this subcommand, see the `crash`(8) man page. For more information, see subsection 2.9.7.4, page 2–63.

- IPI packet driver traces

  The subcommands `pktdi` and `pktdt` were added to support formatting packet driver traces for IPI–3 attached disk and tape storage devices.

  For information on these subcommands, see the `crash`(8) man page. For more information on IPI–3 support, see subsection 2.3.9, page 2–14.

- NFS and RPC data structures

  The `crash` subcommands `svc_data` and `svc_xprt` were added to support formatting NFS and RPC data structures.

  For information on these subcommands, see the `crash`(8) man page. For more information on NFS support, see section 2.5.15, page 2–28.

- Shared memory (Cray T90 series systems only)

  The new `shm` subcommand displays information on shared memory segments. In addition, the `mem`, `job`, and `sess` subcommands have been changed to display shared memory segments.

  For information on these subcommands, see the `crash`(8) man page. For more information on the shared memory feature, see subsection 2.1.3, page 2–4.

- System V semaphores and message queues

  The new subcommands `msgq`, `sema`, and `semundo` display information on semaphore and message queue data structures. In addition, the `job` and `sess` subcommands have been changed to display semaphores and messages.

  For information on these subcommands, see the crash(8) man page. For more information on semaphores and message queues, see subsection 2.9.25, page 2–78.

- UNICOS under UNICOS

  The following subcommands were added to support examination and debugging of a guest UNICOS system:

  `gcom`, `gch`, `gcx`, `grt`, `gpf`, `gpi`, `gqp`, `gsn`, `guest`

  For information on these subcommands, see the `crash`(8) man page. For more information on the UNICOS under UNICOS feature, see subsection 2.9.1, page 2–46.

In addition, the documentation for `crash` has been enhanced to include information on subcommands and options that were formerly available only with the `help` subcommand in `crash`. For more information, see the `crash`(8) man page.

2.9.12 *Dynamic control of disk recovered errors*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

An administrator can stop the routing of recovered disk error messages to the console by executing the `pddconf`(8) command and specifying `racerroff` as the *function* parameter. Specifying `racerron` restores the routing of the messages to the console (the default state).

For more information, see the `pddconf`(8) man page.

2.9.13 *Ability to disable write-behind to a mirrored device*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

An administrator can disable write-behind on write I/O to a mirrored disk device by using the new `-w` option to the `mddconf`(8) command. Disabling write-behind guarantees that the data gets to a device. However, using this feature does result in slower performance.

For more information, see the `mddconf`(8) man page.

Related publications

- *General UNICOS System Administration*, publication SG–2301

2.9.14 *New* `hddmon` *command*

Users affected

End user, administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.4

The `hddmon`(8) command has been added to the UNICOS 9.0 release. The `hddmon`(8) command allows an adminstrator or operator to monitor and control HIPPI disk array devices.

For more information, see the `hddmon`(8), `hdd`(4), and `mnu`(4) man pages.

2.9.15 *Using a dump partition as a swap device supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

You can use the same physical slice for both a dump partition and a swap partition. Because the dump partition is in use only at dump time and remains idle while the system is running, it can be used as one of the partitions of the swap device. Nothing is saved from the swap device between system boots, which allows you to put a dump image on top of the swap data.

When you reboot the system, if there is a swap partition being shared with the dump device, and a dump currently resides on that partition, the `cpdmp`(8) command moves the dump to the file system.

Related publications

- *General UNICOS System Administration*, publication SG–2301

2.9.16 *Tape subsystem enhancements*

The tape subsystem enhancements described in the following subsections are provided with the UNICOS 9.0 release.

For information about an enhancement to the `tpmnt`(1) command, see subsection 2.6.13, page 2–40.

2.9.16.1 *Character-special tape interface support added*

Users affected

End user, programmer, administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.0.3/8.3

The addition of the character-special tape interface to the UNICOS tape subsystem creates another method of accessing tape devices.

This new character-special tape interface method is similar to the traditional UNIX method of accessing tape devices; you have unstructured access to the tape devices. That is, to manage your tapes you can use standard UNIX commands and `ioctl`(2) requests. You may find this access method particularly useful for porting tapes from one UNIX system to another.

In previous releases, tape devices could be accessed only by using a kernel device driver and the tape daemon. The tape daemon assists the device driver by performing additional functions such as tape resource management, device management, volume mounts and dismounts through operator communication or autoloader requests, label processing, volume switching, and error recovery. The new character-special tape interface does not support these capabilities.

For more information, see the mt(1B), close(2), open(2), tape(4), and tpdaemon(8) man pages.

Related publications

- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051

2.9.16.2 *Unstructured access to tape hardware supported*

Users affected

Administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

New options to the tpformat(8) and tplabel(8) commands allow administrators to bypass the tape daemon and have unstructured access to the tape hardware to label and format tapes. The new -C option specifies that the character-special tape interface (instead of the tape daemon) be used to perform the operation. The -D option specifies the device to which the request is issued.

For more information, see the tpformat(8) and tplabel(8) man pages.

Related publications

- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051

2.9.16.3 *Dynamic device group reassignment supported*

Users affected

Administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The dynamic device group feature allows an operator or administrator to reassign down devices to a different device group than the group in which they were originally configured. Sites can use the tpconfig(8) command to move devices from one device group to another depending on load and requirements.

This feature is particularly useful for performing backups when an operator wants to temporarily dedicate a set of devices for the backup operation. Once the backups are complete, the operator may configure the devices back into the public device group for normal use.

For more information, see the `tpconfig`(8) man page.

2.9.17 `tplist` *utility supports Cray/REELlibrarian*

Users affected

Programmer, administrator, end user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `tplist`(1) command has been enhanced so that it supports the Cray/REELlibrarian (CRL) product and the associated `tpmnt`(1) options. You can now specify additional `tplist` parameters for the primary and secondary `tpmnt`(1) commands. You can also set the `no unload` flag to keep the primary volume mounted.

Administrators can make CRL and front-end servicing (FES) on IBM MVS systems available at the same time. If both are set to `on`, and the related mandatory flags are not set, users may select which one to use.

For more information, see the `tplist`(1) man page.

2.9.18 *IPI support enhancements*

The Intelligent Peripheral Interface (IPI) support enhancements described in the following subsections are provided with the UNICOS 9.0 release.

2.9.18.1 `ipi3_clear` *command options added*

Users affected

Administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `ipi3_clear`(8) command has two new options. Administrators can use the new `-c` option to terminate all outstanding activity on a channel and the new `-r` option to issue a slave reset as part of the clear processing.

For more information, see the `ipi3_clear`(8) man page.

2.9.18.2 *IOP-level control of IPI-3 and IPI packet drivers added*

Users affected

Administrator, operator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Administrators can now use the `ipi3_start`(8) and `ipi3_stop`(8) commands to stop and restart an IPI-3/IPI subsystem or a single I/O processor (IOP) within the subsystem. These commands also allow an IOP restart or shutdown to be initiated from an interrupt that was originated by the `inform`(8) command.

For more information, see the `ipi3_start`(8) and `ipi3_stop`(8) man pages.

2.9.19 *Dynamic allocation of file descriptors supported*

Users affected

Administrator, programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

In the past, processes running under the UNICOS system could open no more than 64 files simultaneously. This restriction has proven unacceptable for many programs including database applications and, more recently, applications for the CRAY T3D system.

This restriction was alleviated somewhat in UNICOS 8.0 by a feature that increased the maximum open file limit to 255 files.

The UNICOS 9.0 release implements the second phase of dynamic open file limits. This feature allows the administrator to control the system limit on open files. This system limit is set by using the new `_sc_cray_open_max` variable in `sysconf`(2). The default limit at release is 16,384 files.

Because open files consume other limited system resources (such as inode and file table entries), use of this feature can be controlled by the new `pfdlimit` field in the user database (UDB).

For more information, see the `udbgen`(8), `libudb`(3), `nu`(8), `xadmin`(8), `sysconf`(2), and `limit`(2) man pages.

For information about programming issues related to this feature, see subsection 3.8.4, page 3–31.

2.9.20 *File system enhancements*

File system enhancements described in the following subsections are provided with the UNICOS 9.0 release.

2.9.20.1 *Default number of primary partitions in a file system set to 4*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

To improve file system performance, an upper limit on the number of primary partitions in a file system that are maintained with current data has been set to 4. Other primary partitions continue to contain primary data, but do not have current copies of the file system dynamic block or block allocation bit maps. This feature takes effect at file system mount time.

To further reduce the number of primary partitions updated, the `mkfs`(8) command has been changed to set the number of primary partitions to 4 whenever the number of partitions in a file system is 8 or greater. The remaining partitions are designated as secondary. This is the default behavior of `mkfs`(8). You can still configure a file system with any number of primary partitions by specifying the `-p` option to `mkfs`(8).

Setting a maximum number of updated primary partitions should increase the file system performance of file systems with a large number of primary partitions. This performance increase occurs because the overhead involved in updating multiple primary partitions is reduced.

The `fsck`(8) command has been modified to account for this change. File systems created with previous releases of the UNICOS operating system will encounter `fsck`(8) errors and may require corrective action. For information about how to correct this situation, see subsection 3.8.5, page 3–32.

For more information, see the `fsck`(8) and `mkfs`(8) man pages.

2.9.20.2 *File system scrub added*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The file system scrub feature allows disk blocks to be scrubbed (zeroed) on a file system basis. This capability can be enabled at the time the file system is created by using the `-e` option of the `mkfs`(8) command, or it can be toggled by using the `-e` option of the `setfs`(8) command.

For more information, see the `mkfs`(8) and `setfs`(8) man pages.

2.9.21 *UNICOS Shared File System (SFS) support*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The UNICOS shared file system (SFS) allows multiple Cray Research systems to access one or more shared file systems in a read/write fashion. Shared file systems provide most of the features present in the NC1 file system, such as device striping, mirrored file systems, and asynchronous I/O.

To the user, a shared file system looks no different than an NC1 file system, except that the user can access the file system from any machine in an SFS cluster that is configured to use that shared file system. Systems in an SFS Cluster can mount any of the shared file systems configured on the shared media acessible to the machines in that cluster.

Shared file systems work only with a HIPPI-based disk subsystem, such as the ND-40 network disk device. The UNICOS SFS feature is not efficient for shring small files, or for files on which small I/O operations are frequent. Instead, the UNICOS SFS feature is designed for application which can do large I/O operations.

The *UNICOS Installation/Configuration Menu System* supports the configuration of shared file systems using the special `configsfs` program rather than the standard `install` program.

The `esdmon`(8), `sfsd`(8), `smpmon`(8), and `sfs`(4) man pages describe commands and features that support the SFS feature. The `mkfs`(8) and `setfs`(8) man pages have been updated to support shared file systems.

To use the UNICOS SFS feature you must obtain a software license. For information about licensing this product, see subsection 7.2.3.3, page 7–9 or contact your Cray Research representative.

Related publications

- *UNICOS Shared File System (SFS) Administrator's Guide*, publication SG–2114

2.9.22 *Excess user errors controlled*

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release maintains a new table that counts error exits, operand-range errors, and program-range errors for every program in the system, and allows the administrator to set maximum allowable values for any of these errors.

This feature can prevent situations, for example, where a user program overwrites itself and generates a series of errors that cause the kernel to loop by sending a `SIGERR` signal to a program that has turned off signal processing. This process would accumulate system time until the program reached its CPU time limit.

This feature is disabled by default. By means of the installation tool, you can set the maximum levels for the errors that the system counts. These maximums are set through the following parameters: `MAXUSRPRE`, `MAXUSRORE`, and `MAXUSRERR`. You can change those values at run time by using the new `seterr`(8) command.

For more information, see the `seterr`(8) and `cpu`(4) man pages.

Related publications

- *UNICOS Configuration Administrator's Guide*, publication SG–2303

2.9.23 *Dynamic allocation of the* NPBUF *parameter added*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

An administrator can allocate the number of physical I/O headers (pbufs) at boot time by modifying the NPBUF configuration parameter.

Related publications

- *UNICOS Configuration Administrator's Guide*, publication SG–2303

2.9.24 *Ill-formed I/O split into physical and buffered chunks*

Users affected

Administrator, programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The ill-formed I/O splitting feature improves I/O performance by providing a mechanism to automatically use raw I/O rather than system buffer cache for certain I/O requests. There are two general kinds of I/O that are affected.

The first kind of I/O is on files opened with the O_RAW flag. Large requests now can avoid using the system buffer cache to the extent possible. Previously, if any portion of a request to the I/O device was not well-formed, the entire request was routed through the buffer cache. In UNICOS 9.0, requests that are not well-formed are broken up into well-formed and non-well-formed parts. The well-formed parts use raw I/O, and parts that are not well-formed use the system buffer cache. A threshold is used to limit this behavior to requests that are sufficiently large.

The second kind of I/O to derive benefit from this feature is I/O done on files where the O_RAW flag was not specified when the file was opened, but where request sizes are over a certain size. I/O requests over this minimum size are handled in the same way as large raw requests.

Performance is improved on codes that do large granularity I/O that is well-formed for disks with small sectors but is not well-formed for disks with larger sectors. Performance is also improved where applications do large granularity I/O that currently passes through the system buffer cache but does not fit entirely within the cache.

The criteria used for how large a request must be before being automatically split is controlled by the `nc1_min_raw` system variable in the `config.h` file. The minimum request size is determined by multiplying `nc1_min_raw` times the device I/O unit. Any request which equals or exceeds this value will be automatically split.

In very rare cases, some degradations are possible with this feature. For large granularity I/O to files that fit in the cache, where other I/O activity is very light, this feature will force I/O to disk where it previously might have resided entirely in buffer cache. If degradations are seen and are deemed to be unacceptable, the threshold can be changed to disable the feature.

You can disable ill–formed I/O splitting by setting the `nc1_min_raw` system variable in the `config.h` file to zero. The default value for `nc1_min_raw`, defined as `NC1MINRAW` in the `config.h` file, is currently set to 20.

2.9.25 *IPC semaphores and message queues supported*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Support was added for the UNIX System V interprocessor communication (IPC) mechanism. This mechanism introduces three named object types to the UNICOS system: shared memory segments (CRAY T90 series only); semaphores; and message queues.

For information about shared memory segments (CRAY T90 series only), see subsection 2.1.3, page 2–4.

The `ftok`(3) library routine (described on the `stdipc`(3) man page), used in conjunction with the IPC system calls, generates IPC facilities. The following new system calls support use of semaphores and message queues:

System call	Description
`msgctl`(2)	Provides message control operations
`msgget`(2)	Accesses the message queue
`msgrcv`(2)	Reads a message from a message queue
`msgsnd`(2)	Sends a message to a message queue
`semctl`(2)	Provides semaphore control operations

System call	Description
`semget`(2)	Provides access to semaphore identifiers
`semop`(2)	Provides general semaphore operations

The following configuration parameters have been added to the UNICOS Installation/Configuration Menu System in support of IPC semaphores: `SEMNI`, `SEMMNS`, `SEMMNS`, `SEMMNU`, `SEMMSL`, `SEMOPM`, `SEMUME`, `SEMVMX`, and `SEMAEM`.

The following configuration parameters have been added to the UNICOS Installation/Configuration Menu System in support of message queues: `MSGMAX`, `MSGMNB`, `MSGMNI`, `MSGSSZ`, `MSGTQL`, and `MSGSEG`.

Changes were made to the UNICOS multilevel security (MLS) feature to support IPC semaphores and message queues; for more information, see subsection 4.2.8, page 4–5.

The new `crash`(8) subcommands `msgq`, `sema`, and `semundo` display information on semaphores and message queues.

For more information on this feature, see the following man pages: `ipcrm`(1), `ipcs`(1), `msgctl`(2), `msgget`(2), `msgrcv`(2), `msgsnd`(2), `semctl`(2), `semget`(2), `semop`(2), `stdipc`(3), `ipc`(5), `msg`(5), `sem`(5), `ipc`(7), and `crash`(8).

Related publications

- *UNICOS Configuration Administrator's Guide*, publication SG–2303

2.10 XPG4 compliance

The following subsections describe additions to the UNICOS 9.0 release for compliance with the X/Open XPG4 standard. The XPG4 standard supports all POSIX functionality.

For more information about XPG4 compatibility issues, see subsection 3.9, page 3–36.

2.10.1 *XPG4 compatibility added*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

To comply with the XPG4 standard, some existing functions have been changed and other functions mandated by the standard have been added. No functions or capabilities have been removed. However, include file changes may require user code changes.

For more information about XPG4 compatibility issues, see subsection 3.9, page 3–36.

For more information, see the `catgetmsg`(3), `catgets`(3), `catmsgfmt`(3), `catopen`(3), `regexp.h`(3), `lsearch`(3), `tsearch`(3), `getc`(3), `putc`(3), `getpass`(3), `swab`(3), `chroot`(2), and `ulimit`(2) man pages.

2.10.2 *Utilities now use XPG4-conformant message system*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

UNICOS user-level utilities now issue their messages using the XPG4-conformant UNICOS message system.

The new messages issued by user-level utilities are changed to the default utility message format of **group-number: command message**. For more information about message formatting, see the `explain`(1) man page.

2.10.3 *Locale definition and library routines supported*

Users affected

Administrator, end user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The `localedef`(1) command has full POSIX 1003.2 and XPG4 functionality and issues its messages using the UNICOS message system.

This feature allows users (for themselves) and administrators (for entire systems) to define the sets of culture conventions supported by commands and library routines. This includes information about languages, code sets, monetary formats, numeric formats, and time/date formats. Memory use increases significantly only if large collation tables will be used.

For more information, see the `localedef`(1), `setlocale`(3), `string`(3), `localeconv`(3), `nl_langinfo`(3), and `strfmon`(3), man pages.

Related publications

- *General UNICOS System Administration*, publication SG–2301

2.10.4 *XPG4 standard I/O internationalization supported*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

UNICOS 9.0 internationalizes I/O usage and adds XPG4 support by implementing basic existing I/O functions to convert input from multibyte characters to wide characters and to convert output from wide to multibyte.

For more information, see the `mbstring`(3), `strftime`(3), `strtod`(3), `strtol`(3), and `wstring`(3) man pages.

2.10.5 *User commands in compliance with XPG4*

Users affected

End user

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The following user commands functionally comply with the XPG4 standard.

For compatibility issues related to commands, see subsection 3.9.3, page 3–38, and subsection 3.9.4, page 3–39.

- `admin`(1)
- `alias`(1)
- `ar`(1)
- `asa`(1)
- `at`(1)

- awk(1)
- basename(1)
- batch(1)
- bc(1)
- bg(1)
- c89(1)
- cal(1)
- cat(1)
- cd(1)
- cflow(1)
- chgrp(1)
- chmod(1)
- cksum(1)
- cmp(1)
- comm(1)
- command(1)
- compress(1)
- cp(1)
- crontab(1)
- csplit(1)
- ctags(1)
- cut(1)
- cxref(1)
- date(1)
- dd(1)
- delta(1)
- df(1)
- diff(1)
- dirname(1)
- du(1)
- echo(1)
- ed(1)
- egrep(1)
- env(1)
- ex(1)
- expand(1)

- expr(1)
- false(1)
- fc(1)
- fg(1)
- fgrep(1)
- file(1)
- find(1)
- fold(1)
- fort77(1)
- gencat(1)
- get(1)
- getconf(1)
- getopts(1)
- grep(1)
- hash(1)
- head(1)
- iconv(1)
- id(1)
- jobs(1)
- join(1)
- kill(1)
- ksh(1)
- lex(1)
- ln(1)
- locale(1)
- localedef(1)
- logger(1)
- logname(1)
- lp(1)
- ls(1)
- m4(1)
- mailx(1)
- make(1)
- man(1)
- mesg(1)
- mkdir(1)

- `mkfifo`(1)
- `more`(1)
- `mv`(1)
- `newgrp`(1)
- `nice`(1)
- `nl`(1)
- `nm`(1); incompatibility introduced with the UNICOS 8.3 release
- `nohup`(1)
- `od`(1); incompatibility introduced with the UNICOS 8.3 release
- `paste`(1)
- `patch`(1)
- `pathchk`(1)
- `pax`(1)
- `pr`(1); incompatibility introduced with the UNICOS 8.3 release
- `printf`(1)
- `prs`(1)
- `ps`(1)
- `pwd`(1)
- `read`(1)
- `renice`(1)
- `rm`(1)
- `rmdel`(1)
- `rmdir`(1)
- `sact`(1)
- `sccs`(1)
- `sed`(1)
- `sh`(1)
- `sleep`(1)
- `sort`(1)
- `split`(1)
- `strings`(1)
- `strip`(1)
- `stty`(1)
- `tabs`(1)
- `tail`(1)
- `talk`(1)

- tee(1)
- test(1)
- time(1)
- touch(1)
- tput(1)
- tr(1)
- true(1)
- tsort(1)
- tty(1)
- type(1)
- ulimit(1)
- umask(1)
- unalias(1)
- uname(1)
- uncompress(1)
- unexpand(1)
- unget(1)
- uniq(1)
- uucp(1)
- uudecode(1)
- uuencode(1)
- uustat(1)
- uux(1)
- val(1)
- vi(1)
- wait(1)
- wc(1)
- what(1)
- who(1)
- write(1)
- xargs(1)
- yacc(1)
- zcat(1)

2.10.6 *System calls in compliance with XPG4*

Users affected

End user, programmer, system analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The following system calls functionally comply with the XPG4 standard:

- `access`(2)
- `alarm`(2)
- `chdir`(2)
- `chmod`(2)
- `chown`(2)
- `close`(2)
- `creat`(2)
- `dup`(2)
- `exec`(2)
- `exit`(2)
- `fcntl`(2)
- `fork`(2)
- `fpathconf`(2)
- `fstat`(2)
- `fsync`(2)
- `geteuid`(2)
- `getgid`(2)
- `getgroups`(2)
- `getpgrp`(2)
- `getpid`(2)
- `getppid`(2)
- `getuid`(2)
- `kill`(2)
- `link`(2)
- `lseek`(2)
- `mkdir`(2)
- `mkfifo`(2)
- `msgctl`(2)
- `msgget`(2)
- `msgrcv`(2)
- `msgsnd`(2)

- nice(2)
- open(2)
- pathconf(2)
- pause(2)
- pipe(2)
- read(2)
- rename(2)
- rmdir(2)
- semctl(2)
- semget(2)
- semop(2)
- setgid(2)
- setpgid(2)
- setsid(2)
- setuid(2)
- shmat(2); CRAY T90 only
- shmctl(2); CRAY T90 only
- shmdt(2); CRAY T90 only
- shmget(2); CRAY T90 only
- sigaction(2)
- signal(2)
- sigpending(2)
- sigprocmask(2)
- sigsuspend(2)
- stat(2)
- sysconf(2)
- tcgetpgrp(2)
- tcsetpgrp(2)
- time(2)
- times(2)
- ulimit(2)
- umask(2)
- uname(2)
- unlink(2)
- utime(2)

- wait(2)
- write(2)

2.10.7 *Library routines in compliance with XPG4*

Users affected

End user, programmer, system analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The following library routines functionally comply with the XPG4 standard:

- abort(3)
- abs(3)
- acos(3)
- asctime(3)
- asin(3)
- assert(3)
- atan(3)
- atan2(3)
- atexit(3)
- atof(3)
- atoi(3)
- atol(3)
- bsearch(3)
- calloc(3)
- catclose(3)
- catgets(3)
- catopen(3)
- ceil(3)
- cfgetispeed(3)
- cfgetospeed(3)
- cfsetispeed(3)
- cfsetospeed(3)
- clearerr(3)
- clock(3)
- closedir(3)
- confstr(3)

- cos(3)
- cosh(3)
- crypt(3); DES encryption code requires a separate license for sites outside of the U. S. and Canada
- ctermid(3)
- cuserid(3)
- ctime(3)
- difftime(3)
- div(3)
- drand48(3)
- encrypt(3); DES encryption code requires a separate license for sites outside of the U. S. and Canada
- erand48(3)
- erf(3)
- exp(3)
- fabs(3)
- fclose(3)
- fdopen(3)
- feof(3)
- ferror(3)
- fflush(3)
- fgetc(3)
- fgetpos(3)
- fgets(3)
- fgetwc(3)
- fgetws(3)
- fileno(3)
- flockfile(3)
- floor(3)
- fmod(3)
- fnmatch(3)
- fopen(3)
- fprintf(3)
- fputc(3)
- fputs(3)
- fputwc(3)
- fputws(3)

- fread(3)
- free(3)
- freopen(3)
- frexp(3)
- fscanf(3)
- fseek(3)
- fsetpos(3)
- ftell(3)
- ftrylockfile(3)
- ftw(3)
- funlockfile(3)
- fwrite(3)
- gamma(3)
- getc(3)
- getchar(3)
- getcwd(3)
- getegid(3)
- getenv(3)
- getgrgid(3)
- getgrnam(3)
- getlogin(3)
- getopt(3)
- getpass(3)
- getpwnam(3)
- getpwuid(3)
- gets(3)
- getw(3)
- getwc(3)
- getwchar(3)
- glob(3)
- gmtime(3)
- hcreate(3)
- hdestroy(3)
- hsearch(3)
- hypot(3)
- iconv(3)

- iconv_close(3)
- iconv_open(3)
- isalnum(3)
- isalpha(3)
- isascii(3)
- isatty(3)
- iscntrl(3)
- isdigit(3)
- isgraph(3)
- islower(3)
- isnan(3)
- isprint(3)
- ispunct(3)
- isspace(3)
- isupper(3)
- iswalnum(3)
- iswalpha(3)
- iswcntrl(3)
- iswctype(3)
- iswdigit(3)
- iswgraph(3)
- iswlower(3)
- iswprint(3)
- iswpunct(3)
- iswspace(3)
- iswupper(3)
- iswxdigit(3)
- isxdigit(3)
- j0(3)
- j1(3)
- jn(3)
- jrand48(3)
- labs(3)
- lcong48(3)
- ldexp(3)
- ldiv(3)

- lfind(3)
- lgamma(3)
- localeconv(3)
- localtime(3)
- log(3)
- log10(3)
- longjmp(3)
- lrand48(3)
- lsearch(3)
- malloc(3)
- mblen(3)
- mbstowcs(3)
- mbtowc(3)
- memccpy(3)
- memchr(3)
- memcmp(3)
- memcpy(3)
- memmove(3)
- memset(3)
- mktime(3)
- modf(3)
- mrand48(3)
- nl_langinfo(3)
- nrand48(3)
- opendir(3)
- pclose(3)
- perror(3)
- popen(3)
- pow(3)
- printf(3)
- pthread_attr_destroy(3)
- pthread_attr_getdetachstate(3)
- pthread_attr_init(3)
- pthread_attr_setdetachstate(3)
- pthread_condattr_init(3)
- pthread_cond_broadcast(3)

- pthread_cond_destroy(3)
- pthread_cond_init(3)
- pthread_cond_signal(3)
- pthread_cond_timedwait(3)
- pthread_cond_wait(3)
- pthread_create(3)
- pthread_detach(3)
- pthread_equal(3)
- pthread_exit(3)
- pthread_getspecific(3)
- pthread_join(3)
- pthread_key_create(3)
- pthread_key_delete(3)
- pthread_mutexattr_destroy(3)
- pthread_mutexattr_getkind_np(3)
- pthread_mutexattr_init(3)
- pthread_mutexattr_setkind_np(3)
- pthread_mutex_destroy(3)
- pthread_mutex_init(3)
- pthread_mutex_lock(3)
- pthread_mutex_trylock(3)
- pthread_mutex_unlock(3)
- pthread_once(3)
- pthread_self(3)
- pthread_yield(3)
- putc(3)
- putchar(3)
- putenv(3)
- puts(3)
- putw(3)
- putwc(3)
- putwchar(3)
- qsort(3)
- raise(3)
- rand(3)
- readdir(3)

- realloc(3)
- regcomp(3)
- remove(3)
- rewind(3)
- rewinddir(3)
- scanf(3)
- seed48(3)
- seekdir(3)
- setbuf(3)
- setjmp(3)
- setkey(3); DES encryption code requires a separate license for sites outside of the U. S. and Canada
- setlocale(3)
- setvbuf(3)
- sigaddset(3)
- sigdelset(3)
- sigemptyset(3)
- sigfillset(3)
- sigismember(3)
- siglongjmp(3)
- signgam(3)
- sigsetjmp(3)
- sigwait(3)
- sin(3)
- sinh(3)
- sleep(3)
- sprintf(3)
- sqrt(3)
- srand(3)
- srand48(3)
- sscanf(3)
- strcat(3)
- strchr(3)
- strcmp(3)
- strcoll(3)
- strcpy(3)
- strcspn(3)

- strerror(3)
- strfmon(3)
- strftime(3)
- strlen(3)
- strncat(3)
- strncmp(3)
- strncpy(3)
- strpbrk(3)
- strptime(3)
- strrchr(3)
- strspn(3)
- strstr(3)
- strtod(3)
- strtok(3)
- strtol(3)
- strtoul(3)
- strxfrm(3)
- swab(3)
- system(3)
- tan(3)
- tanh(3)
- tcdrain(3)
- tcflow(3)
- tcflush(3)
- tcgetattr(3)
- tcsendbreak(3)
- tcsetattr(3)
- tdelete(3)
- telldir(3)
- tempnam(3)
- tfind(3)
- tmpfile(3)
- tmpnam(3)
- toascii(3)
- _tolower(3)
- tolower(3)

- _toupper(3)
- toupper(3)
- towlower(3)
- towupper(3)
- tsearch(3)
- ttyname(3)
- twalk(3)
- tzset(3)
- ungetc(3)
- ungetwc(3)
- vfprintf(3)
- wcscat(3)
- wcschr(3)
- wcscmp(3)
- wcscoll(3)
- wcscpy(3)
- wcscspn(3)
- wcsftime(3)
- wcslen(3)
- wcsncat(3)
- wcsncmp(3)
- wcsncpy(3)
- wcspbrk(3)
- wcsrchr(3)
- wcsspn(3)
- wcstod(3)
- wcstok(3)
- wcstol(3)
- wcstombs(3)
- wcstoul(3)
- wcswcs(3)
- wcsxfrm(3)
- wctomb(3)
- wctype(3)
- wcwidth(3)
- wordexp(3)

- y0(3)
- y1(3)
- yn(3)

2.10.8 *External variables comply with XPG4*

Users affected

End user, programmer, system analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The following external variables functionally comply with the XPG4 standard.

- errno
- optarg
- signgam
- stdin
- timezone
- tzname

2.11 POSIX threads (Pthreads) supported

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release provides support for an interface based on POSIX 1003.4a threads (Pthreads). This support does not include all the Pthread functions because of the late finalization of the standard. Future releases will support additional Pthreads functionality as appropriate.

The UNICOS 9.0 release provides the following functionality in compliance with Pthreads:

- Changes to the UNICOS multitasking process model to support a single-process multitasking group model
- Changes to UNICOS signal semantics to support the new process model
- Thread management functions
- Thread synchronization primitives

- Support for thread-specific data
- Reentrant functions

The changes to the UNICOS process model and its effect on signal semantics are discussed in detail in subsection 3.10, page 3–47. The changes described in that subsection are the result of moving the UNICOS system from a multiple-process to a single-process multitasking group model.

The remaining changes to the UNICOS operating system are the addition of new functions for the creation, manipulation, and support of user-directed threads of control. These functions provide capabilities similar in scope to existing UNICOS macrotasking functions.

The following are the primary new functions:

New function	Description
`pthread_create`(3)	Creates a new thread
`pthread_join`(3)	Waits for a thread to exit
`pthread_exit`(3)	Exits the calling thread
`pthread_mutex_lock`(3)	Locks a mutex
`pthread_mutex_trylock`(3)	Attempts to lock a mutex
`pthread_mutex_unlock`(3)	Releases a mutex
`pthread_cond_wait`(3)	Waits for a condition to be signaled
`pthread_cond_timedwait`(3)	Waits for a condition or time-out
`pthread_cond_signal`(3)	Signals a waiter for a condition
`pthread_cond_broadcast`(3)	Signals all waiters for a condition
`pthread_setspecific`(3)	Sets a thread-specific value
`pthread_getspecific`(3)	Gets a thread-specific value

The following new functions provide reentrant versions of existing functions:

New function	Nonreentrant equivalents
`asctime_r`(3)	`asctime`(3)
`ctime_r`(3)	`ctime`(3)
`getgrgid_r`(3)	`getgrgid`(3)
`getgrnam_r`(3)	`getgrnam`(3)
`getlogin_r`(3)	`getlogin`(3)
`getpwnam_r`(3)	`getpwnam`(3)
`getpwuid_r`(3)	`getpwuid`(3)
`gmtime_r`(3)	`gmtime`(3)
`localtime_r`(3)	`localtime`(3)
`rand_r`(3)	`rand`(3)
`readdir_r`(3)	`readdir`(3)
`ttyname_r`(3)	`ttyname`(3)
`strtok_r`(3)	`strtok`(3)

The following functions are provided to support atomic execution of multiple standard I/O routines:

New function	Description
`flockfile`(3)	Locks a file
`ftrylockfile`(3)	Attempts to lock a file
`funlockfile`(3)	Unlocks a file

Currently, the UNICOS system does not support the thread cancellation or `pthread_kill`() functions.

For more information, see the individual man pages for these routines.

2.12 Installation enhancements

The following subsections describe installation enhancements for the UNICOS 9.0 release.

2.12.1 *X Window System interface to the menu system supported*

Users affected

Administrator, operator, system analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

UNICOS 9.0 provides a point-and-click, X Window System-based interface to the UNICOS Installation/Configuration Menu System. Pull-down menus commonly used with windowed applications allow the user to see all the possibilities in one glance.

With the new interface, not only may the user see the current menu, but also a "Where am I" display, which gives the location of the menu within the hierarchy. Also, Help screens can now be shown at the same time as the actual menu and can also display the execution display of a particular action.

CRAY EL systems require an X Window System terminal to use this feature. The feature may be used to reconfigure a system, but may not be used during initial installation. CRAY J90 systems can also use the menu system's configuration window.

Related publications

- *UNICOS Installation/Configuration Menu System User's Guide*, publication SG-2412

2.12.2 *CD-ROM supported for UNICOS upgrades, revisions, and updates*

Users affected

Administrator, operator, system analyst

Supporting hardware

All Cray Research systems supported by this release that have a CD-ROM drive except CRAY J90 series

Initial release: UNICOS 8.3

CD-ROM is supported for upgrade, revision, and update releases. This feature is available only on systems having a CD-ROM drive.

In releases prior to UNICOS 9.0, CD-ROM is supported only for initial installations of base releases.

Related publications

- *UNICOS Installation Guide*, publication SG–2112

2.12.3 *Configuration conversion for restricted releases supported*

Users affected

Administrator, operator, system analyst

Supporting hardware

All Cray Research systems except CRAY EL series

Initial release: UNICOS 8.3

In releases prior to UNICOS 9.0, the UNICOS Installation/Configuration Menu System automatically converted a system configuration from a previous UNICOS base release to a new UNICOS base release (for example, UNICOS 8.0 to UNICOS 9.0).

Beginning in UNICOS 9.0, conversion capability is extended to restricted releases. The menu system allows conversion from a restricted release to a new base release (for example, UNICOS 8.3 to UNICOS 9.0) or from a base release to a restricted release (for example, UNICOS 9.0 to UNICOS 9.1). The CRAY J90 series will support this feature beginning with a UNICOS 9.0 update.

Related publications

- *UNICOS Installation Guide*, publication SG–2112

2.12.4 *Using* `ldcache` *during system builds*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The system builder can specify file systems for assignment to the logical device cache. This capability is applicable only for interactive (nonbatch) builds.

For more information, see the online help text associated with the following installation tool menu:

```
UNICOS 9.0 Installation/Configuration Menu System
   Build/Install System
```

2.13 Online diagnostics

The following subsections describe enhancements to online diagnostics for the UNICOS 9.0 release.

2.13.1 *Enhancements to* `ddms`

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNICOS 9.0 release enhances the `ddms`(8) disk diagnostic and maintenance system with the following features:

- Addition of the `-a` option, which displays valid disk devices and their types as defined in the `/dev/ddd` directory.
- Addition of the `-E` option, which is used with the `read`, `write`, or `surf` action to specify the number of errors allowed before `ddms` aborts the action.
- Addition of the `aft` action, which allows for the creation or update of an `/etc/aft` file (ASCII flaw table file) for a specified device from the current unhideables table. The `-w` option for use with the `aft` action also has been added. The `-w` option writes the unhideable entries of the user flaw table for the specified device to the `/etc/aft` file.
- Addition of the `wrecc` action, which creates error correction code (ECC) errors on a specified device. The `wrecc` action reads the data and ECC on a specified sector, toggles the specified bits, and writes the data and ECC. The sector is then read to verify that an ECC error is generated.

- Enhancement of the `makeuft` action so that it creates a new User Flaw table on the target disk by reading and generating the flaw table information from the sector IDs instead of from the Factory Flaw table.

For more information on these enhancements, see the `ddms`(8) man page.

2.13.2 *New OLNET FDR-4 test*

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems configured with an IOS-E and FDR-4 hardware

Initial release: UNICOS 8.0.4/8.3

The OLNET online diagnostic network communications program can perform online testing of FDR-4 hardware. The test can detect and isolate problems in the fiber-optic communications link between a Cray Research mainframe and an SSD solid-state storage device.

For more information, see the `olnet`(8) man page.

Preface

The *UNICOS Release Overview*, Cray Research publication RO-5000 10.0 is a public document that provides an overview of the Cray Research, Inc. UNICOS operating system 10.0 release.

This release overview describes all features that have been released since the UNICOS 9.0 major release, including all 9.0 revision and update releases.

Ordering Cray Research publications

The *User Publications Catalog*, Cray Research publication CP–0099, describes the availability and content of all Cray Research hardware and software documents that are available to customers. Cray Research customers who subscribe to the Cray Inform (CRInform) program can access this information on the CRInform system.

To order a document, either call the Distribution Center in Mendota Heights, Minnesota, at +1–612–683–5907, or send a facsimile of your request to fax number +1–612–452–0141. Cray Research employees may send electronic mail to `orderdsk` (UNIX system users).

Customers who subscribe to the CRInform program can order software release packages electronically by using the `Order Cray Software` option.

Customers outside of the United States and Canada should contact their local service organization for ordering and documentation information.

Conventions

The following conventions are used throughout this document:

Convention	Meaning
`command`	This fixed-space font denotes literal items such as commands, files, routines, path names, signals, messages, and programming language structures.
`manpage`(*x*)	Man page section identifiers appear in parentheses after man page names. The following list describes the identifiers: 1 User commands

1B	User commands ported from BSD
2	System calls
3	Library routines, macros, and opdefs
4	Devices (special files)
4P	Protocols
5	File formats
7	Miscellaneous topics
7D	DWB-related information
8	Administrator commands

Some internal routines (for example, the `_assign_asgcmd_info`() routine) do not have man pages associated with them.

variable — Italic typeface denotes variable entries and words or concepts being defined.

`user input` — This bold, fixed-space font denotes literal items that the user enters in interactive sessions. Output is shown in nonbold, fixed-space font.

The following machine naming conventions may be used throughout this document:

Term	Definition
Cray PVP systems	All configurations of Cray parallel vector processing (PVP) systems.
Cray MPP systems	All configurations of the CRAY T3D series. The UNICOS operating system is not supported on CRAY T3E systems. CRAY T3E systems run the UNICOS/mk operating system.
All Cray Research systems	All configurations of Cray PVP and Cray MPP systems that support this release.

The default shell in the UNICOS and UNICOS/mk operating systems, referred to in Cray Research documentation as the *standard shell*, is a version of the Korn shell that conforms to the following standards:

- Institute of Electrical and Electronics Engineers (IEEE) Portable Operating System Interface (POSIX) Standard 1003.2–1992
- X/Open Portability Guide, Issue 4 (XPG4)

The UNICOS and UNICOS/mk operating systems also support the optional use of the C shell.

Cray UNICOS Version 9.0 is an X/Open Base 95 branded product.

Definitions of audiences

Chapters 2 and 3 of this release letter list types of users most affected by the described feature or compatibility issue. The following definitions are used for these audiences:

Term	Definition
End user	Those who use the UNICOS operating system, products, applications, or network software.
Programmer	Those who write or modify system or application code for the purpose of solving computer system, scientific, or engineering problems.
Administrator	Those who perform system administration tasks such as installation, configuration, and basic troubleshooting.
System analyst	Those who perform advanced troubleshooting, tuning, and customization.
Operator	Those who perform operational functions or administer the Cray Research system through an operator workstation.

Reader comments

If you have comments about the technical accuracy, content, or organization of this document, please tell us. You can contact us in any of the following ways:

- Send us electronic mail at the following address:

  `publications@cray.com`

- Contact your customer service representative and ask that an SPR or PV be filed. If filing an SPR, use `PUBLICATIONS` for the group name, `PUBS` for the command, and `NO-LICENSE` for the release name.
- Call our Software Publications Group in Eagan, Minnesota, through the Customer Service Call Center, using either of the following numbers:

  1–800–950–2729 (toll free from the United States and Canada)

  +1–612–683–5600
- Send a facsimile of your comments to the attention of "Software Publications Group" in Eagan, Minnesota, at fax number +1–612–683–5599.

We value your comments and will respond to them promptly.

3. Compatibilities and Differences

The following subsections describe user and system administration issues involved in upgrading from a UNICOS 8.0 release to the UNICOS 9.0 release. This section also includes early information about changes planned for future UNICOS releases.

Because this release overview documents all features and compatibility issues introduced since the UNICOS 8.0 base release, each compatibility issue includes the UNICOS release level in which the compatibility issue was introduced. This information is provided to help our customers focus on the compatibility issues that will specifically affect their upgrade.

Each subsection in this section lists in the margin both the type of user and type of hardware affected. For definitions of the terms used, see subsection 1.6, page 1–6.

For information about UNICOS multilevel security (MLS) system compatibility issues, see subsection 4.3, page 4–9.

3.1 Compatibility statement

To meet user requirements for compatibility between releases of Cray Research software, upward compatibility is provided in subsequent releases of the system and products in the following areas:

- UNICOS user commands
- Standard language syntax, semantics, and Cray Research extensions
- Absolute binary code
- Relocatable binary code

This section describes any incompatible changes that were introduced in this release for the following reasons:

- Hardware changes
- Third-party software changes
- Improved software design or numerical techniques
- Bug fixes

If possible, both the old and new software are provided for one release. In other cases, compatibility bridging is provided through special compatibility software for the duration of one major release.

3.2 Selected hardware support withdrawn

Users affected

All

Supporting hardware

All Cray Research systems

The UNICOS 8.0 release was the final major release supporting the following Cray Research system hardware:

- CRAY X-MP EMA systems
- CRAY X-MP EA systems
- CRAY-2 systems
- I/O subsystem model B (IOS-B)
- IOS-C
- IOS-D
- Peripheral expander hardware

Support for use of the X-MP mode on CRAY Y-MP hardware has also been withdrawn.

> **Note:** When hardware support is dropped for a platform, support for compiling and linking for that platform is also dropped from all Cray Research platforms. For example, UNICOS 9.0 and subsequent releases do not support compiling, linking, or running CRAY X-MP binaries on CRAY Y-MP platforms. Additionally, commands such as debuggers and simulators will drop all support for binaries targeted for that platform.

For a list of hardware supported by the UNICOS 9.0 release, see subsection 7.1.1, page 7–1.

3.2.1 *Removal of IOS model D support*

Users affected

All

Supporting hardware

All Cray Research systems with IOS model Ds

Incompatibility introduced with release: UNICOS 9.0

With the UNICOS 9.0 release, IOS model D (IOS-D) systems are no longer supported. This support change will affect all sites with IOS-D systems. All commands and command options specific to the IOS-D have been removed from the UNICOS 9.0 release.

The following commands have been removed for the UNICOS 9.0 release:

- `bconfig`(8)
- `bgdiag`(8)
- `cleario`(8)
- `disk`(8)
- `donut`(8)
- `dsdiag`(8)
- `eft`(8)
- `flaw`(8)
- `idmp`(8)
- `mfdump`(8)
- `netconf`(8)
- `olcfdt`(8)
- `surf`(8)
- `tp`(4)

The following commands have been changed for the UNICOS 9.0 release:

- `brc`(8): `DUMPADEV` and `DUMPBDEV` variables removed
- `cpdmp`(8): `-f` option removed
- `dsk`(4): IOS-D functionality removed
- `hippi`(4): software loopback feature removed, IOS-D `loctl` calls not valid
- `olnet`(8): `FSL`, `FST`, and `HSX` tests removed

3.3 StorageTek support changes

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

Prior to UNICOS 9.0, users of the EMASS robotic and ER90 device products had to special-order them. With UNICOS 9.0, both products are included in the UNICOS release materials.

For additional information on licensing these products, see subsection 7.2.3.6, page 7–10. For additional information on ER90 device support for the CRAY EL series, see subsection 2.3.6, page 2–12.

Beginning with the UNICOS 9.0 release, if you use an automated cartridge library from Storage Technology Corporation (StorageTek) attached to a Sun system in conjunction with your Cray Research system, you must do the following:

- Upgrade to ACSLS version 5.0 (provided by Storage Technology Corporation)
- If you have Redwood drives, order Cray Research license CRSTK/STKRED

You will also find `stknet` files in a new location.

3.3.1 *ACSLS 5.0 required*

Users affected

All

Supporting hardware

All Cray Research systems

ACSLS 5.0 from StorageTek uses packet structure version 4. The `stknet` executable program that will run with UNICOS 9.0 on the Cray Research system will use packet structure version 4 as defined in ACSLS 5.0; Therefore, you must upgrade to ACSLS 5.0. The version of `stknet` that will run with UNICOS 9.0 will work only with ACSLS 5.0 and not with older packet structures defined in earlier versions of ACSLS.

3.3.2 *Order CRSTK/STKRED*

Users affected

All

Supporting hardware

All Cray Research systems

If ACSLS serves a StorageTek library equipped with Redwood drives and you use `stknet` to mount tape cartridges on those Redwood drives, you must have a Cray Research CRSTK/STKRED license. With this license, you will receive a Cray FLEXlm key, which enables stknet to operate with the Redwood drives.

If you use a StorageTek library that does not use Redwood drives, no Cray license is required, but you must use ACSLS 5.0 for the UNICOS 9.0 support to function properly.

For licensing information for StorageTek Redwood Drives with UNICOS 9.0, see subsection 7.2.3.4, page 7–9, or contact your Cray Research representative.

3.3.3 *New* `cmd/c1/tp/stkacs` *subdirectory*

Users affected

All

Supporting hardware

All Cray Research systems

With UNICOS 9.0, source code for `stknet.c` and the associated header files will no longer be available and will be removed from the `cmd/c1/tp` directory.

The components for `stkacs` will reside in a new directory; the components are the `Nmakefile` module, relocatable module `stknet.o`, and archive `stklib.a`. These components will be distributed with the UNICOS 9.0 release materials to all sites.

3.4 Networking and communications

The following subsections describe compatibility issues affecting network connectivity and communications.

3.4.1 *Compatibility concerns for NQS, NQE, and FTA*

The following subsections describe compatibility issues affecting Network Queuing System (NQS), Network Queuing Environment (NQE), and File Transfer Agent (FTA).

3.4.1.1 *NQS changes*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.0.3/8.3

The availability of a Network Queuing Environment (NQE) for UNICOS has caused changes to the Network Queuing System (NQS) configuration.

> **Note:** The following changes affect NQS itself, whether or not you are using NQE.

NQE consists of two existing UNICOS products (NQS and the File Transfer Agent (FTA)) and one additional, separately licensed product, Network Queuing EXtensions (NQX).

NQS now requires the file `/etc/nqeinfo`. This file contains configuration information that NQS and NQX use on startup. This file is placed in `/etc` by the installation process. The UNICOS Installation/Configuration Menu System tool uses an input template `nqeinfo` file that is located in `/usr/src/skl/etc`. You can use the menu system to ensure that the values in `nqeinfo` are appropriate for your installation. NQS will not start without an appropriately configured `/etc/nqeinfo` file.

The `/etc/nqeinfo` file generation is performed automatically, and by default, by the menu system tool. Sites that want to install NQS without NQX must leave `NQE configuration` enabled in the configuration menu.

The following menu selections affect NQE configuration. The selections are shown with their default settings.

The option to configure NQE appears under the menu for `Configurator Automation Options`, as follows:

```
S->  NQE configuration?                    YES
```

The option to enable NQE appears under the menu for `Major Software Configuration`, as follows:

```
S->  Network Queueing Environment (NQE)   ON
```

To start NQS without NQX, use the `qstart`(8) command. To start both NQS and NQX, use the `nqeinit`(8) command. If you disable `CONFIG_NQE`, the `nqeinfo` file is not built during installation, and NQS will not start. If for some reason you do not have an `nqeinfo` file after installing, you can copy the default `nqeinfo` file to `/etc` from `/usr/src/skl/etc/nqeinfo`.

Although NQX requires a separate license, the other components of NQE for UNICOS (NQS and FTA) do not require licenses. They remain part of the UNICOS product set. For information about NQX licensing, see subsection 7.2.3.1, page 7–8.

3.4.1.2 `qdump/qload` *utility scripts not required for NQS 9.0*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

Beginning with the UNICOS 9.0 release, the `qdump/qload` utility scripts are no longer needed. The documentation for `qdump` and `qload` has been removed from the UNICOS 9.0 manuals. These scripts were originally provided to upgrade from UNICOS 7.0 to UNICOS 8.0, due to incompatibilities in the NQS spool directory between these two releases. These commands are no longer needed for upgrading from UNICOS 8.0 releases to UNICOS 9.0 because the NQS spool directory provided with UNICOS 8.0 is upward compatible with the NQS spool directory provided with UNICOS 9.0.

Jobs submitted at the UNICOS 8.0 release level will be rerun after the upgrade to UNICOS 9.0.

Restart files are incompatible between UNICOS 8.0 and UNICOS 9.0. Batch jobs that are checkpointed on a UNICOS 8.0 system are not automatically restarted on a UNICOS 9.0 system.

Although the NQS spool directory is upward compatible from UNICOS 8.0 to UNICOS 9.0, backward compatibility is neither guaranteed nor supported. While testing the UNICOS 9.0 release, it is recommended that you use a different `/usr/spool/nqs` directory be used, to preserve the

UNICOS 8.0 NQS database. Note that the spool directory is specified by the `NQE_NQS_SPOOL` variable in the `/etc/nqeinfo` file, so it is not necessary to rebuild NQS to change the NQS spool directory. See subsection 3.4.1.3.1 for more information.

If after starting production with UNICOS 9.0 it becomes necessary to run UNICOS 8.0, use one of the following procedures:

- Let the queues empty as jobs finish and then fall back to 8.0.
- Perform the following steps:

  Stop all queues so that no more queued NQS requests are initiated.

  Disable the queues so that no more requests are submitted.

  Rerun all running jobs (see the `qmgr rerun request` command). Jobs that can be rerun will be queued. Jobs that can not be rerun will continue running; You can either terminate these jobs or let them finish running.

  Move queued jobs to an enabled, stopped pipe queue on another NQS or NQE host (see the `qmgr move` command). Users must have accounts on the host to which the queued jobs are routed.

  Wait for running jobs and jobs submitted by the UNICOS station call processor (USCP) to finish, or terminate them.

  Reload the UNICOS 8.0 system (using a different NQS spool directory), and then route the queued jobs.

If you have any questions about either method, contact your Cray Research service representative.

3.4.1.3 *NQS and FTA compatibility concerns*

The following subsections describe NQS and FTA compatibility concerns.

3.4.1.3.1 `/etc/nqeinfo` added for NQS and FTA configuration

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.0.3/8.3

NQS and FTA now use the `/etc/nqeinfo` file for configuration information at start-up time. NQS and FTA will not start without an appropriately configured `/etc/nqeinfo` file. To ensure that the values in `nqeinfo` are appropriate for your installation, use the NQE menu in the UNICOS Installation/Configuration Menu System.

Configuration parameters in the `/etc/nqeinfo` file will override equivalent NQS configuration parameters in the `/usr/src/net/nqs/include/config.h` file. To see the values NQS is currently using, use the `qconfigchk`(8) command.

For more information about the `/etc/nqeinfo` file, see the *UNICOS NQS and NQE Administrator's Guide*, SG–2305.

3.4.1.3.2 NQS `qstart` and `qstop` commands location

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

In the UNICOS 9.0 release, the `qstart`(8) and `qstop`(8) commands are installed in the `/etc` directory instead of the `/usr/bin` directory.

3.4.1.3.3 NQS `qstart` and `qstop` commands source

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.0.3

Beginning with the UNICOS 8.0.3 release, the `qstart`(8) command is installed from `/usr/src/net/nqe/bin/qstart`. Previously, it was installed from `/usr/src/net/nqs/cmd/qstart.sh`. The `qstop`(8) command is installed from `/usr/src/net/nqe/bin/qstop`. Previously, it was installed from `/usr/src/net/nqs/cmd/qstop.sh`.

If you have local mods to `qstart`(8) or `qstop`(8), the mods will no longer apply because `qstart` and `qstop` have been moved from the NQS program library (PL) to the NQE source tree. Because an NQE UNICOS source manager (USM) PL does not exist, you can change `qstart` and `qstop` by either editing their scripts or creating your own USM PL.

3.4.1.4 *NQE job dependency support for UNICOS 9.0 systems*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

If you use the Network Queung Environment (NQE) job dependency feature, you cannot run redundant NQE master servers. If a master server goes down, it can not synchronize the job dependency information stored in the Network Load Balancer (NLB) server database with events that may have occurred when the machine was down.

3.4.1.5 *Compatibilty between NQX and NQE 1.x and NQX 2.0 NLB master server*

Users affected

All

Supporting hardware

All Cray Research systems

NQX/NQE 1.*x* `cload`(1) clients and certain NQX/NQE 1.*x* `nlbconfig` command options require updating to function with an NQX 2.0 Network Load Balancer (NLB) master server.

If you have NQE/NQX 1.*x* `cload`(1) clients that need to communicate with an NQX 2.0 NLB server, then you must make changes to the NQX 2.0 NLB server `name_map` file. In the definition of the NJS object, comment out all of the attributes inclusively between:

```
NJS_ORIG_SEQNO  "Request sequence number"
integer(20);

NJS_RPRIORITY  "URM priority incr (qsub -p)"
integer(207);
```

When all `cload`(1) clients are upgraded to the NQE 2.0 level, the `name_map` file should be changed back.

Neither the NJS name list nor the NJS description list can exceed 4096 bytes. It is recommended that you remove all of the status API additions (the status API is available only in NQE 2.0, and will be available for NQX 3.0) for completeness. Note also that there are approximately 190 attributes that will be removed.

3.4.1.6 `cqstat` *display now prompts for password*

Users affected

Administrator, End user

Supporting hardware

All Cray Research systems

The `cqstat`(1) display now will prompt for a password when a user requests detailed job status on a server where password validation is turned on.

However, the password is displayed on the user's screen as the user enters it. This problem will be fixed in NQX 3.0. An alternative for requesting full status, in this case, is to use the –P option to the `cqstatl`(1) command.

3.4.1.7 *Final release supporting the NQS* `config.h` *file*

Users affected

Administrator

Supporting hardware

All Cray Research systems

The UNICOS 9.2 restricted release will be the last UNICOS release to support the NQS `config.h` file. Beginning with the UNICOS 10.0 major release, the NQS `/usr/src/net/nqe/src/nqs/include/config.h` file will not be available. The configuration settings currently in the `config.h` file will either be moved to the `/etc/nqeinfo` file or will no longer be configurable. The `/etc/nqeinfo` file provides the capability to customize NQS without recompiling NQS programs. The settings within the `/etc/nqeinfo` are available at run time.

This change is being made to support Cray Research's continuing move towards binary releases, to provide a more consistent interface for UNICOS NQS and CraySoft NQE, and to simplify NQS customization.

3.4.2 *New format for the* `gated.conf` *file*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The `gated.conf` file has a new format that is incompatible with previous releases.

Configure the `gated.conf` file through the UNICOS Installation/Configuration Menu System by using the following menu selection:

```
Configure System

   Network configuration
      TCP/IP configuration
         Routing
```

For more information, see the `gated-config`(5) man page.

Related publications

UNICOS Networking Facilities Administrator's Guide, publication SG–2304

3.4.3 `route` *command* `-C` *option removed*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

As announced in an earlier UNICOS release, the `-C` option has been removed from the `route`(8) command. The `-C` option forced the `route`(8) command to use the old `ioctl` interface to the kernel for routing operations.

3.4.4 *BGP, EGP, and* `HELLO` *protocols no longer supported with* `gated`

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The `gated`(8) daemon no longer supports the Border Gateway Protocol (BGP), Exterior Gateway Protocol (EGP), and `HELLO` protocol.

3.4.5 *Integrated DCE login*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.0.4

If your system has the Distributed Computing Environment (DCE version 1.0.2.1 or later) installed and turned on, you no longer need to log in to DCE in addition to logging in to the UNICOS system. Integrated DCE login lets users log in to a Cray Research system and have DCE identities (credentials) set up transparently (that is, they will not have to use the `dce_login` command to perform the DCE login process).

The integrated DCE login feature is a supplemental authentication mechanism that lets users access the Cray Research system and simultaneously have a DCE identity created. This feature supports the `rlogin`(1b), `telnet`(1b), `rexec`(3), `ftp`(1b), `fta`(8), and `nqe`(7) commands. To

authenticate users in the DCE registry, the integrated DCE login feature requires a password (currently, Cray DCE/Distributed File System (DFS) does not support ticket forwarding or inheriting). Because of the password restriction, the integrated DCE login does not support `.rhosts` or `host.equiv` functionality for `rlogin`(1b) and `rcmd`(8). For `rlogin`(1b) requests in which the remote user has a `.rhost` file set up, DCE authentication will not occur. DCE authentication is passive (it is not grounds for rejecting a user login). So the user will be allowed on the system but will not have a DCE identity set up. To use DCE/DFS services as an authenticated user, the user then must perform a separate `dce_login`.

For security reasons, a user who logs in with the `root` user name will not be authenticated; to gain access to DCE services, they must perform a `dce_login`.

3.4.6 *DECnet application no longer supported on CRAY EL systems*

Users affected

End user, administrator, operator

Supporting hardware

CRAY EL systems

Incompatibility introduced with release: UNICOS 9.0

The UNICOS 8.0 release was the final major release supporting the DECnet application for CRAY EL systems; beginning with the UNICOS 9.0 release, it is no longer supported. The DECnet application, kiNET, from Ki Research is a third-party application that used the character special file `/dev/ge`, which allowed you to run the DECnet protocols over Ethernet on a CRAY EL system.

3.4.7 *HYPERchannel no longer supported on CRAY EL systems*

Users affected

All

Supporting hardware

CRAY EL series

Incompatibility introduced with release: UNICOS 9.0

The UNICOS 8.0 release was the final major release supporting HYPERchannel on CRAY EL systems; beginning with the UNICOS 9.0 release it is no longer supported.

3.4.8 *Final release supporting USCP and Stations*

Users affected

All

Supporting hardware

All Cray Research systems except CRAY T90, CRAY J90, and CRAY EL series

Incompatibility introduced with release: UNICOS 10.0

UNICOS 9.0 is the final major release supporting Cray Research Station products and the UNICOS station call processor (USCP). USCP and the following station products will, however, be supported until one year after UNICOS 10.0 is released: IBM MVS Station, IBM VM Station, DEC VAX/VMS Station, and CDC NOS/VE Station. TCP/IP-based alternatives to stations are available for all of these environments through a combination of Cray Research and third-party vendor products.

For more information on station migration options, contact your Cray Research representative.

3.4.9 *Final release supporting OSI*

Users affected

Users of the OSI optional product

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 10.0

UNICOS 9.0 is the final major release supporting the Open Systems Interconnection (OSI) protocol family, AF_ISO, at the socket level. Support for OSI lower layers in UNICOS and for the OSI unbundled product will not be available beginning with the UNICOS 10.0 release.

3.4.10 *Final release supporting `netmon`, `xnetmon`, and `xsnmpmon` networking tools*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 10.0

UNICOS 9.0 is the final major release supporting the following networking tools: `netmon`, `xnetmon` and `xsnmpmon`. Beginning with the UNICOS 10.0 release, these tools will not be supported.

To provide standard monitoring of new and existing devices, there will be new simple network management protocol (SNMP) software that will support standard management information bases (MIBs) for these industry devices. However, Cray Research will not be providing any user displays providing

monitoring capabilities. These features will, therefore, be available only from a third-party network management station provided by the customer.

For further information contact your Cray Research representative.

3.4.11 *UNICOS 9.2 is final release supporting full X11 clients*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 10.0

Cray Research ports X11 from the X Consortium, Inc. distribution of the X11 product. The Consortium has decided to discontinue support of a number of programs as of X11 release 6. Therefore, Cray Research will also no longer support the affected features with X11R6, which will be released with UNICOS 10.0.

The following clients will still be available to the public in the X Consortium `contrib` directory:

Client	Description
`listres`	List resources in widgets
`viewres`	Graphical class browser for Xt
`xcalc`	Scientific calculator for Xt
`xditview`	Display distroff output
`xdpr`	Dump an X window directly to a printer
`xedit`	Simple text editor for X window system
`xfontsel`	Point and click interface for selecting X11 fonts
`xload`	System load average display for X window system
`xpr`	Print an X window dump

The `contrib` directory will remain available through anonymous `ftp` at `ftp.x.org`.

Note: The X Consortium is also discontinuing support for xman, a manual page display for the X Window System. Cray Research will continue to support xman in the UNICOS 10.0 major release and in the Cray Visualization Toolkit (CVT) release.

3.4.12 *New* `dnsquery` *command for domain name servers*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The new `dnsquery`(8) command provides an interface to name servers by using Berkeley Internet name domain (BIND) resolver library calls. `dnsquery`(8) supports queries to the name server with an operation code of `QUERY`. This command is intended to be a replacement or supplement to commands such as `nstest`, `nsquery`, and `nslookup`(1).

For more information on `dnsquery`(8), including syntax and options, see the `dnsquery`(8) man page.

3.5 User interface, tools, commands, and utilities

The following subsections describe compatibility issues affecting the user interface, tools, commands, and utilities.

3.5.1 *UNICOS tools and libraries moved to the programming environment*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Change introduced with release: UNICOS 8.3

The Fortran libraries and most UNICOS performance utilities are no longer being released with the UNICOS system. Instead, they are released with the programming environment releases, beginning with the 1.2 releases.

> **Note:** Sites installing the UNICOS 9.0 release must upgrade to the programming environment 1.2 or later releases to obtain Fortran run-time libraries.

The `libf`, `libu`, and `libfi` Fortran libraries and related commands and include files were moved from the UNICOS operating system to the CrayLibs portion of the programming environments. All routines in these libraries are now released and documented as part of the programming environments. The following commands are also released and documented with the programming environments:

- `asgcmd`(1)
- `assign`(1)

- `fdcp`(1)

These utilities are released with CrayLibs, which is part of the programming environment releases.

The following performance utilities were moved from the UNICOS operating system to the CrayTools portion of the programming environments. All of these utilities are now released and documented as part of the programming environments.

- `atchop`(1)
- `atexpert`(1)
- `flowview`(1)
- `jt`(1)
- `jumpview`(1)
- `libperf`
- `libprof`
- `libtrace`
- `perfdmp`(1)
- `perfview`(1)
- `procview`(1)
- `prof`(1)
- `profview`(1)

These utilities are documented in the *Tuning Guide to Parallel Vector Applications*, publication SG–2182. The *UNICOS Performance Utilities Reference Manual*, publication SR–2040, is now obsolete.

3.5.2 *Standard shell ability to execute* `setuid` *and* `setgid` *scripts removed*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

In order to support the UNICOS multilevel security (MLS) policy, the standard shell no longer will execute `setuid` and `setgid` shell scripts. Validation of `setuid` and `setgid` programs now is performed exclusively by the kernel. This change is consistent with the majority of computer vendors.

3.5.3 *New search options added to* `man` *utility, obsolete section title option*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 9.0

The `-s` and `-l` options were added to the `man`(1) utility. The new search options make the `man` *section title* option obsolete. The `man` *section title* option will be removed in a future release.

3.5.4 *New* `scanit` *command for CRAY J90 scalar cache use*

Users affected

All

Supporting hardware

CRAY J90 systems

Initial release: UNICOS 8.0.4A

Scalar cache was disabled in the UNICOS 8.0.3.2J restricted release because of a problem found when a certain sequence of instructions was executed with scalar cache enabled. The problem caused incorrect calculations, data corruption, and (ORE) aborts.

The new `scanit`(1) command will search executables for code sequences that cause errors when scalar cache is enabled. The `scanit`(1) command changes the code so the sequence of instructions does not cause errors. The `scanit`(1) command may be used on other vendor supplied programs only if the vendor permits program modification.

For more information, see the `scanit`(1) man page, or contact your Cray Research representative.

3.5.5 *Checkpoint/restart incompatibility*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

Because of features introduced in this UNICOS release, checkpoint files created on a UNICOS 8.0 system cannot be restarted under UNICOS 9.0.

3.5.6 New bc *utility replaces previous* bc *and* dc *utilities*

Users affected

End user

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The bc(1) and the dc(1) utilities included in previous UNICOS releases were renamed to be obc(1) and odc(1), respectively, in the UNICOS 9.0 release. The obc(1) and odc(1) commands will be removed in a future UNICOS release.

The new bc(1) utility uses source code ported from the Free Software Foundation (FSF). This new bc(1) utility is different from the version of bc(1) provided with previous UNICOS releases in the following ways:

- The dc(1) utility is not invoked as part of the processing done by bc(1); the new bc(1) utility incorporates the functionality of the bc(1) and the dc(1) utilities that were included in previous UNICOS releases.
- The `-c` option, which produced compile only output, has been removed.
- The new `-s` option causes bc(1) to accept only the language defined by POSIX.
- The new `-w` option warns of the use of extensions to the POSIX bc utility.
- Names can be longer than 1 character.
- POSIX `if` statements do not allow an `else` clause.
- Logical operators, a `read` function, a `print` statement, and a `continue` statement have been added.
- Numbers cannot contain embedded spaces.
- The source code for bc(1) is now included with the release.

The bc(1) man page from previous releases is now available under the name obc(1). The man page for the FSF utility is available under the name bc(1).

3.5.7 *The* make *command sends* .f *and* .F *files directly to* cf77

Users affected

End user

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The make utility has improved the Fortran source preprocessing by invoking a Fortran preprocessor. In prior UNICOS releases, the make(1) command had rules for converting .F files to .f files by calling the CF77PP preprocessor (/lib/cpp). The default rules of the make(1) command have been modified to call the cf77(1) command, which automatically calls the gpp preprocessor (/usr/lib/gpp) for .F input files. The CF77PP and CF77PPFLAGS macros are no longer defined by the make(1) utility. To pass options to the cf77 preprocessor, the FFLAGS macro can be used.

The following differences exist between the gpp and cpp preprocessors:

- The gpp preprocessor does not process #define macros unless the -F option is set. Macros are not processed by default because they can cause errors by expanding Fortran source lines to more than 80 characters.
- The gpp preprocessor does not process C-style comments If allowed, gpp could confuse Fortran code or Fortran comments as C-style comments, causing errors.
- The gpp preprocessor does not process #pragma, #line, #class, or #ident directives because these directives are used only in C.
- The gpp preprocessor does not process the -C, -E, or -N options.
- The cpp preprocessor does not process the -F or -Q options.
- The cpp preprocessor cannot correctly interpret some Fortran code.
- The cpp preprocessor cannot add the BTRNSFRM and ETRNSFRM directives.

If you want to continue to have make(1) call cpp for .F files, you must call /lib/cpp explicitly or write your own make(1) rule.

3.5.8 `sar` *utility changes*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The following changes have been made to the system activity reporting command, `sar`(1):

- The display of the `-X` option has been altered to show the total abnormal exchanges, rather than a rate that is almost always 0.
- The `ldcache` statistics are reset to 0 upon reconfiguration of the system `ldcache` parameters.

3.5.9 *Support removed for several UNICOS utilities*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

Several UNICOS utilities have been removed from the UNICOS system, as announced in the *UNICOS 8.0 Release Overview*, publication RO–5000 8.0. The utilities removed are as follows:

- `cl`(1)
- `ftref`(1)
- `hconv`(1)
- `ldovl`(1)
- `lmedit`(1)
- `lmstak`(1)
- `nicem`(8)
- `nmodex`(1)
- `nupdate`(1)
- `oawk`(1)
- `old`(1)
- `osh`(1)
- `pcpp`(1)
- `plcopy`(1)
- `pshell`(1)
- `whodo`(8)

3.5.10 *Support removed for* nupdate *utility*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Incompatiblilty introduced with release: UNICOS 9.0.

The `nupdate` utility has been removed in UNICOS 9.0 so that support and development efforts can be focused on only one source control utility.

To prepare for the removal of the `nupdate` utility, convert existing `nupdate` program libraries (PLs) to USM PLs before you upgrade to UNICOS 9.0. USM can convert existing `nupdate` PLs to USM PLs; however, because the `nupdate` utility may be used in the conversion process, you may not be able to convert them on any UNICOS releases after UNICOS 8.0. For information on how to convert `nupdate` PLs to USM PLs, see the *UNICOS Source Manager (USM) User's Guide*, publication SG–2097.

The Source Code Control System (SCCS), which is available in UNICOS 9.0, is an alternative for source code maintenance. Unlike USM, SCCS is portable across UNIX systems. UNICOS SCCS utilities conform to the X/Open Portability Guide, version 4 (XPG4) standard and are compatible with all other X/Open compliant systems.

3.5.11 *GNU Emacs upgraded to Emacs-19.28*

Users affected

End user

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

As announced in the *UNICOS 8.0 Release Overview*, publication RO–5000 8.0, GNU Emacs-19 has replaced Emacs-18.

The following subsections describe differences that exist between the GNU Emacs-19 and GNU Emacs-18 user start-up file, `.emacs`. If the differences affect you, you must modify your `.emacs` file. You will, however, be able to construct the start-up file so that only parts of the file will execute depending on which version of Emacs is running. Refer to the sample start-up file `/usr/lib/emacs/etc/.emacs`.

3.5.11.1 *Defining keys for editing functions*

The way that users define keys for editing functions in the `.emacs` file has changed.

For GNU Emacs-18, users must use actual keyboard sequences to identify the keys. For example:

```
define-key RSI-map "226z" 'query-replace) ;;  F3
```

For GNU Emacs-19, users can name keys according to what appears on the key tops. For example:

```
(define-key function-key-map [f14] [undo]) ;; L4
```

If a user's `.emacs` file defines key functions according to the old GNU Emacs-18 method, the user must change the `.emacs` file according to the new GNU Emacs-19 method. Starting GNU Emacs-19 with a `.emacs` file that contains old definitions will be successful, but the key function definitions will not take effect.

3.5.11.2 *New GNU utilities*

GNU Emacs-19 includes GNU utilities that were not part of the GNU Emacs-18 release. For GNU Emacs-18, users can obtain these utilities from the Free Software Foundation, make them work on the UNICOS system, and use the `.emacs` file to load the utilities into Emacs. For GNU Emacs-19, using the `.emacs` file to load utilities that are already part of release 19 will cause errors.

3.5.12 *UNICOS 9.0 and SecurID version 2.3 dependency*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

Customers who use SecurID and enable the SecurID password checking option must upgrade to version 2.3 or later of SecurID. When the password checking option is enabled, the user is authenticated against both the SecurID passcode and the user database (UDB) password. When the password checking option is disabled, authentication is performed only against the SecurID passcode.

UNICOS 9.0 does not support the SecurID password checking option on versions of SecurID prior to version 2.3. When using SecurID, only passcode authentication will be performed, regardless of the password checking option configuration.

3.5.13 *UNICOS 9.0 and SMARTE 5.0 dependency*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

Customers who use system maintenance and remote testing environment (SMARTE) must upgrade to version 5.0 or later with the UNICOS 9.0 release. UNICOS 9.0 does not support earlier versions of SMARTE software.

3.5.14 *Final release including the Docview utilities*

Users affected

All

Supporting hardware

All Cray Research systems

The UNICOS 9.0 release is the final major release for which documentation will be delivered in Docview format. You will be able to access documents already in Docview format until software support for the UNICOS 9.0 release ends.

Cray Research now provides online versions of manuals through the CrayDoc online information reader, a workstation-based electronic viewing tool that includes graphics, hypertext linking, and both book and multibook searches.

3.5.15 *Final release supporting the process monitor,* `xproc`

Users affected

End user

Supporting hardware

All Cray Research systems

The UNICOS 9.0 release is the final major release supporting the process monitor, `xproc`(1). The `xproc`(1) utility provides a visual tool, based on the X Window System, that displays and controls UNICOS processes and NQS jobs. Users who install NQE will be able to display and control NQS jobs. The `ps`(1) and `kill`(1) commands can be used to display and control UNICOS processes.

3.5.16 *Final release supporting the file manager,* `xfm`

Users affected

End user

Supporting hardware

All Cray Research systems

The UNICOS 9.0 release is the final major release supporting the File Manager, `xfm`(1). The `xfm`(1) utility provides a visual tool, based on the X Window System, that performs file management for the UNICOS system. When `xfm`(1) is retired, there will be no X Window System-based file manager tool on UNICOS. In the future, the Common Desktop Environment (CDE) will provide a file manager as part of the desktop; however, CDE may not be available at the time that `xfm`(1) is retired.

3.5.17 `diskmap` *man page renamed to be* `diskspec`

Users affected

All

Supporting hardware

All Cray Research systems

Change introduced with release: UNICOS 9.0

The `diskmap`(7) man page was renamed to be `diskspec`(7) to more accurately reflect its content, which is disk specifications.

3.5.18 *UNICOS 9.2 to package CAL with programming environment*

Users affected

Administrators

Supporting hardware

All Cray Research systems

Packaging change introduced with release: UNICOS 9.2

UNICOS 9.1 will be the last UNICOS release to include Cray Assembly Language (CAL). Beginning with the release of UNICOS 9.2, CAL will be available on the programming environment release media. This is a packaging change only; CAL will still be licensed with UNICOS and there will be no additional fees charged beyond the cost for the UNICOS license.

3.6 System calls

The following subsections describe compatibility issues that affect system calls.

3.6.1 `sigctl` *system call functionality restricted*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

With the introduction of the `sigaction`(2) system call in the UNICOS 6.0 release, the `sigctl`(2) system call has become obsolete. While `sigaction`(2) does not provide a superset of the functionality of `sigctl`(2), the additional functionality that `sigctl`(2) provides is no longer considered necessary.

The specific additional functionality provided by `sigctl`(2) is the ability to choose an arbitrary action (such as termination with or without a core dump) for an arbitrary signal. In contrast, `sigaction`(2) only allows the user to specify a signal handler, ignore a signal, or accept a system-defined, signal-specific default action.

This additional functionality in `sigctl`(2) was provided so pre-existing interfaces, such as `signal`(2), could be implemented in terms of `sigctl`(2) without `sigctl`(2) setting default action policy. The main value of the `sigctl`(2) system call to Cray Research users was to provide a signal registration function that did not revert to a default action after entering a signal handler; this behavior is now provided by `sigaction`(2).

The functionality of the `sigctl`(2) system call is now restricted. Any attempt to specify an action other than to catch (`SCTL_REG`) or ignore (`SCTL_IGN`) is silently mapped to the system-defined default action for the signal being registered. To avoid confusion, a new action flag for `sigctl`(2) has been provided. Making the `sigctl(SCTL_DEF,` *signo*`, 0)` call causes the default action to be taken when the signal *signo* is received.

3.6.2 `acctctl` *accounting system call replaces* `acct` *and* `dacct` *system calls*

Users affected

Administrator, programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The new `acctctl`(2) system call enables, disables, and checks the status for process, daemon, and record accounting. The `acctctl`(2) system call replaces the `acct`(2) and `dacct`(2) system calls.

3.6.3 `limits` *system call functionality changes with addition of* `policy` *system call*

Users affected

Administrator, programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The functionality of the `limits`(2) system call is now limited to lnode operations. The `policy`(2) system call handles other fair-share functionality. The new `policy`(2) system call provides an interface to the kernel for the fair-share daemon, and allows access to the fair-share constants structure, `sh_consts`.

The `L_GETCOSTS` and `L_SETCOSTS` functions of the `limits`(2) system call have been removed in the UNICOS 9.0 release. The `policy`(2) system call provides the `get_costs` and `set_costs` actions as replacements.

3.7 Libraries

The following subsections describe compatibility issues that affect run-time library routines.

3.7.1 *UDB library changes*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The `libudb`(3) library replaces the `udblib` library. The library routines for the user database (UDB) have been moved from `libc/gen` to `libc/udb`.

3.7.2 *Changes to memory manager routines*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The memory manager routines formerly documented on the `memmgr`(3) man page have been replaced with a new set of routines documented on the `malloc`(3) man page. The old routine names may be removed in a future release of the UNICOS system. The old routines and their corresponding replacements are as follows:

Old routine	New routine
`_memcheck`	`malloc_check`
`_inplace`	`malloc_inplace`
`_expand`	`malloc_expand`
`_extend`	`malloc_extend`
`_howbig`	`malloc_howbig`
`_isvalid`	`malloc_isvalid`
`_memfree`	`malloc_space`
`_memlimit`	`malloc_limit`
`_memstats`, `memstats`	`malloc_stats`
`_memtron`	`malloc_tron`
`_memtroff`	`malloc_troff`
`_memetrac`	`malloc_etrace`
`_memdtrac`	`malloc_dtrace`
`_malloc`	none; use `malloc`
`_free`	none; use `free`
`_realloc`	none; use `realloc`

The new routines are similar to the old routines, except that their names are in the user's name space (they do not begin with an underscore), and all sizes are in bytes rather than in words.

For complete information on the new routines, see the `malloc`(3) man page. The `memmgr`(3) man page has been removed.

3.8 Operating system

The following subsections describe compatibility issues that affect the operating system.

3.8.1 *UNICOS non-MLS and MLS systems to be merged as of UNICOS 10.0 release*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

On UNICOS 8.0 and UNICOS 9.0 systems, the MLS configuration is optional. That is, to use security features specific to the UNICOS MLS configuration, sites must enable the `SECURE_CONFIG` configuration parameter.

As of the UNICOS 10.0 release, the `SECURE_CONFIG` parameter will not be supported, and MLS features will be incorporated into the UNICOS 10.0 system.

Combining the non-MLS and MLS systems makes the security features, such as access control lists (ACLs) and security auditing, available to all Cray Research customers. Note that use of these security features will still be optional. Sites can choose to use only those features that are applicable to their sites.

For sites that are currently using a UNICOS non-MLS system, this feature will provide a UNICOS configuration that has the same behavior as the current UNICOS non-MLS system. For sites that are currently using a UNICOS MLS system, this feature will provide a UNICOS configuration that has the same behavior as the current UNICOS MLS system. Commands, libraries, and system calls will not change. However, interfaces that are currently available only on UNICOS MLS systems will be generally available on UNICOS 10.0 systems.

Changes will be made to some of the default settings of options in the UNICOS Installation/Configuration Menu System. These changes will not impact sites that import their previous configurations.

For more information about other UNICOS 10.0 security feature changes, see subsection 4.3.4, page 4–10.

3.8.2 `gencat` *utility renamed to be* `mfsck`

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The parallel file system check utility formerly known as `gencat`(8) has been renamed to be `mfsck`(8). Scripts and procedures must be changed to use the `mfsck`(8) name.

This change was required to comply with the XPG4 standard, which uses the name `gencat` for a message system utility.

For more information, see subsection 3.9.3, page 3–38.

3.8.3 *Fair-share scheduler differences*

Users affected

Administrator

Supporting hardware

All Cray Research systems

This UNICOS release introduces the following fair-share scheduler differences:

- Incompatibility introduced with release: UNICOS 8.0.3/8.3

  The `-y` option of the `shradmin`(8) command is no longer deferred; the fair-share scheduler now allows administrators to set charges for terminal I/O operations.

  For more information, see the `shradmin`(8) man page.

- Incompatibility introduced with release: UNICOS 8.3

  A feature was added to enforce correct usage of the fair-share flags (the `shrflags` field) in the user database (UDB). If incorrect information in the UDB would cause the creation of an improperly labeled or positioned lnode, the system issues an error and the user is prevented from logging in or submitting jobs. The major impact of this feature will be felt by sites that run with Share by Account mode enabled. The `SHAREHOLDER` flag must be set in the `shflags` field for UDB records that define account IDs (acids).

  For more information, see the `shrtree`(8) and `shradmin`(8) man pages.

- Incompatibility introduced with release: UNICOS 8.3

  As announced in the *UNICOS 8.0 Release Overview*, publication RO–5000 8.0, the commands `shrates`(1), `shrinfo`(1), `shrusage`(1), and `shrstats`(1) have been deleted. Their functionality has been replaced by the `shrview`(1) command, which was introduced in UNICOS 8.0. The `shrmon`(8) command, however, remains for compatibility reasons; it will be deleted in a future release. Users of `shrmon` are encouraged to convert to `shrview`, which will continue to be supported in future releases.

  For more information, see the `shrview`(1) and `shrmon`(8) man pages.

3.8.4 *Programming considerations for dynamic allocation of file descriptors*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The following programming recommendations are related to the dynamic allocation of file descriptors feature in the UNICOS 9.0 release. For a description of the feature, see subsection 2.9.19, page 2–73.

- The dynamic allocation of file descriptors feature in the UNICOS 9.0 release will not affect existing binaries. However, use caution when writing new code that makes use of this feature.

  Some existing binaries could use unsafe programming practices or make assumptions about `OPEN_MAX` having a value of 64 and being the maximum number of files a UNICOS process can open. An example of this would be direct use of the `OPEN_MAX` define to allocate file-related storage or to loop through file descriptors. If a process opens more than `OPEN_MAX` files and then uses `exec`(2) to execute such a binary, the execution of that binary may fail.

  The `_sc_open_max` parameter to `sysconf`(2) should be used instead to avoid this problem. This recommendation also applies to UNICOS 8.0, where `OPEN_MAX` has a value of 255.

- When a process dynamically increases its open files, the open file array of the process is no longer assured to be contained in the internal `ucomm` structure of the process. Programs making use of the `proc`(4) `PRFS_UCOMM` function should use the new `PRFS_FDS` function to get the open file array of such a process. Use of `PRFS_FDS` is needed only when looking at processes that have opened more than 300 (`K_OPEN_DEFAULT`) files.

3.8.5 *Default number of current primary partitions changed*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The limit on the number of primary partitions in a file system that are maintained with current data has been set at the default value of 4. The `fsck`(8) command has been modified to account for this change.

When an administrator or operator is switching to a file system created with an older version of the UNICOS system, the following messages may be encountered:

```
/scr_401: file system opened
/scr_401: super block fname scr_401, fpack scr_400
/scr_401: alternate dynamic block in block 300027
differs from primary
/scr_401: rewrite dynamic blocks ('y' or 'n')?
```

These messages may occur multiple times for one file system, and for multiple file systems. If the administrator answers `y` (yes), the file system is restored to its older state under which all primary partitions are active.

If the administrator answers `n` (no), the update occurs during most normal file system activity.

Caution: Answering `n` could cause a serious problem in the unusual case that all active primary partitions are down, and the file system was not checked. In this case, the old dynamic data and bit map could lead to damage of existing data.

3.8.6 *UDB files*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The user database (UDB) has been substantially rewritten to allow for future enhancements. The UDB has been extended and now spans several files. There are now extension files in a new subdirectory, `/etc/udb_2`, that physically separate public and private data in the UDB. (Private data includes encrypted passwords, security compartments, permission bits, and so on.) Fields added appear in the extension files, with the exception of the user name, UID, group list, and account ID (acid) list.

> **Note:** The files `/etc/udb` and `/etc/udb.public` continue to exist for compatibility; however, in a future release they will be removed and all data will be moved into the new files.

For UDB library compatibility issues, see subsection 3.7.1, page 3–27. For Fair-share compatibility issues, see subsection 3.8.3, page 3–30.

3.8.7 *New `relasync` command added*

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

The binary packaging tools are being upgraded, resulting in the removal of the `ldproto`(8) command. The `ldproto`(8) command will be replaced by a more robust, more easily maintainable set of tools that can be used by both UNICOS and asynchronous products.

The UNICOS release introduces the first of these new tools with the `relasync`(8) command. The `relasync`(8) command verifies loaded files and directories on disk against information in a database.

For more information, see the `relasync`(8) man page.

3.8.8 `dodisk` *mail output removed*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The `dodisk`(8) accounting command no longer sends mail to the administrator that shows the current date and time. This change brings `dodisk`(8) into conformance with other UNIX implementations.

For more information, see the `dodisk`(8) man page.

3.8.9 *UNICOS SFS* `esdaemon` *command replaced by* `sfsd` *command*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

The `sfsd`(8) command, which initializes and monitors the external semaphore device for the UNICOS shared file system (SFS) feature, has replaced the `esdaemon`(8) command.

For more information, see the `esdaemon`(8) man page.

3.8.10 *Character-special tape interface node 43 (ddal) support removed*

Users affected

End user, administrator, operator

Supporting hardware

CRAY J90 series and CRAY EL series

Incompatibility introduced with release: UNICOS 9.0

The character-special tape interface that uses major node number 43 (which is also referred to as the `ddal` interface), is no longer supported. As of the UNICOS 9.0 release, the character-special tape interface created by the `tpdaemon`(8) command is the only character-special tape interface supported.

3.8.11 *UNICOS tape subsystem becomes a separate product at UNICOS 10.0*

Users affected

All

Supporting hardware

All Cray Research systems

Packaging change introduced with release: UNICOS 10.0

Beginning with the UNICOS 10.0 release, the UNICOS tape subsystem will be packaged with the release materials in binary form and will be sold as a separate product for new hardware platforms. Users of CRAY T3E systems and subsequent new platforms must purchase a license and obtain a FLEXlm key to enable the subsystem to function.

The new product will contain the feature-rich tape daemon-assisted interface; the character-special tape interface will continue to be available without cost as part of the UNICOS release materials. Its online tape capabilities will provide tape access similar to the access that users on other UNIX systems have. This access, a basic means of reading and writing tape information, will not require a license or a FLEXlm key.

3.8.12 *UNICOS 8.0 release support ending*

Users affected

All

Supporting hardware

All Cray Research systems

Support for the UNICOS 8.0 release will end on September 30, 1996.

Note: For model D systems only, UNICOS 8.0 and its related products will be supported with updates as needed from September 30, 1996, through September 30, 1997.

3.8.13 `mtdump` *and* `segldr` *packaging change*

Users affected

All

Supporting hardware

All Cray Research systems

The UNICOS 9.0 major release will be the final release containing both source and binary code for `mtdump` and `segldr`. Beginning with the UNICOS 9.1 release, `mtdump` and `segldr` will be packaged in binary form only. The generation compiler necessary to build these utilities will not be part of the UNICOS release package.

3.9 XPG4 compliance

Changes have been made to make the UNICOS system compliant with the X/Open XPG4 standard. The following subsections describe the UNICOS 9.0 release XPG4 compliance and compatibility issues.

3.9.1 *Function prototypes changed for compliance with XPG4*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

Several function prototypes in various system include files have been changed to conform with the XPG4 standard. Some of these new prototypes may require users to recompile or change source code that built successfully in previous releases.

The include files and prototypes in the following list have changed. The include file name, the old prototype, and the new prototype are specified for each changed prototype.

File: <nl_types.h>
Old: `char *catmsgfmt(const char *, const char *, const int, const char *, const char *, char *, const int)`
New: `char *catmsgfmt(const char *, const char *, int, const char *, const char *, char *, int)`

File: <nl_types.h>
Old: `char *catgetmsg(const nl_catd, const int, const int, char *, const int)`
New: `char *catgetmsg(nl_catd, int, int, char *, int)`

File: <nl_types.h>
Old: `char *catgets(const nl_catd, const int, const int, const char *)`
New: `char *catgets(nl_catd, int, int, const char *)`

File: <nl_types.h>
Old: `nl_catd catopen(const char *, const int)`
New: `nl_catd catopen(const char *, int)`

File: <nl_types.h>
Old: `int catclose(const nl_catd)`
New: `int catclose(nl_catd)`

File: <search.h>:
Old: void *lsearch(const void *, const void *, size_t, size_t, int (*)(const void *, const void *))
New: void *lsearch(const void *, void *, size_t, size_t, int (*)(const void *, const void *))

File: <search.h>:
Old: void twalk(void *, void (*)(void *, VISIT, int)
New: void twalk(const void *, void (*)(const void *, VISIT, int)

File: <stdlib.h>:
Old: char *getpass(char *, ...)
New: char *getpass(const char *)

File: <stdlib.h>:
Old: int putenv(char *)
New: int putenv(const char *)

File: <stdio.h>:
Old: long getw(FILE *)
New: int getw(FILE *)

File: <stdio.h>:
Old: long putw(long, FILE *)
New: int putw(int, FILE *)

File: <string.h>:
Old: void swab(const char *, char *, int)
New: void swab(const void *, void *, ssize_t)

File: <time.h>:
Old: time_t timezone;
New: long timezone;

File: <unistd.h>:
Old: int chroot(char *)
New: int chroot(const char *)

File: <unistd.h>:
Old: char *getpass(char *, ...)
New: char *getpass(const char *)

File: <unistd.h>:
Old: void swab(const char *, char *, int)
New: void swab(const void *, void *, ssize_t)

File: `<unistd.h>`:
Old: `int ulimit(int, long)`
New: `int ulimit(int, ...)`

3.9.2 *XPG4 utilities now use compliant message system*

Users affected

End user

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

UNICOS user-level utilities subject to the XPG4 standard now issue messages using the XPG4-conformant UNICOS message system. In prior releases, each utility used internal messages. As a result of this, the format of messages has been changed. This also provided an opportunity to clarify messages and make them more helpful.

These changes support the `NLSPATH` environment variable specified in the XPG4 standard. The language and cultural conventions of diagnostic and information messages is affected by `LC_MESSAGES` and `NLSPATH` settings.

The format of utility messages is controlled by a combination of the new `CMDMSG_FMT` environment variable and the existing `MSG_FORMAT` environment variable.

For more information on messages, see the `explain`(1) man page.

Related publications

- *UNICOS Message System Programmer's Guide*, publication SG–2121

3.9.3 `gencat` *and* `catgen` *utilities renamed for compliance with XPG4*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

To comply with the XPG4 standard, the following utilities were renamed:

- The message system administrator utility formerly named `catgen`(8) has been renamed to be `gencat`(1). (This utility is used to rebuild UNICOS message system catalogs.) As a compatibility bridge, the utility will be callable through the

name `catgen` in the 9.0 release and 9.0 revision releases. Using the `catgen` name will produce an informational message. As of the UNICOS 10.0 release, only the name `gencat` will be recognized.

- Because the `catgen`(8) command has been renamed to be `gencat`(1), the file system utility formerly known as `gencat`(8) has been renamed to be `mfsck`(8). (This utility runs parallel file system checks.) Scripts and procedures must be changed to use the `mfsck`(8) name.

The operation of these utilities is not affected by the name changes.

For more information, see the `gencat`(1) and `mfsck`(8) man pages.

3.9.4 *Commands changed for compliance with XPG4*

Users affected

End user, programmer

Supporting hardware

All Cray Research systems

The following commands were changed to conform to the XPG4 standard. Subsections 2.10.5, 2.10.6, 2.10.7, and 2.10.8 list all user commands, system calls, library routines, and external variables that comply with the XPG4 standard.

For more information about these utilities, see their man pages.

Note: One of the central purposes for the UNICOS 9.0 major release is to deliver an XPG4-compliant environment. This required many changes to commands. With each change made, Cray Research made every effort to identify and minimize the impact on users of prior releases (release-to-release compatibility). This section describes the changes necessary for XPG4 compliance that are likely to affect users.

While testing for compliance, the new XPG4 commands and utilities test suite (with more than 6000 tests) also identified a number of latent defects not related to the XPG4 standard. Although we have not identified any such cases, procedures that depend on the defective behavior may be affected by the corrective code.

- Incompatibility introduced with release: UNICOS 8.3

  For the nm(1) utility, the -g option (print only global symbols) replaces the -f option (which was redundant with -g in previous releases). The -A option replaces the -o option as the method for causing the file and member name to be prepended to the symbol name.

- Incompatibility introduced with release: UNICOS 8.3

  For the od(1) utility, the default output has been changed to specify 2-byte words. The od(1) command formerly specified its output in 8-byte words. Use the -to option to receive output in 8-byte words.

- Incompatibility introduced with release: UNICOS 8.3

  For the pr(1) utility, the -L option performs the function (folding lines of output) formerly performed by the -f option. The -f option is now used to specify that a form-feed character should be used for new pages instead of the default sequence of newline characters.

- Incompatibility introduced with release: UNICOS 9.0

  The pr(1) utility options -l, -w, and -o now require the argument with the option; if the argument is not present, an error message will be returned.

- Incompatibility introduced with release: UNICOS 8.3

  The output of the ps utility when the -f or -l options are specified has a new column labeled C. This column does not have meaning on a UNICOS system, but its presence is required by the standard.

- Incompatibility introduced with release: UNICOS 9.0

  The cd(1) utility now writes the name of the new working directory only to standard output when it is called from within a script. Users who use the cd(1) utility through the CDPATH environment variable, or with a dash (–) as the directory operand from within a shell script, will notice this change. If you do not want the name of the new working directory to appear in the output, redirect the output from the cd(1) utility as follows: `cd - > /dev/null`. This change only applies to cd(1) when called from within a script; there is no change to cd(1) in interactive mode.

- Incompatibility introduced with release: UNICOS 9.0

  The `sccs`(1) utility options `admin`, `delta`, and `prs` now require the argument with the option; if the argument is not present, an error message will be returned.

- Incompatibility introduced with release: UNICOS 9.0

  The shell built-in `time` command was renamed to be `shtime` so that when the `time` command is entered, the behavior and output format match the behavior and output format of the `/bin/time` command and comply with the X/Open XPG4 standard. Anyone using the shell built-in `time` command must use `shtime`; anyone using the `/bin/time` command will see no change.

- Incompatibility introduced with release: UNICOS 9.0

  The shell (`sh` and `ksh`) changed as follows for XPG4 compliance:

  1. When the `trap` built-in command is invoked with no options or operands, output is now `trap -- 'echo foo' INT`, instead of `trap 'echo foo' INT`. This change may affect anyone who depends on the output of the `trap` command.

  2. When displaying the status of stopped jobs, the `jobs` built-in command now also indicates the name of the signal that caused it to stop. This change may affect anyone who depends on the output of the `jobs` command and tries to parse the output positionally, which is not commonly done from shell scripts.

     For example:

     ```
     [1] + Stopped (SIGTSTP)        sleep 30
     ```

  3. Parameter expansion using expressions such as `${var:-`*word*`}`, where `var` is an unset or null variable, result in *word* being expanded, and now requires using the tilde expansion in addition to parameter expansion, command substitution, and arithmetic expansion. For example, in the case of `${var:-~tee/foo}`, when `var` is unset or null, the XPG4 compliant shell expands it to `/cool/u6/tee/foo`. This change could affect the behavior of shell scripts if they expect that tildes will not be expanded. In most cases, the results will be the same,

since it is likely that the tilde will be expanded later anyway. If you really do not want a tilde to be expanded, you must escape it. For example:

```
% echo ${var:-~tee/foo}
/cool/u6/tee/foo
% echo ${var:-\~tee/foo}
~tee/foo
```

4. The positional parameter `0` should be unchanged by a call to a function. On a call to a function, `$0` now remains unchanged instead of being reset to the name of the function. This change could affect anyone who checks `$0` from inside a function and expects that it has been changed to the function name.

5. A variable assignment specified with a special built-in command remains in effect after the built-in completes.

   For example:

   ```
   var=value set -a
   ```

   Because `set` is a special built-in command, the variable assignment `var=`*value* now remains in effect in the current shell invocation after the `set -a` command completes. This is a very uncommon thing to do with special built-in commands (`break`, `continue`, `return`, `eval`, `set`, `trap`, and so on), but if you do it, you could be changing your current environment while thinking that you are only affecting the environment of the command.

6. A word expansion or redirection error during a call to a function now aborts a noninteractive shell. If you have a word expansion or redirection error in a function in your script, then you will have problems. The desired behavior is probably to abort as soon as the error is detected.

7. The `AND` and `OR` operators now have equal precedence and are evaluated by the shell from beginning to end (left to right). This change will be noticed by anyone who uses commands lists using the `AND` (`&&`) and `OR` (`||`) operators and does not group them in any way.

8. When the value of the internal field separator (IFS) consists of a combination of white-space characters and other characters, then any sequence of zero or more of the IFS white-space characters with a single occurrence of one

of the other IFS characters now serves to delimit a field. This is a very minor change that could affect any shell script that defines its own IFS characters and expects multiple contiguous IFS characters (which must be a mixture of white-space and nonwhite-space characters) to delimit null fields.

9. When in command mode and the command ?*string*<newline> is entered, where *string* is found in the current command, the cursor now moves to the beginning of that string. Previously, searching with ? did not look for the string on the current line. This change will be noticed by anyone who uses command-line editing in an interactive shell. It will not affect shell scripts.

10. When a job is suspended, it becomes the current job. When at least two jobs are suspended, they become both the current and previous jobs. This will affect anyone who has stopped jobs, uses the job control symbols %+ and %–, and expects that the last job that was put in the background is guaranteed to be %+. It will not affect the use of %1, %2, and so on.

- Incompatibility introduced with release: UNICOS 9.0

  An interpretation request was submitted regarding the following change to verify it is in conformance with the standard; if it is not, the change will not be made.

  The order in which input records are parsed into fields has been changed in the awk(1) command. Previously, input records were not parsed into fields until a field was required. With this change, input records are parsed into fields as soon as they are read, which can change the way that the fields are parsed when the action statement of the awk program assigns the FS (field separator) variable. The FS variable is the field separator. For example, prior to this change, if *awkfile* contained:

  ```
  a.b.c d.e.f
  ```

  then the following script would print a:

  ```
  awk '{FS = "."} {print $1}' awkfile
  ```

  With this change, the same script prints a.b.c.

Users may change their scripts to obtain the old behavior of awk. A suggested change is as follows:

```
awk -F"." '{print $1}' awkfile
```

or:

```
awk 'BEGIN {FS = "."} {print $1}' awkfile
```

Both of these scripts will work with both the new and old versions. This change could impact anyone whose awk scripts set the FS variable.

- Incompatibility introduced with release: UNICOS 9.0

  The vi(1) command was changed as follows for XPG4 compliance.

  Note: The following changes were made to comply with POSIX 1003.2 (and XPG4). Due to complaints about the POSIX 1003.2 definition of vi, POSIX is currently rewriting its vi definition to take some previous behavior into account. It is possible that in the future some of the following changes may need to be reversed to comply with POSIX 1003.2b. Because of this, these changes were implemented in a way that gives users the option of turning off the POSIX behavior (all except the [*count*] e change, which corrects a bug) and using the previous behavior. To use the previous behavior, use the vi option (no)posix92. You can turn it ON/OFF from within vi by entering the following:

  ```
  set posix92          /* ON */
  set noposix92        /* OFF */
  ```

  It will be ON by default.

  You can also add set noposix92 to your $HOME/.exrc file or your EXINIT environment variable if you always want the previous behavior.

  – If both the -t *tagstring* and -c *command* options are given, the -t *tagstring* option is processed first. This should have very little effect on anyone; it adds more functionality.

  – When scroll down is entered in command mode and the line movement would place the current line after the end of the file, then the movement does not occur, the terminal is

alerted, and the current position is not changed. Anyone who uses `vi` very much will be sure to notice this change.

- When `u` is entered in command mode and the reversal only affects one line, then `vi` positions the cursor at the first nonblank character of the changed line. Anyone who uses `vi` very much will be sure to notice this change.
- When deleted text is placed in the unnamed buffer by using the `S` command, it also is placed in the numbered buffers. This change adds new functionality.
- Cursor positioning was incorrect when using the `p` command to put a buffer that contains multiple incomplete lines. This is a very minor change because this is a very uncommon action.
- The [*count*] `e` was incorrect when the cursor is already at the end of a word. This was a bug in `vi` that was fixed.
- The [*count*] `.` command now repeats the last command that changed the buffer. Previously, this did not include the `&`, `u`, and `U` commands, and some cases of the `p` and `P` commands. Anyone who uses `vi` very much will be sure to notice this change.
- The `vi` command was not handling paragraphs correctly. The characters `{` and `\f` at the beginning of line can now also be used to delimit paragraphs. This will affect anyone who expects paragraphs to be delimited only by blank lines.

- Incompatibility introduced with release: UNICOS 9.0

  The `lex`(1) command was changed as follows for XPG4 compliance:

  new `lex`(1): `^foo |bar = ^(foo|bar)`
  old `lex`(1): `^foo|bar = (^foo)|bar`

  Users may need to change `.l` files that included the `lex`(1) command.

- Incompatibility introduced with release: UNICOS 9.0

  The XPG4 standard required three changes to the `yacc`(1) parser-generator utility. The effects of these changes are minor for users; very few `yacc` (*.y) files required modification, and those that did required only trivial changes.

XPG4 requires the programs section's contents be included in the code file after the tables and code generated by `yacc`. Previously, the programs section was inserted before code generated by `yacc`.

Note: The above change may cause compile-time warnings or errors. These compilation errors are easy to fix. Typically, function prototypes will be required.

XPG4 requires certain global variables be of type "int." Some of the required variables were of type "long." This will affect only programs using these global variables in code that was not generated by `yacc`.

The retyped variables are `yydebug`, `yychar`, `yyerrflg`, `yynerrs`, `yytabelem`, `yystate`, `yys`, `yyps`, and `yytmp`. Programmers using these global variables will have to change their code to match code generated by `yacc`.

For example, change:

```
long yydebug;
```

to:

```
int yydebug;
```

Lastly, XPG4 makes it illegal to assign the same value to two different tokens. In the past, duplicate tokens were accepted and ignored, potentially masking problems in user code.

3.9.5 `locale` *definition support removed for compliance with XPG4*

Users affected

End user, programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

Due to XPG4 compliance in the UNICOS 9.0 release, customers can no longer define their own locales in the manner described on the `locale`(1) man page. The new `localedef`(1) command provides a superset of this functionality.

Previously constructed locales will continue to be supported by the `setlocale`() interface until the UNICOS 10.0 release.

3.10 POSIX Threads (Pthreads) support

Users affected

Programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The UNICOS process model is now consistent with the process model described by the POSIX Threads (Pthreads) interface. The key areas involved in the changes are the definition of a process with respect to multitasking and the behavior of signals in a multitasked application.

These changes do not affect single-tasked applications; the new semantics are detectable only from multitasked applications. Many of these changes take affect only if applications are recompiled. However, some behaviors also affect existing binaries. The following subsections describe the specific incompatibilities and their scope.

3.10.1 *Multitasked process model changes*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

As was first presented in the UNICOS 8.0 release documentation, the definition of a *process* in the UNICOS system is changing for multitasked applications. Previously, the UNICOS system supported a model in which a *multitasking group* described a shared address space in which multiple processes executed. In the new model, a process (or multitasking group) contains multiple *light-weight processes* (LWPs).

The primary change to support this new process model is in those system calls that support process IDs as part of their interface. In particular, the following new system calls were provided in UNICOS 8.0:

- `_getlwpid`(2)
- `_getlwppid`(2)
- `_lwp_exit`(2)
- `newgetpid`(2)
- `newgetppid`(2)
- `_newexit`(2)

The first three system calls were provided as synonyms for `getpid`(2), `getppid`(2), and `_exit`(2). It was also stated at that time that `getpid`(2), `getppid`(2), and `_exit`(2) would be changed and that the last three system calls provided early access to the new behavior.

In UNICOS 9.0, the behavior of `getpid`(2), `getppid`(2), and `_exit`(2) has been changed to that of `newgetpid`(2), `newgetppid`(2), and `_newexit`(2), respectively. (Note that the behavior of `exit`(3) has changed similarly to `_exit`(2).)

All of these changes affect only applications that are recompiled under UNICOS 9.0.

3.10.2 *Multitasked signal changes*

Users affected

End user, programmer

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

The changes to signals are largely the result of the process model changes described previously. The basic idea is that a multitasking group is the only entity that can be signaled from outside of that multitasking group.

In order to support this new signal model, the `kill`(2) and `killm`(2) system calls do not support the sending of signals to a specific light-weight process (LWP) in a multitasking group. Instead, the system chooses one of the LWPs to service the signal.

This change of behavior does not have any adverse effects on macrotasked or Autotasking applications because such applications have no specific control over the behavior of LWPs. However, the change affects applications that use the `tfork`(3) and `t_fork`(3) functions because tasks and LWPs have a one-to-one mapping in those applications.

This change affects only signals that are registered to execute a signal handler. If the signal has a system-defined default action associated with it, the behavior (whether to terminate or create a core dump) continues to affect all LWPs. Additionally, the `tfork`(3) and `t_fork`(3) functions support individual registration for each thread. Since the `kill`(2) and `killm`(2) system calls take action based on the registration of a signal, they must choose an arbitrary thread to reflect the action taken by the entire multitasking group. Because of this, `kill`(2) and `killm`(2) should not be used to send signals to such applications.

To allow a signal to be used with these applications, the `_lwp_kill`(2) and `_lwp_killm`(2) systems calls provide the `kill`(2) and `killm`(2) behavior that occurred in previous UNICOS releases; however, job control signals such as `SIGTSTP`, `SIGSTOP`, and `SIGCONT` cannot be used through these system calls.

> **Note:** The use of `tfork`(3), `t_fork`(3), `_lwp_kill`(2), and `_lwp_killm`(2) are not recommended because they may not be supported in future releases. It is suggested that you use the new Pthreads-based interfaces instead.

The specific changes to signal semantics are the following:

- The `kill`(2) and `killm`(2) system calls send a signal to a multitasking group, not the individual members of a multitasking group. The member that services the signal is chosen by the system.

  If an application uses `kill`(2) or `killm`(2), this change only affects the application if it is recompiled under the UNICOS 9.0 release. If an application is receiving a signal, the behavior is dependent on whether the sending application has been recompiled under UNICOS 9.0.

  This change adversely impacts only applications using the `tfork`(3) or `t_fork`(3) functions to create tasks.

- The `alarm`(2) system call sends a signal to any member of the multitasking group from which `alarm`(2) is called. Previously, the calling LWP received the signal. The old behavior is provided by using the `_lwp_alarm`(2) system call.

  > **Note:** Use of the `_lwp_alarm`(2) system call is not recommended because it may not be supported in future releases.

  This change affects only applications that are recompiled under UNICOS 9.0.

- The delivery of a signal that is asynchronous with respect to the event that caused the signal to be sent is delivered to any member of the multitasking group.

> **Caution:** Because the transmission of these asynchronous signals is not tightly coupled to the execution of a system call, this change impacts all multitasked applications, including existing binaries.

The change should adversely affect only applications using `tfork`(3) or `t_fork`(3) because Autotasking and macrotasking applications could never depend on any correspondence between tasks and LWPs.

The following behaviors are affected by this change:

- The delivery of the `SIGCLD` signal when a process exits.
- Signals used as parameters to the `reada`(2), `writea`(2), and `listio`(2) system calls.
- The delivery of the `SIGINFO` and `SIGCLULIM` signals upon such events as overrun of file system quotas and other limits.
- The delivery of the `SIGURG` and `SIGIO` signals for network I/O.
- The delivery of a signal used as a parameter to the `setjob`(2) system call.
- The delivery of a `SIGRECOVERY` signal after the restarting of a multitasking group.
- Signals generated by using terminal drivers (`SIGINT`, `SIGQUIT`, `SIGTSTP`, `SIGTTIN`, and `SIGTTOU`).
- Signals sent by using the `/proc PFCKILLM` interface.
- In `cdbx cont signo`, `signo` is a signal number. This `cdbx`(1) command now generates only one signal to a multitasking group. Previously, it generated one signal per LWP.

There are three primary reasons for changing this behavior for all these binaries:

- It would be difficult to track the binaries for which the old or new behavior would be appropriate.
- The new behavior is a more predictable and manageable behavior.
- The impact is expected to be very limited due to the limited scope of the `tfork`(3) and `t_fork`(3) functions.

3.11 Installation

The following subsections describe compatibility issues affecting the installation of the UNICOS operating system software.

3.11.1 *Installation and configuration tool interface changes*

Users affected

Administrator, operator, system analyst

Supporting hardware

All Cray Research systems

The following changes were made to the UNICOS Installation/Configuration Menu System interface:

- Incompatibility introduced with release: UNICOS 8.3

  Two rarely used keys have been eliminated in order to support the new X Window System interface; the `check key` command (`c` or `C`) and the ability of the accelerator key (`a` or `A`) to jump into form menus. This functionality is replaced in part by the ability to traverse the menu tree through a visual representation in the X Window System interface.

- Incompatibility introduced with release: UNICOS 9.0

  Configuration menu items that were disabled (marked N/A) are no longer visible as of the UNICOS 9.0 release; when the item is enabled, it will become visible.

3.11.2 *USM version restriction*

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

Because UNICOS 9.0 requires a new UNICOS source manager (USM) feature to support named sideline branches, installers cannot use the UNICOS 8.0 version of USM to apply mods to a UNICOS 9.0 system.

Attempts to use the UNICOS 8.0 version of USM to apply a mod to a UNICOS 9.0 system will result in the following error message and the failure of the mod application:

```
$msg 374 The format for PL file file is invalid.
Please contact the database administrator.
```

3.11.3 *Media support for UNICOS 9.1 limited to CD–ROM*

Users affected

Administrators

Supporting hardware

All Cray Research systems except CRAY J90 and CRAY EL series

Incompatibility introduced with release: UNICOS 9.1

Beginning with UNICOS 9.1, CD–ROM will be the only supported release media. This will apply to all present and future platforms except CRAY J90 series and CRAY EL series.

3.12 Online diagnostics

The following incompatibility issues affect the online diagnostics software.

3.12.1 `olsbt` *limits CPU selection*

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

To increase the efficiency of the `olsbt`(8) online diagnostic test, the number of CPUs that can be selected has been limited to 2 through 4 CPUs. The limitation has been imposed because the `olsbt`(8) test does not run efficiently on 1 CPU or on more than 4 CPUs. The `+anycpus` option allows a user to override the CPU restriction on a lightly loaded, dedicated system.

For more information, see the `olcfpt`(8) man page.

3.12.2 `olcfdt` *disk test support removed*

Users affected

Administrator, system analyst

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 9.0

The `olcfdt` test was removed. All disk drives that were supported by the `olcfdt` test and any new disk devices are now supported by the `oldt`(8) disk test, which is an online confidence test for disks and mass storage.

For more information, see the `oldt`(8) man page.

3.12.3 *OLNET support removed for CRAY EL series*

Users affected

Administrator, system analyst

Supporting hardware

CRAY EL series

Incompatibility introduced with release: UNICOS 9.0

The OLNET online diagnostic network communications program is no longer supported for CRAY EL series.

3.12.4 *Final major release supporting* `olnet` *for HiPPI and FDDI*

Users affected

Administrator, system analyst

Supporting hardware

Cray PVP systems, except CRAY J90 series and CRAY EL series

Incompatibility introduced with release: UNICOS 10.0

Beginning with the UNICOS 10.0 release, `olnet`(8) support for HiPPI and FDDI will end. The equivalent diagnostic capabilities will be provided for HiPPI by `vht`(8) and for FDDI by `vft`(8) in the UNICOS 10.0 release.

Additional diagnostic support will be added for ATM by `vat`(8) and `vet`(8) for Ethernet. The remaining functionality of `olnet`(8), which includes FDR-4, NSC, FEI-3, and MPP I/O support will be in maintenance mode until hardware support for those devices ends. In maintenance mode, only critical and selected urgent bugfixes are provided.

Related Publications

- *`OLNET` Online Diagnostic Network Communications Program Maintenance Manual for UNICOS*, publication SD-1021

3.13 Disk and Memory Requirements

This section provides an approximation of disk and memory requirements for installing the UNICOS 9.0 release. Configuration parameters and machine characteristics influence binary sizes; therefore, this information provides only an estimation of what your site may experience.

3.13.1 *Disk requirements*

The following table displays disk requirements for UNICOS 9.0. The sizes represented in the table have been buffered by 15% and rounded up to the nearest thousand.

File system	Size in 4K blocks
`/`	82,000
`/usr`	174,000
`/tmp`	2,000
`/usr/src` (source)	376,000
`/usr/src` (binary)	286,000

These numbers are estimates, and partition size can vary greatly (especially `/src` and `/tmp`) depending on what the `NPROC` value is set to, what asynchronous products are loaded, and the number of user programs that will be put onto the system.

When these numbers were generated, a minimal `root` and `usr` file system was loaded, `NPROC` was set to four, and no asynchronous products were loaded. The maximum file size was found, 15 percent was added, and all file sizes were rounded up to the nearest thousand.

3.13.2 *Memory requirements*

This subsection describes the system size increase from the UNICOS 8.0 major release to the UNICOS 9.0 major release. The measurements were taken on a CRAY Y-MP2E system configured with 16MW of memory and identical configuration parameters and products for both UNICOS releases.

For the UNICOS 8.0 16 MW system, a sample configuration was created by first comparing the settings in the UNICOS installation/configuration menu system and then looking for the most common setting for the parameters from some customer sites that were surveyed. For the UNICOS 9.0 system, the configuration was kept consistent with that of the UNICOS 8.0 system.

The measurements for the amount of available user memory were gathered with the system running in multiuser mode. The `sysconf`(1) command was used to get the sizing numbers.

On the 16 MW system, the memory available to the user as compared to the total memory available decreased 4.1% from UNICOS 8.0 to UNICOS 9.0. The size decrease in user space will be approximately 650,000 words. This decrease will vary depending on site-configured products and parameters.

On larger systems, the amount of memory the system uses will increase, but the percentage of memory the system uses as compared to the total memory available will be smaller than what was measured on the 16 MW system. This is because the total memory used by the system will not increase proportionately to the total memory available.

Note: User programs that currently allocate all of the available user memory by using a hard-coded value may not be able to run because of the decrease in available user memory.

Introduction [1]

The *UNICOS Release Overview*, Cray Research publication RO–5000 10.0 is a public document that provides an overview of the Cray Research, Inc. UNICOS operating system 10.0 release.

1.1 Contents of this release preview

This release preview includes the following chapters:

- Chapter 2, Software Enhancements, describes new features and enhancements included since the UNICOS 9.0 release.
- Chapter 3, Compatibilities and Differences, describes compatibility issues and functionality changes involved in upgrading from UNICOS 9.0 to UNICOS 10.0. This chapter also includes early information about changes planned for future UNICOS releases.
- Chapter 4, Documentation, lists the printed and online documentation supporting this release.
- Chapter 5, Customer Services, describes the customer services that Cray Research offers to support this release, including software, training, problem reporting, and general service information.
- Chapter 6, Release Package, contains licensing information and lists the release package contents.

1.2 Theme for UNICOS 10.0 release: Stability

The theme for the UNICOS 10.0 release is Stability. Since a primary goal of the 9.X IDS release legs was to better control of the introduction of new features, new hardware platforms, and system requirements, UNICOS 10.0 has had more exposure time than any previous major release of UNICOS. As a result, there is little new functionality going into UNICOS 10.0 that was not first available in one of the 9.X IDS releases.

1.3 Hardware supported by UNICOS 10.0

The UNICOS 10.0 release supports the following Cray Research systems:

- Systems with an IOS model V (IOS-V)
  - CRAY J90 series
- Systems with an IOS model E (IOS-E)
  - CRAY T90 series with Cray floating-point CPUs
  - CRAY T90 series with IEEE Std. 754 floating-point CPUs
  - CRAY C90 series
- Systems with a GigaRing IOS
  - CRAY T90 series with Cray floating-point CPUs
  - CRAY T90 series with IEEE Std. 754 floating-point CPUs
  - CRAY J90se series
- Cray Research hosts with an IOS-E for CRAY T3D systems
  - CRAY C90 series

1.4 Support for CRAY Y-MP and CRAY EL series systems discontinued with UNICOS 10.0

Beginning with UNICOS 10.0, the following Cray Research systems will no longer be supported:

- CRAY Y-MP E M90 series, including the following systems:
  - CRAY Y-MP M92
  - CRAY Y-MP M94
  - CRAY Y-MP M98
- CRAY Y-MP E series, including the following systems:
  - CRAY Y-MP 2E
  - CRAY Y-MP 4E
  - CRAY Y-MP 8E
  - CRAY Y-MP 8I
- CRAY EL series, including the following systems:

- CRAY Y-MP EL
- CRAY EL92
- CRAY EL94
- CRAY EL98

For more information, contact your Silicon Graphics / Cray Research representative.

4. Multilevel Security

This section contains the following information:

- Information on the nature of the UNICOS multilevel security (MLS) system
- Enhancements in the UNICOS MLS 9.0 release
- UNICOS MLS compatibility issues involved in upgrading from the UNICOS MLS 8.0 system to the UNICOS MLS 9.0 system and early information about system changes planned for future UNICOS releases

Because this release overview documents all features and compatibility issues introduced since the UNICOS 8.0 base release, each feature and compatibility issue includes the UNICOS release level in which the feature or compatibility issue was introduced. This information is provided to help our customers focus on the features and compatibility issues that are new specifically for their upgrade.

Each subsection in this section lists in the margin both the type of user and type of hardware affected.

For definitions of the terms used, see subsection 1.6, page 1–6.

4.1 Change in the definition of Trusted UNICOS

The Trusted UNICOS system is a configuration of the UNICOS multilevel security (MLS) system that supports processing at multiple security labels and system administration using only non-super user administrative roles. The Trusted UNICOS system consists of the subset of UNICOS software that offers these capabilities. The Trusted UNICOS name does not imply maintenance of the UNICOS 8.0.2 security rating.

For more information about Trusted UNICOS support in the UNICOS 10.0 release, see subsection 4.3.4.3, page 4–14.

4.2 MLS software enhancements

The following subsections describe enhancements to the UNICOS multilevel security (MLS) system.

For information about UNICOS MLS compatibility issues, see subsection 4.3, page 4–9.

4.2.1 *New functionality for* `ia_user` *library routine*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `ia_user`(3) library routine has been enhanced to support identification only. This extension for `ia_user` allows the caller to ask only for identification service and to specify the type of returned user database (UDB) entry (public or private) directly.

The `IA_IDENTIFICATION` and `IA_PUBLICIDENT` flags were added. The `IA_PUBLICIDENT` flag returns the public UDB entry to the caller. The `IA_IDENTIFICATION` flag tries to return the private UDB entry to the caller, but if the user is not privileged, the public UDB entry is returned and `IA_PUBLIC` error code is returned to warn the caller.

For more information, see the `ia_user`(3) man page.

4.2.2 *MAC read policy restricts pipes*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The mandatory access control (MAC) read policy has been enforced for reading all objects, including pipes. Because reading a pipe is destructive, the act of reading a pipe is actually a write operation. Therefore, pipes can be used to subvert the MAC policy, which is a covert channel.

To close this covert channel, the `Enforce restricted pipes?` selection on the `MLS Systems Option` menu has been added to the UNICOS Installation/Configuration Menu System. This configuration parameter is set to `OFF` by default. Enabling this parameter enforces the new policy that requires a process to have MAC write access to perform a read on a pipe. Also, `getsysv`(2) returns the actual setting of the new parameter.

For more information, see the getsysv(2) and open(2) man pages.

Note: The *UNICOS 8.3 Release Letter* stated that the default setting for the Enforce restricted pipes? configuration selection option would be changed from OFF to ON for UNICOS 10.0 Trusted UNICOS configuration. This change will not be implemented; the Enforce restricted pipes? configuration selection option will still be available and the default setting will remain OFF in the UNICOS 10.0 release.

For more information about Trusted UNICOS support in the UNICOS 10.0 release, see subsection 4.3.4.3, page 4–14.

Related publications

- *General UNICOS System Administration*, publication SG–2301

4.2.3 pathname *routine added*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The new pathname(3) library routine provides flexible path resolution and symbolic link expansion to user level programs. This routine understands the semantics of symbolic and multilevel symbolic links, as well as the traditional dot (.) and dot dot (..) directory entries, and it produces true paths from paths that contain these elements.

4.2.4 FSETID_RESTRICT *configuration option changed*

Users affected

Programmer

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The getsysv(2) system call can place the state of the FSETID_RESTRICT configuration parameter in a reserved bit of the sysv structure. This allows applications to use the getsysv system call to determine the state of FSETID_RESTRICT and, if necessary, to manage their behavior accordingly. The value of the sy_fsetid_restrict field in the sysv structure is nonzero if the FSETID_RESTRICT parameter is enabled.

For more information, see the getsysv(2) man page.

4.2.5 SLG_TRUST *record changed*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

Execution of the `fsoffload`(8), `mailx`(1), and `mail`(1) commands generates a trusted process activity record, SLG_TRUST, provided that generation of the SLG_TRUST record type is enabled. UNICOS trusted processes issue the SLG_TRUST record to describe a trusted activity that is performed on behalf of a user. Issuing a trusted process activity record allows a UNICOS trusted process to disable kernel level auditing of its activities and thus reduces the number of audit records that are written.

The changes to `mail` and `mailx` reduce the number of audit records generated when a user logs into the system because kernel-level audit records are no longer generated when the mail programs search their directories for new and existing mail messages.

Related publications

- *General UNICOS System Administration*, publication SG–2301

4.2.6 *Security log daemon changed*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The security log daemon, `/etc/slogdemon`, no longer exits during system initialization if auditing has been disabled. This change improves system resiliency by keeping the daemon available in case the administrator does not enable auditing until after the system has been brought up to multiuser mode.

4.2.7 *MLS support for CRAY T3D systems added*

Users affected

All

Supporting hardware

CRAY T3D systems

Initial release: UNICOS 8.0.4/8.3

Modifications have been made to support the use of a CRAY T3D system on a UNICOS multilevel security (MLS) system with `PRIV_SU` enabled or on a Trusted UNICOS configuration. These UNICOS releases contain the new `/etc/privdb/mpp.db` stub file. The effective version of the `mpp.db` file is installed by the UNICOS MAX operating system.

For information about using the CRAY T3D system in a trusted environment, including levels of the UNICOS MAX system required, refer to the UNICOS MAX 1.2 (or later) release information.

Related publications

- *UNICOS System Security Overview for Administrators*, publication SG–2141

4.2.8 *UNIX System V IPC MLS supported*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The UNIX System V interprocess communication (IPC) mechanism introduces three new named object types to the UNICOS multilevel security (MLS) system: shared memory segments (CRAY T90 series only), semaphores, and message queues. These new objects have associated mandatory access control (MAC) label information and access control list (ACL) information that users must be able to set and get by using the user-level commands. The `-M`, `-Q`, `-S`, and `-K` options have been added to the `spset`(1), `spget`(1), and `spclr`(1) commands to allow this information to be set and displayed.

In addition, changes to the `SLG_DISC_7` and `SLG_MAND_7` audit record types allows IPC object creation and use to be audited on a UNICOS MLS system.

For more information, see the `spset`(1) man page (which documents the `spset` and `spget` commands) and the `spclr`(1) man page.

Related publications

- *General UNICOS System Administration*, publication SG–2301

4.2.9 *New utilities added to the trusted computing base (TCB)*

Users affected

All

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The following utilities have new entries defined in the file `/etc/privdb/mls.db` of the TCB:

- `addbss`(1)
- `asa`(1)
- `cksum`(1)
- `comm`(1)
- `csplit`(1)
- `dd`(1)
- `deplib`(1)
- `diff3`(1)
- `fold`(1)
- `ipcrm`(1)
- `ipcs`(1)
- `join`(1)
- `line`(1)
- `nasa`(1)
- `newgrp`(1)
- `nl`(1)
- `paste`(1)
- `renice`(1)
- `sdiff`(1)
- `seterr`(8)
- `setf`(1)
- `size`(1)
- `split`(1)

- `strings`(1)
- `strip`(1)
- `sum`(1)
- `tsort`(1)

The entry for each utility defines the mandatory access control (MAC) attributes and privilege assignment list (PAL) attributes. The addition of these entries allows these utilities to be used on a Trusted UNICOS system.

For more information, see the man pages for these utilities.

4.2.10 `privcmd` *command enhanced*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

The `privcmd`(8) command no longer requires that security attribute entries for a file be in a specific order. Now, entries for all security attributes can be listed in any order. Also, when making the privilege assignment list (PAL) entry, if two categories are assigned an identical set of privileges and the same privilege text, only a single PAL entry is needed to describe both categories.

The `privcmd`(8) databases created with this new format cannot be processed by versions of `/etc/privcmd` prior to UNICOS 9.0.

Also, the `privcmd`(8) command supplied with UNICOS 8.0 applies all security attributes from the privilege database in the directory `/etc/privdb`. This meant that certain configurations could not be supported. For example, if a site wanted to run a UNICOS multilevel security (MLS) system with `PRIV_SU` and `SECURE_MAC` enabled, `privcmd` did not allow the site to apply the appropriate security labels without also applying discretionary access controls (DACs) and privilege assignment lists (PALs), which were not appropriate for that configuration.

To eliminate this problem, `privcmd`(8) has been enhanced in UNICOS 9.0 to allow a site to specify which grammar object or objects it wants to apply from the privilege database.

The `-S` option and the `grammar_object` operand have been added to `privcmd`(8) to support this new functionality.

For more information, see the `privcmd`(8) man page.

4.2.11 *New MLS field added to the user database (UDB)*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

On the UNICOS 8.0 multilevel security (MLS) system, an administrator could not define a minimum compartment set, although setting the `deflbl_as_minlbl` field of the configuration file forced the compartment set of the user's default security label to serve as the minimum compartment set. (The user's default security label is defined in the user database (UDB).)

The `mincomps` field has been added to the UDB. This field allows a site to define a minimum compartment set for the users. The `deflbl_as_minlbl` field can still be used on UNICOS 9.0 MLS systems to force the user's default security label to be used as the user's minimum security label.

For more information, see the `udbgen`(8) and `libudb`(3) man pages.

For complete information about UDB enhancements in the UNICOS 9.0 release, see subsection 2.9.5, page 2–53.

Related publications

- *UNICOS Multilevel Security (MLS) Feature User's Guide*, publication SG–2111
- *General UNICOS System Administration*, publication SG–2301

4.2.12 *Trusted tape access with Cray/REELlibrarian changed*

Users affected

Administrator

Supporting hardware

All Cray Research systems

Initial release: UNICOS 8.3

On a Trusted UNICOS 8.0 system, a site had to use the Cray/REELlibrarian (CRL) product in order to use tapes.

Trusted UNICOS systems no longer need to have (CRL) to run tapes, if the site permits tape access to administrators only. This new functionality affects only the Trusted UNICOS configurations that are not configured with CRL. Trusted UNICOS systems configured with CRL will continue to work as they did for the UNICOS 8.0 release.

To support this functionality, changes have been made to the UNICOS Installation/Configuration Menu System so that CRL is not automatically required for use on Trusted UNICOS systems. Specifically, the default setting for the tape subsystem option `Enable Cray Reel Librarian (CRL)` is now `NO`. In addition, changes have been made to the privilege assignment list (PAL) of the `rsv`(1) command so that the privileges needed to run this command are assigned to security administrators only.

For more information, see the `rsv`(1) man page.

Related publications

- *UNICOS System Security Overview for Administrators*, publication SG–2141
- *General UNICOS System Administration*, publication SG–2301

4.3 MLS compatibility issues

The following subsections describe user and system administration issues involved in upgrading from the UNICOS 8.0 multilevel security (MLS) system to the UNICOS 9.0 MLS system. This section also includes early information about MLS system changes planned for future UNICOS releases.

4.3.1 *Support for the* `-u` *option of the* `pr` *command dropped*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.3

Support for the `-u` option of the `pr`(1) command has been dropped as of the UNICOS 9.0 release.

The functionality of the `-u` option was made the default behavior of the `pr`(1) command in the UNICOS 8.0 release, but the `-u` option was retained. In UNICOS 9.0, the option has been dropped completely.

4.3.2 *NQX not supported on UNICOS MLS/Trusted UNICOS systems*

Users affected

All

Supporting hardware

All Cray Research systems

Incompatibility introduced with release: UNICOS 8.0.3/8.3

Unlike the UNICOS 8.0 Network Queuing System (NQS), the Network Queuing EXtensions (NQX) product has not been integrated into the UNICOS multilevel security (MLS) environment and is not part of the trusted computing base of the Trusted UNICOS system. (However, MLS-related NQX problems will be accepted as design SPRs.)

The Network Queuing Environment (NQE) client access to the request status information in the load balancer is controlled by load balancer access control lists (ACLs) instead of security labels. The NQX access from workstations is similar to Remote Queuing System (RQS) or public domain NQS access to the UNICOS MLS system. In these cases, the UNICOS network access list (NAL) controls the label of these connections.

For more information about configuring and using NQX in a UNICOS MLS environment, contact your Cray Research support representative.

4.3.3 *Cray Research publication SN–2133 no longer supported*

Users affected

Administrator

Supporting hardware

All Cray Research systems

As of the UNICOS 9.0 release, the *UNICOS Trusted Network Interface Specification (UTNIS)*, publication SN–2133, is no longer supported.

4.3.4 *Future direction of UNICOS multilevel security (MLS)*

Users affected

All

Supporting hardware

All Cray Research systems

Cray Research has a continuing commitment to support consistent security policies for the UNICOS system. To do this, several features will be incorporated into the UNICOS system during the UNICOS 9.*x* releases, and will be generally available by the UNICOS 10.0 release.

All sites need to be aware of the impact of these upcoming features, especially as they relate to migration and compatibility issues. For sites that are currently using a UNICOS non-MLS system, the UNICOS 10.0 system will have the same behavior as the current UNICOS system used by your site. For sites that

are currently using a UNICOS MLS system, your site may have migration and/or compatibility issues, depending on the UNICOS MLS configuration you are using currently. The features are as follows:

- Merge the UNICOS non-MLS and MLS systems
- Remove support for the UNICOS 7.0 trusted system management (TFMgmt) mechanism (PRIV_TFM)
- Remove the Trusted UNICOS configuration option
- Support only the following system management mechanisms to enforce the assigning of privileges:
  - a PRIV_SU system with privilege assignment lists (PALs)
  - a non-PRIV_SU system with PALs
- Change the default setting of the FSETID_RESTRICT configuration parameter
- Reduce the number of security-related configuration parameters

Each of these features and their associated impacts is discussed in more detail in the following subsections.

4.3.4.1 *UNICOS non-MLS and MLS systems to be merged*

Users affected

End user, administrator

Supporting hardware

All Cray Research systems

On the UNICOS 8.0 and 9.0 systems, the MLS configuration is optional. That is, to use security features specific to the UNICOS MLS configuration, sites must enable the SECURE_CONFIG configuration parameter.

As of the UNICOS 10.0 release, the SECURE_CONFIG parameter will not be supported, and the MLS features will be incorporated into the UNICOS 10.0 system.

Combining the non-MLS and MLS systems makes the security features, such as access control lists (ACLs) and security auditing, available to all Cray Research customers. Use of these security features will still be optional. Sites can choose to use only those features that are applicable to their sites.

For sites that are currently using a UNICOS non-MLS system, this feature will provide a UNICOS configuration that has the same behavior as the current UNICOS non-MLS system. For sites that are currently using a UNICOS MLS system, this

feature will provide a UNICOS configuration that has the same behavior as the current UNICOS MLS system. Commands, libraries, and system calls will not change. However, interfaces that are currently available only on UNICOS MLS systems will be generally available on UNICOS 10.0 systems.

Changes will be made to some of the default settings of options in the UNICOS Installation/Configuration Menu System. These changes will not impact sites that import their previous configurations.

4.3.4.2 PRIV_TFM *configuration option to be removed*

Users affected:

Administrator

Supporting hardware:

All Cray Research systems

UNICOS MLS configurations using the UNICOS 7.0 style trusted facility management, TFMgmt, (also referred to as PRIV_TFM) were supported in the UNICOS 8.0 release and will be supported in the UNICOS 9.0 release. On a PRIV_TFM system, the administrative roles of operator, system administrator, and security administrator are available, but design problems exist. A PRIV_TFM system does not support true separation of administrative roles, and when used in a MLS environment (that is, nonzero security labels are used), many system utilities function incorrectly.

Support for UNICOS MLS systems with PRIV_TFM enabled will be dropped as of the UNICOS 10.0 release and the PRIV_TFM configuration option will no longer be available through the UNICOS Installation/Configuration Menu System. Also, support for the tsubcmd(8) and udbcmd(8) commands (which are used to install system binaries that require 7.0 TFMgmt security labels), and the associated man pages will be dropped as of the UNICOS 10.0 release. All references to 7.0 TFMgmt and/or PRIV_TFM will be removed from the UNICOS 10.0 documentation.

In addition, support for the SYSTEM_ADMIN_CONSOLE, SECURE_SYSTEM_CONSOLE, and SECURE_OPERATOR_CONSOLE configuration parameters will also be dropped as of UNICOS 10.0. The functionality provided by these parameters will no longer be available. References to these parameters will be removed from the UNICOS 10.0 documentation.

System calls and commands that manage PRIV_TFM user classes, file classes, and file categories will continue to be available in the UNICOS 10.0 release. However, setting user class, file class, and file category attributes will serve no useful purpose, because the UNICOS system will no longer use those attributes to make security-related decisions.

All PRIV_TFM interfaces will be removed in a future UNICOS release. During the UNICOS 9.0 release, to prepare for the removal of PRIV_TFM interfaces, you should perform the following steps:

- Use of the setucls(2), setcls(2), setfcat(2), and settfm(2) system calls should be eliminated from applications.
- Use of the setucls(1) and the -i and -j options of the spset(1) commands should be eliminated from shell scripts.
- Use of the setfflg(2) to set the TFM_EXEC file flag should be eliminated from applications.
- Use of the -k option of the spset(1) command to set the exec file flag should be eliminated from shell scripts.
- Values in the st_intcls and st_intcat fields of the secstat structure should not be used to make decisions. The st_secflg field of the secstat structure should not be checked for the exec flag value.
- Values in the sv_intcls and sv_intcat fields of the usrv structure should not be used to make decisions.
- Applications should not depend on the output format of the spget(1) command with no options supplied. Display of the user class information will be eliminated.
- Applications should not depend on the output format of the spget(1) command with the –f option supplied. Display of the file class, file category, and the 'exec' file flag will be eliminated.
- Applications should not depend on the output format of the ls(1) command with the -e option supplied. Display of the i field, which indicates a nonzero file category or class, will be eliminated.
- Applications should not depend on the output format of all other commands that display user class, file class, or file category information. Those commands include udbsee(1), crash(8), reduce(8), and so on.

4.3.4.3 *Trusted UNICOS configuration option to be removed*

Users affected:

Administrator

Supporting hardware:

All Cray Research systems

The Trusted UNICOS configuration was first introduced in the UNICOS 8.0 release. The National Security Agency (NSA) evaluated this configuration and gave it a B1 MDIA† rating in March 1994. Support for the Trusted UNICOS configuration continues in the UNICOS 9.0 release, although no evaluation was done. Cray Research has no plans for a future evaluation.

As of the UNICOS 10.0 release, the functionality of the Trusted UNICOS system will be retained, but the `CONFIG_TRUSTED` option, which enforces conformance to the strict B1 configuration, will no longer be available. All references to Trusted UNICOS systems will be removed from the UNICOS 10.0 documentation.

† B1 is a class defined in the Department of Defense Trusted Computer System Evaluation Criteria (TCSEC). This class represents a set of security criteria for computer systems. MDIA is an acronym defined in the Trusted Network Interpretation (TNI). It is formed by combining the first letter of the following four security policies, which network components can support in order to obtain an evaluated rating:

M=Mandatory access control (MAC)
D=Discretionary access control (DAC)
I=Identification and authentication (I&A)
A=Audit

4.3.4.4 *Supported system management configurations in UNICOS 10.0*

Users affected:

Administrator

Supporting hardware:

All Cray Research systems

On UNICOS 9.0 MLS systems, the ability to define different administrative tasks and roles is called trusted facility management. For the UNICOS 10.0 MLS release, this concept will be replaced with the term "system management." *System management* addresses the security-related aspects of system administration, operation, and maintenance. It provides administrative and operational policies and procedures for maintaining system security.

On a UNICOS 10.0 MLS system, system management will support the option of the all-powerful root administrative role. It will also support the definition of roles by assigning each role an administrative category. For example, the security administrator role is assigned the `secadm` category, while the operator role is assigned the `sysops` category. Categories are used in conjunction with the UNICOS privilege assignment list (PAL) -based privilege mechanism to assign different administrative tasks to each administrative role.

The UNICOS 10.0 MLS system will support the following mechanisms to enforce the assigning of privileges:

- A super user (`PRIV_SU`) system with PALs
- A non-super user (non-`PRIV_SU`) system with PALs

The use of a super user on a UNICOS MLS system (enabled by using the `PRIV_SU` configuration option) was introduced in the UNICOS 8.0 release and granted a root user full administrator control.

PALs were introduced in the UNICOS 8.0 release and were used to separate administrative roles. The PALs were applied only when the `privcmd`(8) command was executed. The use of PALs and the way they are applied continues in the UNICOS 9.0 system. Only a subset of the UNICOS software is supported by PALs in the UNICOS 8.0 and UNICOS 9.0 releases. This subset of software is basically the set of software defined for the Trusted UNICOS 8.0 and UNICOS 9.0 systems. As of the UNICOS 10.0 release, PALs will be applied on all systems and will continue to support only a subset of UNICOS software.

Sites must decide which UNICOS 10.0 system management configuration they want to use. Sites that do not need the strict separation of administrative roles will probably want to use the PRIV_SU system with PALs. Sites needing stricter security measures will probably want to use the non-PRIV_SU system with PALs.

Regardless of which system management configuration is used, PALs must be assigned on all UNICOS 10.0 systems. Once these PALs are assigned, their effect will be transparent on systems administered only by the root user. The PRIV_SU system without PALs that is supported in the UNICOS 8.0 and UNICOS 9.0 releases will not be supported in the UNICOS 10.0 release.

4.3.4.5 *Reduction of security-related configuration options*

Users affected:

End user, administrator

Supporting hardware:

All Cray Research systems

The number of configuration options related to security will be reduced in the UNICOS 10.0 release.

The configuration options that will be deleted are as follows:

- MAC_COMMAND
- MLS_INTEGRITY
- PRIV_TFM
- SECURE_MLSDIR
- SECURE_MOUNT
- SECURE_REMOTE
- STAT_RESTRICT

Removal of these configuration options could cause migration issues for sites upgrading from a UNICOS 9.0 MLS system to a UNICOS 10.0 system. All UNICOS 10.0 documentation will be updated to reflect the removal of these options.

The following list describes the impact of removing these configuration options. Where appropriate, restrictions can be bypassed by an authorized administrator.

Option	Impact
`MAC_COMMAND`	When this option is removed, subjects will be permitted to view information for an object only when the subject dominates the object, which is consistent with the current MLS mandatory access control (MAC) policy.
`MLS_INTEGRITY`	This UNICOS MLS option is not currently used.
`PRIV_TFM`	See subsection 4.3.4.2, page 4–12, for more information.
`SECURE_MLSDIR`	When this option is removed, a user with a label that dominates but does not equal the label of the parent directory will no longer be allowed to create a subdirectory in that parent directory. Instead, a user at the label of the parent directory will be allowed to create a subdirectory with a higher label, or upgrade an existing subdirectory provided that the subdirectory is empty and is initially at the same label as the user.
`SECURE_MOUNT`	This option becomes obsolete as of the UNICOS 10.0 release because of the merging of UNICOS non-MLS and MLS systems (see subsection 4.3.4.1, page 4–11). All file systems (including UNICOS non-MLS file systems) will be treated as labeled file systems.
`SECURE_REMOTE`	This UNICOS MLS option is not currently used.
`STAT_RESTRICT`	When this option is removed, a subject will be able to perform a `stat`(2) operation only for an object that the subject dominates, which is consistent with the current MLS MAC policy.

4.3.4.6 *Default value of the* FSETID_RESTRICT *configuration parameter to be changed*

Users affected:

Administrator

Supporting hardware:

All Cray Research systems

Beginning with the UNICOS 10.0 release, the default value of the FSETID_RESTRICT configuration parameter will be OFF. This will be a change from the default value on UNICOS 9.0 MLS systems, which is ON.

4.3.4.7 *MLS documentation changes*

Users affected:

All

Supporting hardware:

All Cray Research systems

Because of the features outlined previously, the relevant sections of the *UNICOS Multilevel Security (MLS) Feature User's Guide*, publication SG–2111, and the *UNICOS System Security Overview for Administrators*, publication SG–2141, will be merged into other UNICOS man pages, user manuals, and administrator manuals. You will not be able to order these two publications for the UNICOS 10.0 release.

4.3.5 *Changes to* su *password use for system administrators*

Users affected:

Administrator

Supporting hardware:

All Cray Research systems

In an upcoming UNICOS 9.0 bugfix release, a user with an active sysadm category can no longer use the su(1) command without supplying a password. This change affects sites using UNICOS MLS systems with privilege assignment lists (PALs). The supported PAL for /bin/su was updated to remove the sysadm PAL category record. In addition, the su(1) man page was updated to reflect this change.

This change was introduced to prevent users with a sysadm category from gaining other types of administrative capabilities by invoking the su command without a password to assume the identity of another administrator, and subsequently using facilities that perform reauthentication using that new user ID.

Sites that do not approve of the new restriction, and that are willing to assume the risks of preserving the previous functionality, can add the original /bin/su PAL definition to the /etc/config/localpriv.db file.

Software Enhancements [2]

This chapter describes the features and enhancements new to the UNICOS 10.0 operating system since the 9.0 release. Information about upgrading to this release can be found in Chapter 6, page 93.

Each feature section in this chapter lists the initial release for the feature, type of user affected, and type of hardware affected. For definitions of the terms used, see the Conventions section of the Preface.

Features listed in this section are documented in the UNICOS 10.0 document set — see Chapter 4, page 81 for a list or publications released with UNICOS 10.0. For a description of each publication, see the *User Publications Catalog*, Cray Research publication CP–0099, on the CRInform service.

2.1 UNICOS 10.0 support for J90 VME-based and J90se GigaRing-based systems

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: CRAY J90 systems with VME I/O and CRAY J90se systems with GigaRing based I/O.

UNICOS 10.0 is the first release to support both J90 systems with VME I/O and J90se systems with GigaRing based I/O. In addition, customers with J90se CPUs and VME I/O can now compile as if the system is a J90se rather than a CRAY Y-MP.

2.2 CRAY J90se system support

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: CRAY J90se systems

UNICOS 9.2 added support for CRAY J90se GigaRing based systems. The following enhancements allow the UNICOS operating system to run properly on CRAY J90se systems:

- Support for the identifier (ID) bits, which is a field in the exchange package (XP) that identifies the type of CPU that has been exchanged.
- Support for the mainframe subtype of CRAY-JSE.
- Support for CPU types in the processor working storage. This information is used to determine when to enable scalar cache on a per-CPU basis.

2.3 CRAY T90 system support

The following sections describe new or enhanced features for the support of CRAY T90 series supercomputers with either Cray floating-point CPUs or IEEE Standard 754 floating-point CPUs.

2.3.1 Support for the CRAY T90 IEEE CPU type

Initial release: UNICOS 9.1

Users affected: all

Hardware supported: CRAY T90 systems with IEEE floating-point CPUs.

The IEEE floating-point support feature added support to the UNICOS kernel for the CRAY T90 CPU type, which supports IEEE Std. 754 floating-point arithmetic. CRAY T90 systems can contain either Cray floating-point arithmetic CPUs or IEEE floating-point arithmetic CPUs. The new CPU supports only the native IEEE CRAY T90 instruction set, and not the Cray format floating-point instruction set used on CRAY C90 and non-IEEE CRAY T90 systems.

The support for IEEE floating-point arithmetic permits the CRAY T90 system to be data- and algorithm-compatible with other IEEE arithmetic platforms. The IEEE floating-point arithmetic CPU provides a data format with the following:

- increased precision
- multiple rounding modes
- expanded classification of floating-point exceptions
- a true divide instruction
- a new set of compare instructions

The mainframe type remains `CRAY_TS`. The IEEE characteristic is an attribute for the `target` command. The main areas of change in support of the new IEEE floating-point CPUs are as follows:

- Conditional code based on `_CRAYIEEE`.
- Exchange package format changes for the following features:
  - IEEE floating-point exceptions (flags/modes/status)
  - Removal of single Cray floating-point exception
  - Addition of IEEE rounding modes
  - Support of software-controlled status bits
  - Removal of CRAY C90
- Separate generation products and programming environments are required.
- Conditional code for CRAY C90 mode.
- Support for the new status register SRO format.
- Initialization of floating-point exception modes and rounding modes.
- Support for `ioctl`(2) for `CPU_GETMODE` and `CPU_SETMODE` on `/dev/cpu`.
- Recognition of CRAY T90 IEEE executables.
- An update of the `target`(2) system call.
- Change to the Cray Assembly Language (CAL) code for new instructions.

2.3.2 CRAY T90 IEEE floating-point interrupt reporting support

Initial release: UNICOS 9.1

Users affected: administrators, system analysts

Hardware supported: CRAY T90 systems with IEEE floating-point CPUs

Kernel support has been added for new IEEE floating-point interrupts on CRAY T90 systems with IEEE floating-point CPUs. The default mode settings for the interrupts can be altered by using the `cpu`(8) command.

2.3.3 `crash` enhancements for CRAY T90 IEEE systems

Initial release: UNICOS 9.1, updated in UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: CRAY T90 systems with IEEE floating-point CPUs

The `crash`(8) administrator command is enhanced to allow examination and debugging of CRAY T90 IEEE systems:

- The `xp` and `xpa` subcommands now format exchange packages for CRAY T90 IEEE systems.
- The `od` subcommand decodes instructions for CRAY T90 IEEE systems.

2.3.4 Library changes to support IEEE Std. 754 floating point modes

Initial release: UNICOS 9.1

Users affected: programmers

Hardware supported: CRAY T90 systems

Cray Research C and C++ software now supports IEEE Std. 754 floating-point hardware on the CRAY T90 series. The Cray implementation follows the *IEEE Standard for Binary Floating-Point Arithmetic, ANSI/IEEE* Std. 754-1985.

The system library functions listed below are part of this implementation. (Equivalent routines are available for Fortran.) The functions that have names beginning with `is` do not raise an exception when their arguments are not a number (`NaN`). Some of these functions may actually be implemented as macros. They will also be available in `float` and `long double` versions.

Table 1. IEEE library functions

Function	Description
`copysign`	Returns *x* with the sign of *y*.
`feclearexcept`	Clears the specified exception flags.
`fegetenv`	Retrieves the floating-point environment.
`fegetexcept`	Returns the state of specified floating-point exception flags.

Function	Description
`fgetround`	Returns the current floating-point rounding mode.
`feholdexcept`	Retrieves the floating-point environment, clears the exception flags, and installs nonstop mode.
`feraiseexcept`	Raises floating-point exceptions.
`fesetenv`	Sets the floating-point environment but does not raise exceptions.
`fesetexceptflags`	Sets, but does not raise, specified exception flags.
`fesetround`	Sets the floating-point rounding mode.
`fetestexcept`	Returns the state of specified floating-point exception flags.
`fpclassify`	Returns the class to which a specified floating-point number belongs. Some of the classes are NaN, infinity, and so on.
`isgreater`	Returns nonzero if value *x* is larger than value *y*.
`isgreaterequal`	Returns nonzero if value *x* is larger or equal to value *y*.
`isless`	Returns nonzero if value *x* is smaller than value *y*.
`islessequal`	Returns nonzero if value *x* is smaller or equal to value *y*.
`islessgreater`	Returns nonzero if value *x* is smaller or larger than (not equal to) value *y*.
`isunordered`	Returns nonzero if either of two specified values is a NaN (not a number).
`isfinite`	Returns nonzero if the specified value is not infinity.
`isnan`	Returns nonzero if the specified value is a NaN (not a number).
`isnormal`	Returns nonzero if the argument is neither zero, denormalized, NaN, or infinity.
`logb`	Returns the unbiased exponent of *x*.
`nextafter`	Returns the next representable neighbor of *x* in the direction of *y*.
`remainder`	Returns the remainder of the operation *x*/*y*.

Function	Description
`rint`	Returns the argument rounded (according to the current rounding mode) to an integral value in floating-point format.
`scalb`	Returns $x * 2^y$ for integral values y without computing 2^y.
`signbit`	Returns nonzero if the argument is negative.

2.3.5 New static partitioning, degraded mode for CRAY T932 systems

Initial release: UNICOS 9.1

Users affected: administrators, system analysts

Hardware supported: CRAY T932 systems

The CRAY T932 machine can be divided into two physical machines with static partitioning, degraded mode. This feature allows the machine to be shut down and reconfigured to allow one half of the machine to continue production (following a UNICOS system restart) with the other half available for full maintenance.

Caution: All CRAY T90 series maintenance, which includes degrading the machine, must be performed by Cray Research personnel.

For more information, contact your Cray Research representative.

2.4 Operating system

This following section describes support for the UNICOS operating system that is new since UNICOS 9.0.

2.4.1 Addition of `PRIV_ALL` pseudo privilege

Initial release: UNICOS 9.1

Users affected: administrators

Hardware supported: all Cray Research systems

On pre-9.1 UNICOS multilevel security (MLS) systems, there was no mechanism available to specify or display the set of all granular privileges of

privilege assignment lists (PALs). The introduction of the new `PRIV_ALL` pseudo privilege allows administrators to assign or display the set of all granular privileges through the PAL-related administrator commands instead of supplying or viewing the entire list.

The information on this privilege has been added to the `setpal`(8), `setprivs`(8), `getpal`(8), `getprivs`(8), and `privcmd`(8) man pages, an example of which has been added to the super user PAL section of *General UNICOS System Administration*, Cray Research publication SG–2301.

2.4.2 Partition level cache

Initial release: UNICOS 9.1

Users affected: administrators, system analysts

Hardware supported: Cray PVP systems

Partition level cache allows administrators to assign cache to specified partitions. This is similar to logical device cache, with cache being allocated one level lower in the logical device's structure. The `pcache`(8) command assigns partition cache.

Partition level cache provides greater flexibility than logical cache, particularly for logical devices with complex structures or logical devices that reside on devices with different I/O unit sizes. Cache at the partition level does not need to be allocated to all partitions. Cache may be shared among an arbitrary group of partitions within the same logical device, or, each partition can be cached independently.

For more information, see the partition cache section in the file system planning section of *General UNICOS System Administration*, Cray Research publication SG–2301, and the `pcache`(8) man page.

2.4.3 `rc` script now starts dgdemon at boot time

Initial release: UNICOS 9.1

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems supporting Model E technology

The diagnostic daemon, `dgdemon`(8), which is used by the System Maintenance and Remote Testing Environment (SMARTE) to execute all online diagnostic tests and concurrent maintenance utilities from SMARTE, is now started at boot

time by the rc(8) script instead of by errdemon(8). In addition, a privileged user can start dedemon(8).

Note: The dgdemon command is not available on GigaRing based systems.

2.4.4 rc script now starts diagccmt at boot time

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems supporting Model E technology

The diagnostic daemon, diagccmt(8), which is used by the concurrent maintenance tool, xdi(8), is now started at boot time by using the sdaemon(8) command. In addition, a privileged user can start diagccmt(8).

2.4.5 qmgr schedule request command change

Initial release: UNICOS 9.1

Users affected: all

Hardware supported: all Cray Research systems

The qmgr schedule request command allows you to change a queued job request that has a schedule attribute value of now.

If a request has a schedule attribute of now, is currently in a queued or waiting state, and is in a queue that has been started, the request is initiated immediately. The request is initiated without regard to the current Network Queuing System (NQS) scheduling mode.

In all other cases, the now schedule attribute value has no immediate effect, but will cause the request to be initiated when all the preceding conditions have been satisfied.

If you specify a schedule attribute value other than now, the current NQS schedule must recognize the attribute and the request must meet any other criteria imposed upon it, such as wait time or resource requirement.

Requests can be moved between subqueues of a batch queue with no restrictions.

The `qstat -f` and `qstat -a` displays have also been updated to display the current scheduled state of the job (for example, `FIRST` or `NEXT`) instead of displaying only `SCH` or `SCHEDULE`.

For more information, see the `qmgr`(8) man page.

2.4.6 `chacid` feature improved

Initial release: UNICOS 9.1

Users affected: all

Hardware supported: all Cray Research systems

The `chacid`(1) utility lets users set the account ID of a disk file. This utility lets users set the account ID of symbolic links as well as regular files.

2.4.7 `dmofrq` changes with removal of pre-migration directory

Initial release: UNICOS 9.1

Users affected: administrators

Hardware supported: all Cray Research systems licensed for the Cray Data Migration Facility

Beginning with the Data Migration Facility (DMF) version 2.4, the `dmofrq`(2) system call will be changed to reflect the removal of the pre-migration directory.

The main purpose of the removal of the pre-migration directory is to allow safe, arbitrary changes of migration fields by privileged processes. It allows DMF greater flexibility to chang files from regular or dual-state status to offline status without using a pre-migration directory. Files can be taken offline directly without the data being moved into the pre-migration directory. However, DMF cannot use the "migrating" state of the file without the `/inode` feature; to migrate a file, it must have its data put into the `.dmpre` directory.

2.4.8 USM supports additional PL identifiers

Initial release: UNICOS 9.1

Users affected: all

Hardware supported: all Cray Research systems

The UNICOS source manager (USM) has been upgraded with a new default PL type: `f`. To create PLs that are backward compatible, use the new `-o` option to the `sm`(1) subcommands to specify the old type you need.

The limit on the number of modules has increased from 2^{14} to 2^{16}. The maximum number of lines per module has increased from 2^{17} to 2^{20}.

For more information, see the `sm`(1) man page.

2.4.9 New `config.h` file parameter

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The new `XTRASEC config.h` file parameter sets the number of CPU seconds that a process or session may use following receipt of a `SIGPULIM` signal before the `SIGKILL` signal is sent to terminate the process or session. The default value for `XTRASEC` is three.

2.4.10 New `MAXRUN` limit for `cron` command

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

A new `-m` limit option for `cron`(8) command allows an upper limit, `MAXRUN`, to be specified for the number of jobs that can be run at once. In previous UNICOS releases, `MAXRUN` was hard coded to 25. By default, `MAXRUN` is still 25.

2.4.11 New option for `target` utility

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

A new `-s` option has been added to the `target`(1) utility. This option prints only the machine subtype field. If the `-s` option is not specified, the `target`(1)

utility prints the subtype field with the CRAY prefix when the target is a Cray PVP system.

2.4.12 New option for `msgdaemon` log file

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

A new `-l` option has been added to the `msgdaemon`(1) command to allow the creation of a linear `msgdaemon` log file.

This feature allows the customer to specify a linear log file rather than the default circular log file. It was developed for local accounting purposes.

For more information, see the `msgdaemon`(8) man page.

2.4.13 New `sdconf`(8) and `sdstat`(8) commands

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

The `sdconf`(8) command controls the state of a disk drive.

It is based on the `pddconf`(8) command, but it controls physical device with `pdd`(4), `hdd`(4), and `xdd`(4) device drivers. The `pddconf`(8) command controls devices with `pdd`(4) drivers only. Support for GigaRing I/O requires this additional functionality.

The `sdstat`(8) command displays information about disk activity. It is based on the `pddstat`(8) command, but like `sdconf`(8), it displays information about all disk types supported with GigaRing I/O.

For further information, see the `sdconf`(8) and `sdstat`(8) man pages.

2.4.14 Support added for CRAY T90 asymmetric CPUs

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: CRAY T90 systems with Cray floating-point CPUs and with IEEE Std. 754 floating-point CPUs.

The CRAY T90 chassis now provides kernel support for a mixture of both Cray floating-point and IEEE floating-point CPUs within a single system.

In addition to kernel support, the following sections describe collateral changes to accommodate this feature.

2.4.14.1 Install tool changed

The install tool has been changed to make asymmetric CPUs a configurable option. This change switches the values in `/etc/config/config.mh`.

2.4.14.2 Library `nmake` files changed

All library `nmake` files provide IEEE floating-point support on CRAY T90 systems. These files previously provided cross-compatible version support for Cray floating-point CPUs on CRAY T90 systems.

Only Cray floating-point versions will be supported on CRAY T90 systems with IEEE support.

2.4.14.3 Generation compiler environment changes

The generation compiler environments for the UNICOS operating system have been changed to support building alternate libraries for both CRAY T90 floating-point and CRAY T90 IEEE packages.

2.4.14.4 Programming environment support

Programming environments have been modified to include CRAY T90 asymmetric CPU support.

2.4.15 UNICOS under UNICOS (UUU) support for GigaRing based systems

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: all CRAY GigaRing based systems including CRAY J90se, CRAY T90, and CRAY T90 IEEE

UNICOS under UNICOS (UUU) supports the GigaRing architecture on CRAY J90se, CRAY T90, and CRAY T90 IEEE platforms. This includes support for the following:

- Network devices

  ATM

  HIPPI

  Ethernet

  FDDI

- Disks

  DA-60

  DA-61

  DA-301

  DA-302

  DD-60

  DD-61

  DD-62

  DD-301

  DD-302

  DD-304

  DD-308

  DD-316

  DD-332

- Any tape drive supported on a CRAY Y-MP system

  Note: For CRAY J90se systems, use of memory HIPPI is not supported with this feature.

  Note: For CRAY T90 and CRAY T90 IEEE systems, the following functions are not supported with this feature:

  - Use of memory HIPPI
  - Guest use of `ssdt` (solid state disk for CRAY T3E systems)

2.4.16 Added support for array services and MPI

Initial release: UNICOS 9.3

Users affected: system administrators

Hardware supported: all Cray Research systems

The UNICOS 9.3 release included the `libarray.a` library and the `arrayd` array services daemon, which provide support for the following asynchronous products:

- Array Services 3.0 for UNICOS, which uses `libarray.a` and `arrayd` for array service commands. This product, which contains all of the client commands for array services, will be available soon.
- Message Passing Toolkit (MPT), which needs `libarray.a` for its Message Passing Interface (MPI) in the 1.2 release.

2.4.16.1 File modifications required for array services and MPI

In order to use array services and/or MPI on your UNICOS system, you must make the following modifications in the default or existing `/etc/hosts.equiv` and `/etc/config/daemons` files:

- The `/etc/hosts.equiv` file must have `localhost` present:

```
MID @(#)skl/etc/hosts.equiv 100.1   07/14/97 09:35:57
#
#       (C) COPYRIGHT CRAY RESEARCH, INC.
#       UNPUBLISHED PROPRIETARY INFORMATION.
#       ALL RIGHTS RESERVED.
#
# This hosts.equiv file has been created with the line
# 'localhost' so that the array services daemon can
# create processes to handle requests on the machine it
# is running on.  The array services daemon is used by
# MPI from the MPT product.  Array Services and MPI require
# the localhost entry to function.
localhost
```

- The `/etc/config/daemons` file must contain a line for `arrayd` that has a start value of `YES`. This enables the `arrayd` daemon to start automatically when you go to multi-user mode:

```
# USMID @(#)skl/etc/config/daemons      100.1   07/11/97 14:19:09
#
# Configuration file for TCP daemons (and other commands) started by
# /etc/netstart (through /etc/sdaemon).
#
# File format is:
#
# group tag             start   kill            pathname arguments
#

                       <snip>

SYS2    arrayd          YES     *               /etc/arrayd
```

Note: The following applies to the modifications made to the `/etc/hosts.equiv` and `/etc/config/daemons` files:

- If 9.3 is your initial operating system, the default `/etc/hosts.equiv` and `/etc/config/daemons` files are automatically copied onto your system when the system is built. However, you still need to make the modifications described above in order to use array services and MPI.

For more information, refer to the following man pages: `arrayd`(1M), `ascheck`(1), `newarraysess`(2), `syssgi`(2), `getash`(2), `setash`(2), `arrayd.conf`(4), and `array_sessions`(5).

2.4.17 Automatic downing of CPUs on uncorrectable memory errors

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: all Cray Research systems

A mechanism has been created to down a CPU that is experiencing uncorrectable memory errors.

This mechanism is released in an "off" state and can be enabled as required. It allows you to select the following options, parameters for which have been added to the `secded`(8) command:

- The number of errors seen by a CPU before it is downed.
- The lifetime of each error (for example, three errors in a rolling 24-hour period).

- The length of time the CPU should remain down before the system is returned to service.

  Note: The system may remain down indefinitely.

For more information, see the `secded`(8) man page.

2.4.18 Third party device for direct memory access (DMA) dump for GigaRing based systems

Initial release: UNICOS 9.3

Users affected: analysts

Hardware supported: CRAY J90se and T90 GigaRing based systems

This feature allows you to configure a disk partition to use as a raw dump device, rather than using the `/opt/CYRIdump` directory on the system workstation (SWS).

This feature increases the speed of a postmortem dump.

2.4.19 Year 2000 compliance added in UNICOS 10.0

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: all Cray Research systems

UNICOS 10.0 is the first release of the UNICOS operating system to comply with the Year 2000 date standards as defined by the X/Open standard. This standard defines the features and functions required for UNIX systems so such systems remain unaffected by the transition to the year 2000.

2.4.19.1 The '69' rule

Cray Research recommends that customers apply the '69'-rule to their two-digit ASCII (*YY*) dates. This rule interprets years greater than '69' (that is, 1969 — the UNIX clock begin ticking January 1, 1970) as `19`*YY*. Years less than '69' will be interpreted as `20`*YY*.

Cray Research further recommends that customers implement a four-digit *YYYY* policy to be applied to all newly-created date fields.

For more information on the X/Open standards for Year 2000 date compliance, see the following web page:

```
http://www.rdg.opengroup.org/public/tech/base/year2000.html
```

2.4.20 `sinclude` functionality added to `make(1)` command

Initial release: UNICOS 10.0

Users affected: programmers, system administrators

Hardware supported: all Cray Research systems

The `make`(1) command includes the IRIX `sinclude` functionality in UNICOS 10.0.

If the string `sinclude` appears at the beginning of a line in a *makefile*, followed by a blank space or a tab, then the rest of the line is assumed to be a *filename* and will be read by the current invocation after substituting for any macros.

For more information, see the `make`(1) man page.

2.4.21 `ls(1)` command indicates multilevel symbolic links

Initial release: UNICOS 10.0

Users affected: all

The `ls`(1) command now indicates if a file is a multilevel symbolic link.

For more information, see the `ls`(1) command.

2.4.22 New `-h` option for `chacid(1)` utility

Initial release: UNICOS 10.0

Users affected: programmers, system administrators

A new `-h` option has been added to the `chacid`(1) utility.

When the `-h` option is specified and the file is a symbolic link, the requested operation (display or chacid) is done on the link; that is, it does not follow the link to the destination file. If this option is not specified, the link is followed and the operation is performed on the destination file.

For more information, see the `chacid`(1) man page.

2.4.23 Error message for `rm -f` option

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: all Cray Research systems

The `-f` argument to the `rm` command now displays an error message if a file or directory can not be removed. This change is in compliance with POSIX standards.

For more information, see the `rm` man page.

2.4.24 `ls` command indicates multilevel symbolic links with `-le` options

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: all Cray Research systems

With the `-le` options, the `ls` command now indicates a multilevel symbolic link by using `*>` instead of `->` to display the link's contents. For example, the result of `ls -le /usr/mail` would be:

```
lrwxrwxrwx  0 1  root bin  13 Dec 22 1997 /usr/mail *> /usr/mail.mld
```

2.5 Tape subsystems

The following sections describe support for tape subsystems that is new since UNICOS 9.0.

2.5.1 `tpquery` command to query loaders

Initial release: UNICOS 9.1

Users affected: programmers

Hardware supported: all Cray Research systems

With UNICOS 9.1, the `tpquery`(1) command enabled you to query an autoloader server program. It provides a query interface from the Cray Research system to an autoloader server. Use this new command to find out whether one or more volume serial numbers are within the domain of the queried autoloader.

For more information, see the `tpquery`(1) man page.

2.5.2 Two new `MTIOCATTR` `ioctl` flags

Initial release: UNICOS 9.2

Users affected: end users

Hardware supported: all Cray Research systems

The `MTIOCATTR` `ioctl`(2) system call supports the new `MT_COMPRESSION` and `MT_NO_COMPRESSION` flags. For additional on using the character-special tape interface, see *Tape Subsystem Administration*, Cray Research publication SG–2307.

2.5.3 New `MTIOCTOP` `ioctl` code for message display

Initial release: UNICOS 9.1

Users affected: all

Hardware supported: all Cray Research systems

The `MTIOCTOP` `ioctl`(2) system call supports a new operation code for the `mt_op` field. This code, `MTMSG`, displays a message on a tape device.

For more information, see the `ioctl`(2) man page.

2.5.4 Improved tape drive utilization

Initial release: UNICOS 9.1

Users affected: administrators, operators

Hardware supported: all Cray Research systems

A new `overcommit` feature allows the number of current mount requests to exceed the number of available tape drives. It can increase tape drive use because it enables operators to mount available tapes while they are searching for others. This feature is best used on systems that run many single-mounted tape jobs.

When the feature is activated, mount requests are issued for the following jobs without the system previously allocating tape drives.

- Jobs that need only one tape mount.

- Jobs that are requesting the last of a series of tape mounts.

When a tape drive becomes available, an operator mounts an overcommitted tape, and the system then assigns the drive to the user's job.

The `overcommit` feature requires that automatic volume recognition (AVR) be turned on for the device group requested by the user, and that this device group use only operator-mounted tapes.

The updated `tapeconfig`(5) file format, `tpset`(8) command, and `tpstat`(1) command allow you to specify overcommitted mount requests. New error messages have also been added.

2.5.5 `tpinit` command for initializing tape subsystem

Initial release: UNICOS 9.1

Users affected: administrators, system analysts, operators

Hardware supported: all Cray Research systems

The `tpinit`(8) command provides a new means of initializing the tape subsystem. It reads and processes a tape configuration file, creates the tape device files, sends the tape configuration to the tape driver and I/O processors, and configures the channels and control units. Configuring the tape subsystem is now part of the start-up process as long as `/etc/tpinit` has been installed.

After you have initialized the tape subsystem, the character-special tape interface, which provides unstructured access to tape devices, can be used.

The `tpdaemon`(8) command uses the `tpinit`(8) command to initialize the tape subsystem, and then it initializes a daemon process and begins request processing. The new `-b` option on the `tpdaemon`(8) command instructs the tape daemon to bypass all configuration tasks and to use the existing tape configuration. By using this option, you can start the tape daemon after you have configured the tape subsystem by using `tpinit`(8). You can also start and stop the tape daemon without configuring the tape subsystem. New error messages have also been added.

For more information, see the `tpinit`(8) and `tpdaemon`(8) man pages.

2.5.6 `xtpldr` command for tape cartridge management

Initial release: UNICOS 9.1

Users affected: administrators, system analysts, operators

Hardware supported: all Cray Research systems

A new X Window System-based administrator command, `xtpldr`(8), manages tape cartridges on Storage Technology Corporation (StorageTek), IBM, and EMASS autoloaders. This command enables you to manage tape cartridges from a display driven by a Cray Research system. It enters tape cartridges into the domain of an autoloader, ejects them from the domain of an autoloader, and queries autoloaders about the volume serial numbers of the tape cartridges.

For more information, see the `xtpldr`(8) man page.

2.5.7 New tape subsystem monitor available

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

Administrators can use a new interactive monitor for continuous information about a running UNICOS tape subsystem. The `tpcore`(8) command, which initiates this monitor, offers a variety of options that administrators can select to tailor the information for their own sites or to investigate specific problems.

For more information, see the `xpcore`(8) man page.

2.5.8 New `tplist` bypass-label-processing option

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

With the release of UNICOS 9.2, users with `bypasslabel` set in their UDB entry will be able to take advantage of the `-B` option on the `tplist`(1) command. This new option generates an internal `tpmnt`(1) with a label type of `blp`.

For more information, see the `tplist`(1) and `tpmnt`(1) man pages.

2.5.9 New tape subsystem command options

The following new options provide users with more output control:

Option	Command	Description
`-t`	`rsv`(1)	Specifies the placement of the message file.
`-a`	`tplist`(1)	Verifies the output from a `tplist`(1) copy operation.
`-a`	`tpstat`(1)	Outputs device status for all tape devices, except those with `DOWN` status.
`-a`	`tpgstat`(8)	Provides status information for device groups that are reserved or active.

For more information, see the `rsv`(1), `tplist`(1), `tpstat`(1), `text_tapeconfig`(5), `tape`(7), `tpgstat`(8), and `tpinit`(8) man pages.

2.5.10 New tape filter

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

The `mvf`(1) command is a tape filter that handles input, output, and volume switches. For users of the character-special tape interface who need to dump and restore file systems that span multiple tape volumes, this command makes the volume switch transparent. Used with the tape subsystem, `mvf`(1) can handle labeled tapes and can transfer data at high rates.

For more information, see the `mvf`(1) and `tpmnt`(1) man pages.

2.5.11 New user exits

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

User exits provide escapes from the standard subsystem code; these escapes are activated in the tape configuration file. Each site selects the user exists that it needs to add site-specific code to the tape subsystem. With the release of UNICOS 9.2, the `user_exit_mask` option of the `OPTIONS` statement accepts five new exits:

- `uex_ask_hdr1`

  Adds code so that the tape daemon can:

  1. Obtain a number that controls how many characters of the file identifier, filed in a header 1 label, are compared to a character string kept by the tape daemon, or to an alternate string provided by the user exit code.
  2. Obtain an alternate character string for the file identifier that is compared to the character string in the file identifier field in the header 1 label from the tape.
  3. Obtain an alternate character string, which in the case of ANSI labels, is compared to the accessibility character string in the accessibility field in the header 1 label from the tape.

- `uex_chk_access`

  Adds code that allows or rejects access to a tape volume after the code has checked a locally maintained permission file.

- `ues_cls_file`

  Adds code that allows the tape daemon to add information to the `tape.msg` file concerning the tape volumes that are used while processing the tape file.

- `ues_mac_hor2`

  Adds code that controls access to the tape volume.

- `uex_mnt_msg`

  Adds code that appends information to the existing mount message or changes it in any other way.

2.5.12 `tpconfig` and `tpdev` enhancements

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: Cray Research systems with scalable I/O products

The new `-n` option on the `tpconfig`(8) command enables you to disable automatic unloading of a volume when you release a tape that will be used repeatedly.

In addition, the `-c` option on `tpconfig`(8) now supports a 6 digit number on systems with scalable I/O products. The display created by the `tpdev`(8) command also uses this number.

For more information about these enhancements, see the `tpconfig`(8) and `tpdev`(8) man pages.

2.5.13 `tpmnt` enhancements

Initial release: UNICOS 9.2

Users affected: end user

Hardware supported: all Cray Research systems

The special meaning that the years 1998 and 1999 have on the `tpmnt`(1) utility can be overridden. If you enter `@` as the first digit for the `-x` option, the real 1998 and 1999 expiration dates are used.

The `-Q` option, a variant of the `-q` option, is now available. This option is for users who are confident of the contents of single volume tapes.

In addition, the `-i` option documentation has been updated.

For more information about these enhancements, see the `tpmnt`(1) man pages.

2.5.14 IBM ESCON 3590 supported

Initial release: UNICOS 9.3

Users affected: system administrators

Hardware supported: all Cray Research systems

The UNICOS 9.3 release supports the IBM ESCON tape devices.

The `DEVICE` statement contains a new parameter, `timeout`, and the `type` parameter now accepts `3590` as a type. The `timeout` parameter specifies the time-out value in seconds that the ESCON IOP, which supports the IBM ESCON 3490, 3490E, and 3590 devices, waits for a response from the channel.

The `errpt`(8) command contains the new `-t` option, which requests the formatted output of the buffered logs from the control units of the IBM ESCON 3490, 3490E, and 3590 devices.

For more information, see the `text_tapeconfig`(5) man page for the `DEVICE` statement, and the `errpt`(8) man page.

2.5.15 New tape daemon optimization feature

Initial release: UNICOS 9.3

Users affected: system administrators

Hardware supported: all Cray Research systems

A tape daemon optimization feature has been created that consolidates device-specific child processes into a single-device support child process. This feature controls the device from the initial tape mount through the release sequence.

2.6 Networking and communication

The following section describes support for networking and communication that is new since UNICOS 9.0.

2.6.1 `daemon` library function added

Initial release: UNICOS 9.2

Users affected: all

The new `daemon`(3) library function detaches programs from the controlling terminal, allowing them to run in the background as system daemons.

For more information, see the `daemon`(3) man page.

2.6.2 `sysctl` library function and command added

Initial release: UNICOS 9.2

Users affected: administrators, programmers, analysts

The new `sysctl`(3) library function and `sysctl`(8) command retrieve kernel state and allow processes with appropriate privilege to set kernel state.

For more information, see the sysctl(3) and sysctl(8) man pages.

2.6.3 New option for getsockopt and setsockopt system calls

Initial release: UNICOS 9.2

Users affected: programmers

The getsockopt(2) and setsockopt(2) system calls now support the following socket level options:

- SO_REUSEPORT, which allows duplicate bindings by multiple processes to a single port.
- SO_OWNPORT, which allows a process to bind to a port, preventing other processes from binding to the port.

For more information, see the getsockopt(2) man page.

2.6.4 Routing code updated to 4.4BSD-lite

Initial release: UNICOS 9.2

Users affected: programmers

The new sactl(2) system call has been added to the UNICOS 9.2 release to support and emulate the 4.4BSD-lite sysctl(3) library. This upgrades the routing code to 4.4BSD-lite.

For more information, see the sactl(2) and sysctl(3) man pages. Also, see Section 2.6.2, page 29 for information on the new sysctl(3) library function.

2.6.5 New options for the netstat utility

Initial release: UNICOS 9.2

Users affected: all

The following new options were added to the netstat(1B) utility:

- -Ar, which prints the kernel memory addresses.
- -A, which causes the kernel memory address of route data structures to be printed.

For more information, see the netstat(1B) man page.

2.6.6 New options for the `rlogin` utility

Initial release: UNICOS 9.2

Users affected: all

The following new options were added to the `rlogin`(1B) utility:

- `-E`, which stops any character from being recognized as an escape character.
- `-L`, which allows `rlogin`(1B) to be run in `-opost` mode.

For more information, see the `rlogin`(1B) man page.

2.6.7 New options for the `ping` command

Initial release: UNICOS 9.2

Users affected: administrators

The following new options were added to the `ping`(8) command:

- `-c`, which stops after sending (and receiving) packets.
- `-f`, which floods `ping`(8).
- `-i`, which waits wait seconds between sending each packet
- `-l`, which sends the number of packets specified by `preload` as fast as possible before falling into its normal mode of behavior.
- `-n`, which specifies numeric output only.
- `-p`, which pads the packet with bytes of a specified pattern.
- `-q`, which specifies quiet output.
- `-R`, which records the route.
- `-s`, which specifies the number of data bytes to be sent.

For more information, see the `ping`(8) man page.

2.6.8 New socket accounting feature

Initial release: UNICOS 9.3

Users affected: system administrators, site analysts

Hardware supported: all Cray Research systems

A new socket accounting feature has been implemented with UNICOS 9.3 to track network usage from the perspective of sockets, wherein one process may use several sockets, and several processes may use the same socket.

The recorded accounting information tracks all of a socket's usage, but it can only be linked to the process which most recently closed the socket. This information can help an administrator resolve network problems and monitor system network usage.

This feature records the following information:

- Time a socket was created
- Time a socket was destroyed
- Socket user ID (UID)
- Socket group ID (GID)
- Socket family and domain
- Socket type
- Socket protocol
- Socket options
- The executing program
- Number of reads and writes performed
- Number of bytes read and written
- Foreign and local Internet addresses
- Foreign and local port numbers

Note: This feature does not include the ability to charge for network usage. The accounting records produced are only processed in order to make the data available to the site-supplied user exits.

You can use the standard accounting interface to turn this feature on or off. You can also use the `csasocket`(8) command to summarize and process the socket data.

For more information on this feature, see the `csaswitch`(8) and `csasocket`(8) man pages.

2.6.9 named (domain name service) granted all privileges to execute on a UNICOS system with MLS

Initial release: UNICOS 9.3

Users affected: system administrators

Hardware supported: all Cray Research systems

The Internet domain name server command, `named`, is a service that controls the host information database that maps between host names and their internet addresses. With UNICOS 9.3, this service has been granted all privileges to execute on a UNICOS system with the multilevel security (MLS) feature. Previously, `named` privileges were restricted to `PRIV_SU` systems only.

Note: This feature will still function on a system that is not running `SECURE_MAC`.

For more information, see the `named`(8) man page.

2.6.10 TCP/IP connections allowed over GigaRing channels

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: CRAY J90se and CRAY T90 GigaRing based systems.

The UNICOS 9.3 release supports a new feature that allows GigaRing based CRAY T90 and CRAY J90se systems to use TCP/IP for host-to-host communications.

2.6.11 Network device and driver optimization for GigaRing systems

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: all Cray GigaRing based systems

The UNICOS 9.3 release includes performance optimization for the following network devices and network drivers on GigaRing based systems:

- Unified network drivers
- MPN network drivers
- HPN network drivers

For more information, see the `setionlink`(8) man page.

2.6.12 TTY protocol rewrite

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: all Cray Research systems with GigaRing-based I/O

The UNICOS 10.0 release supports TTY protocol rewrite. TTY protocol rewrite adds connection resiliency to the protocol between `mfcon` and the tty driver. This modification enables the reestablishment of console connections after an MPN reboot or an `mfcon` restart.

For more information, see the `mfcon`(8) man page.

2.6.13 Network disk options added to `olhpa`

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: all Cray Research systems with Model-E based IOS.

New `-n` and `-N` options have been added to the `olhpa` command to provide viewing of network disk errors separately from local disk errors. The `-d` and `-D` options have been modified to provide local disk error only.

For more information, see the `olhpa`(8) man page.

2.7 System installation

The following sections describe enhancements made to system installation procedures or practices.

2.7.1 Pre-installation work for initial installation

Initial release: UNICOS 9.1 for T90 systems, UNICOS 9.2 for J90se systems

Users affected: administrators

Hardware supported: CRAY T90 series and CRAY J90se series systems.

The CRAY T90 and CRAY J90se operating system software is preinstalled prior to shipment of the hardware except in situations where no disks are ordered or sent with the mainframe. The benefit to the customer is a system that is ready for customer configuration. No media loading (except for asynchronous products) is required and much of the complex initial start-up activity is eliminated. Also, if customers need to reinstall at the initial level, they will find it a much easier process for completing their initial media load and boot.

2.7.2 New system software load utility

Initial release: UNICOS 9.1

Users affected: administrators

Hardware supported: all Cray Research systems

An upgrade in binary packaging tools has resulted in the removal of the `ldproto`(8) command. It has been replaced by a more robust set of tools that can be used by both UNICOS and asynchronous products. The following tools are included in the new `relload`(8) utility:

- `relload`(8)
- `relarch`(8)
- `relvfy`(8)
- `relrcvr`(8)
- `rellist`(8)
- `relasync`(8)

For more information, see the `relload`(8) man page.

2.8 File systems

The following sections describe file system enhancements since UNICOS 9.0.

2.8.1 New `INODE` file system

Initial release: UNICOS 9.1

Users affected: administrators, system analysts

Hardware supported: Cray PVP systems

The INODE file system allows privileged processes access to a file or directory by using an INODE device encoded in a path name. The INODE file system does not store files, but serves as a path to other file systems.

This feature eliminates the need for the pre-migration directory for the Cray Research Data Migration Facility (DMF). The INODE file system may be mounted anywhere, but DMF will recognize INODE only if it is mounted on /inode.

For more information on configuring an INODE file system, see the new inode(5) man page. In addition to the new inode(5) man page, the INODE feature is reflected in changes to the following man pages: mnttab(5), mount(8), and fstab(5).

2.8.2 fstest(8) command added

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

The UNICOS 9.2 release supports the fstest(8) command. The fstest(8) command tests the basic functionality, data integrity, and performance of a file system or disk device. The fstest(8) command is similar to the pddtest(8) with the addition of timers that can be used at the file system level. The fstest(8) command can also perform random I/O without performing sequential I/O first and can test a range of transfer sizes.

For more information, see the fstest(8) man page.

2.8.3 fstatvfs(2) and statvfs(2) system calls added

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

The fstatvfs(2) and statvfs(2) system calls obtain information about the status of file systems. These calls are similar to the statfs(2) system call, and are being added for conformance with UNIX standards.

The structure definition that this call accesses has been moved from the `vfs.h` file to a new include file `include/sys/statvfs.h`.

For more information, see the `fstatvfs`(2) and `statvfs`(2) man pages.

2.8.4 New `MLS_OBJ_RANGES` configuration item

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

Site administrators may now choose whether they want the file system label ranges to be constrained by the system label range. If the `MLS_OBJ_RANGES` configuration option is enabled, file system and object label ranges are constrained to the system label range. This behavior is identical to the former UNICOS MLS systems. If the `MLS_OBJ_RANGERS` configuration option is disabled, file system and object label ranges are no longer constrained. This allows you to make, label, and mount file systems with label ranges that are outside of the system label range.

This configuration option provides flexibility that is necessary for the merging of the MLS and non-MLS operating systems. Sites running systems in a mixed MLS and non-MLS set of configurations will not need to relabel file systems on their machines whenever there is a change in the kernel that is run. Also, this option lets sites that were once configured for UNICOS MLS, but have fallen back to a non-MLS configuration avoid relabeling their file systems. Without this option, these sites would encounter problems when moving to the merged configuration as a result of the restrictions on file system label ranges.

The new `MLS_OBJ_RANGES` configuration item defaults to `OFF`, the recommended setting. This setting relaxes file system label range restrictions without loss of security, because the file system label ranges still constrain the labels of objects and the system label range still constrains the labels of subjects (processes). This retains the original intent of the label range security policy.

2.8.5 New aggregate quotas feature

Initial release: UNICOS 9.2

User affected: administrators, system analysts

Supported hardware: Cray PVP systems

The new aggregate quota feature is a modification to the UNICOS file system quota feature which can (optionally) affect how file system quotas interact with the Data Migration Facility (DMF).

By default, files which are migrated by DMF and are not currently on disk do not count towards the disk block quotas for a user, account, or group. If the new aggregate quota feature is used, however, offline files count against disk quotas as much as online files do. This feature can be used to limit the amount of storage in an offline device, such as an automatic tape silo. If this feature is selected for a file system, only the offline space is subject to top quotas. No quota control is available for the actual data stored on the disk.

For more details, see the article on Aggregate Disk Quotas in the December 1996 *Cray Research Service Bulletin (CRSB)*.

2.8.6 Bulk data service added as a supplement to the network file system (NFS)

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: all Cray Research PVP systems running UNICOS and NFS

The Bulk Data Service (BDS) is a nonstandard enhancement to NFS that improves performance for large data transfers (100 megabytes or larger).

This enhancement includes modifications to the UNICOS kernel and the `mount` and `automount` commands, as well as a new `bds` daemon, and a new utility program called `lmdd`, which is used primarily for timing I/O.

For more information, see the `mount`(8), `automount`(8), `bds`(8), and `lmdd`(8) man pages.

2.8.7 New configuration specification language (CSL) parameters

Initial release: UNICOS 9.3

Users affected: system administrators

Hardware supported: all Cray Research systems

UNICOS 9.3 adds the following new configuration specification language (CSL) parameters:

- `nfs3_async_max` defines the maximum amount of data that will be written per file asynchronously.

- `nfs3_async_time` defines the amount of time that data will be held in the NFS async write cache on the client.

For more information, see the *UNICOS Configuration Administrator's Guide*, Cray Research publication SG–2303 9.3.

2.9 Diagnostics

The following sections describe support for online diagnostics new since UNICOS 9.0.

2.9.1 New `vst`(8) network exerciser added

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

The `vst`(8) online network exerciser exercises network devices that support TCP/IP and have been configured into the operating system. `vst` can be used to exercise TCP/IP network devices between two Cray Research systems, or between the system workstation (SWS) and the Cray System (GigaRing only), or between the SWS and the multipurpose node (MPN) (GigaRing only). The general procedure is to open a listening connection on one platform, followed by an attempt to send data to that connection.

For more information, see the `vst`(8) man page.

2.9.2 New `vtt`(8) tape exerciser added

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all GigaRing based Cray Research systems

The online tape exerciser, `vtt`(8), exercises any online tape device that has been configured into the operating system. A device may be configured either down or up. When using a device that is configured down, the block-special node in `/dev/tape` is accessed directly. For a device that is configured up, that device is accessed through the tape daemon. For up mode tests, the device name is assumed to be configured up by using `rsv`(1) and `tpmnt`(1).

For more information, see the vtt(8) man page.

2.9.3 errpt enhancements

Initial release: UNICOS 9.3

Users affected: system administrators, site analysts

Hardware supported: all Cray Research systems with IOS-E and GigaRing based architectures

Before UNICOS 9.3, there were two methods to create reports for hardware errors, errpt(8) and olhpa(8). errpt provided basic interpretation of data with few report format options. olhpa, on the other hand, included many features and report formatting options, but was difficult to maintain.

To eliminate a duplicated effort to maintain both utilities, olhpa is discontinued for GigaRing based architectures, and errpt functionality has been enhanced with some olhpa options as described in the following sections. (See also Section 2.5.14, page 28 for related information.)

2.9.3.1 One-line summary report for errpt

The short report format option has been added to the errpt utility. This 80-character format includes a one-line summary of each error, similar to the standard olhpa output.

Error reports can now be viewed in simple form, chronologically, and according to device type and date.

2.9.3.2 Enhanced -s option for errpt

An enhanced olhpa-style -s option was added to errpt in UNICOS 9.3 to support the -sl[0--n] date format. This allows you to indicate a starting date n days prior to the current date, or an ending date (specified by the -e option).

2.9.4 New vi tagstack feature

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: all Cray Research systems

A new tagstack feature has been added for `vi` in UNICOS 9.3. Tagstack allows you to track backward through up to 20 tag jumps. This is very useful when examining unfamiliar C code.

2.9.5 Quick summary option added to `errpt`

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: all Cray Research systems

A new `-q` option has been added to the `errpt`(8) command to provide a quick summary of errors found in the file.

The quick summary includes:

- total for each type of device (for example, memory, disk, tape)
- total or unrecovered errors
- sum total of all errors

The following is an example output of an `errpt -q` command on an IOS-E based mainframe:

```
$ /etc/errpt -q

Quick Summary Report

Total Memory Errors     : 0     Uncorrected     : 0
Total Disk Errors       : 0     Unrecovered     : 0
Total Tape Errors       : 0     Unrecovered     : 0
Total SSD Errors        : 0
Total COMM Errors       : 58
Total FDDI Errors       : 0
Total HIPPI Errors      : 0
Total LSP Errors        : 0
Total CPU Errors        : 0
Total Register Errors   : 0



Error Types: all
```

```
Limitations:
Date of Earliest Entry: Wed Aug 27 09:01:11 1997
Date of Latest   Entry: Wed Aug 27 12:17:58 1997
```

For more information, see the `errpt`(8) man page.

2.9.6 `vtt`(8) replaces `unitap`(8)

Initial release: UNICOS 10.0

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems with GigaRing-based I/O

On GigaRing-based systems, `vtt`(8) will replace `unitap`(8) in UNICOS 10.0.

For more information see the `vtt`(8) man page.

2.9.7 new commands for monitoring and notification

Initial release: UNICOS 10.0

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems with GigaRing-based I/O

On GigaRing-based systems in UNICOS 10.0, monitoring and notification are handled by `watchstream`(8) and `watchlog`(8) on the SWS, and `watchstream`(8) on the mainframe.

See the `watchstream`(8) and `watchlog`(8) man pages for more information.

See also the new `thresholding`(7) man page, which contains an introduction to automated monitoring and notification, also referred to as thresholding.

2.10 Disk and storage device enhancements

The following sections describe disk and device enhancements.

2.10.1 New `disksmpn`(7) and `disksfcn`(7) man pages

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

The UNICOS 9.2 release includes two new man pages that provide the physical specifications of disk drives connected to systems with GigaRing I/O: `disksmpn`(7) and `disksfcn`(7). The `disksfcn`(7) man page provides specifications of disk drives connected to the FCN-1 and the `disksmpn`(7) man page provides specifications of disk drives connected to the MPN-1.

The specifications of disks connected to the IPN-1 remain in the `diskspec`(7) man page, along with the specifications of disks supported on systems with an I/O model E subsystem.

2.10.2 New xdd(4) and qdd(4) device drivers

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems with GigaRing I/O

UNICOS 9.2 supports `xdd`(4) and `qdd`(4) physical disk device interfaces for systems with GigaRing I/O; these interfaces are the counterparts to `pdd`(4) disk device interfaces on systems with an I/O subsystem model E.

Files in `/dev/pdd` with a major device number of `dev_qdd` are special files that allow read and write operations to physical disk devices connected to the IPSN-1. Files in `/dev/xdd` are special files that allow read and write operations to physical disk devices connected to the MPN-1 or the FCN-1.

For more information, see the `xdd`(4) and `qdd`(4) man pages and the section on file system planning in the *General UNICOS System Administration*, Cray Research publication SG–2301.

2.10.3 DD-501 disk drive support added for CRAY T90 and CRAY J90se systems

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: CRAY T90 and CRAY J90se systems

The DD-501 disk drive is now supported for CRAY T90 and CRAY J90se systems. This high-capacity disk drive supports the Elite-23 disk type.

The DD-501 disk drive offers a very low cost per unit storage, giving users an inexpensive way to store bulk data.

2.10.4 SSD support added for CRAY T90 systems

Initial release: UNICOS 9.2

Users affected: system administrators and site analysts

Hardware supported: CRAY T90 systems

The UNICOS 9.2 release introduced the GigaRing-based Solid State Disk (SSD) storage device known as the SSD-T90. This included special files in `/dev/ssdt` that allow read and write operations to the SSD-T90.

SSDs are generally used for I/O buffer memory to augment the central memory.

System administrators can configure the SSD-T90 as a disk device or as a secondary storage device:

- To configure the SSD-T90 as a disk device, see the `ssdt`(4) man page.
- To configure the SSD-T90 as SDS memory, see the *UNICOS Configuration Administrator's Guide*, Cray Research publication SG–2303.

5. Documentation

This section describes the following documentation that supports the UNICOS 9.0 release:

- New publications, including the reorganized system administration set and renamed and reclassified publications
- Publications no longer supporting the UNICOS release package
- Online documentation for UNICOS 9.0
- Printed documentation included with the UNICOS 9.0 release package (core set of documentation)
- Printed documentation available for purchase that supports the UNICOS 9.0 release

  Note: For the UNICOS 9.0 release, a core set of printed documentation is included with the release package; all other documentation is included as online documentation only. For a list of the core set of printed documentation, see subsection 5.4.1, page 5–17. For lists of all online documentation that is included with the release package, see subsection 5.3, page 5–9.

  Printed copies of documentation that you receive online as man pages, Docview files, or CrayDoc books may be purchased from Cray Research. If you elect to purchase a printed version of any online documentation that is included with the release package, you must order the publications separately from the UNICOS release package.

All Cray Research, Inc. publications referenced in this release overview can be ordered from the Cray Research Distribution Center. Also, this *UNICOS 9.0 Release Overview* is a public document and may be ordered from the Cray Research Distribution Center (stock number RO–5000 9.0).

5.1 New publications

The following publications are new since the UNICOS 8.0 base release.

- *UNICOS Shared File System (SFS) Administrator's Guide*, publication SG–2114 9.0. This guide documents the administration of the UNICOS SFS feature, which allows multiple Cray Research systems to access one or more shared file systems for read/write operations.
- *NQE User's Guide*, publication SG-2148 2.0. This publication describes how to use the Network Queueing Environment (NQE). A tutorial is provided. NQE user-level man pages are only available online. This manual is available through CrayDoc; it is not shipped with the release.
- *NQE Administration*, publication SG-2150 2.0. This publication provides information on configuring, operating, and monitoring NQE. It also describes how to set up load-balancing policies and use NQE cycle-stealing functionality. NQE administrator man pages are only available online. This manual is available through CrayDoc; it is not shippedwith the release.
- *Introducing NQE*, publication IN-2153 2.0. This publication provides an overview of NQE functionality and information on accessing online documents and obtaining support. This manual is available through CrayDoc; it is not shipped with the release.
- *UNICOS under UNICOS Administrator's Guide*, publication SG–2156 9.0. This guide provides administrators with information for installing, configuring, and running the UNICOS under UNICOS feature, which lets a site run two copies of the UNICOS operating system concurrently on a single Cray Research mainframe. This publication supports all Cray Research systems except the CRAY T90 series, the CRAY J90 series, and the CRAY EL series.
- *CRAY IOS-V Commands Reference Manual*, publication SR–2170 9.0. This manual provides administrators with information about IOS-V commands. This manual contains the printed version of the IOS-V man pages, which reside on a CRAY J90 system console.

- *CRAY IOS-V Messages*, publication SQ–2172 9.0. This publication is for system administrators and operators of CRAY J90 systems. It documents the messages produced by the Cray Research IOS-V on the CRAY J90 series. The document contains procedures for conducting IOS and UNICOS system dumps; procedures for recovering from a `root` (`/`) file system crash; definitions of PANIC messages; and definitions of WARNING messages.

- *UNICOS Installation Guide for the CRAY J90 Series*, publication SG–5271 9.0. This manual provides administrators with procedures for installing the CRAY J90 console software and the UNICOS operating system.

- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169 9.0. This manual provides administrators with an overview of ONC+, information about NIS+ (including planning for NIS+ and setting up and administering NIS+), and information about AUTH_KERB, a new RPC authentication type in ONC+.

- *Asynchronous Transfer Mode (ATM) Administrator's Guide*, publication SG–2193 1.0. This manual describes the Bus Based Gateway (BBG) and VME interfaces used with ATM 1.0 and includes the following sections: network requirements for BBG and VME interfaces; installation for BBG and VME interfaces; and a glossary of terms associated with ATM technology.

5.1.1 *Reorganized system administration set*

The system administration documentation formerly contained in *UNICOS System Administration*, publication SG–2113, has been reorganized and is now published in an 8-volume set of manuals. The manuals in the new system administration set and the topics they document are as follows:

- *General UNICOS System Administration*, publication SG–2301 9.0
  - Introduction to system administration
  - File system planning
  - UNICOS startup and shutdown procedures
  - File system maintenance
  - Basic administration tools
  - User database (UDB)
  - Crash and dump analysis
  - UNICOS multilevel security (MLS)
  - Online documentation features
- *UNICOS Resource Administration*, publication SG–2302 9.0
  - Accounting
  - Automated incident reporting (AIR)
  - Fair-share scheduler
  - File system quotas
  - File system space monitoring
  - System activity monitoring
  - Unified Resource Manager (URM)
- *UNICOS Configuration Administrator's Guide*, publication SG–2303 9.0
  - Sections and parameters of the configuration file
  - Run-time configuration files

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304 9.0
  - TCP/IP
  - NFS
  - NIS and NIS+
  - Cray-based network monitor
- *UNICOS NQS and NQE Administrator's Guide*, publication SG–2305 9.0
  - NQS
  - NQX (NQE for UNICOS)
- *Kerberos Administrator's Guide*, publication SG–2306 9.0
  - Introduction to Cray Research Kerberos
  - Implementing Kerberos
  - Configuring Kerberos
  - Troubleshooting
- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307 9.0
  - Tape administration commands
  - Tape configuration
  - Miscellaneous tape information
  - Tape troubleshooting
- *UNICOS Station Call Processor (USCP) Administrator's Guide*, publication SG–2308 9.0; this publication supports all Cray Research systems except the CRAY J90 series and the CRAY EL series.
  - USCP installation
  - Daily use and operational tips
  - USCP troubleshooting
  - USCP internals
  - Other USCP topics

5.1.2 *Renamed and reclassified publications*

The following publications have been renamed. Changes in content related to the renaming are described.

- *UNICOS System Libraries Reference Manua*l, publication SR–2080 9.0, formerly titled *UNICOS C Library Reference Manual*. This manual now includes man pages for all system libraries released with UNICOS. In the past, it included only libraries in `libc`.
- *UNICOS System Libraries Ready Reference*, publication SQ–2147 9.0, formerly titled *UNICOS C Library Ready Reference*. This document now includes man page summaries for all system libraries released with UNICOS. In the past, it included only libraries in `libc`.
- *TCP/IP Network User's Guide*, publication SG–2009 9.0, formerly titled *TCP/IP and OSI Network User's Guide*. Information on OSI has been removed from this document.
- *Cray Assembly Language (CAL) for Cray PVP Systems Reference Manual*, publication SR–3108 9.0, formerly titled *CRAY Y-MP Computer System CAL Assembler Version 2 Reference Manual*. Information on the CRAY T90 and CRAY J90 instruction sets has been added.
- *Cray Assembly Language (CAL) for Cray PVP Systems Ready Reference*, publication SQ–3110 9.0, formerly titled *CRAY Y-MP Computer System CAL Assembler Version 2 Ready Reference*. Information on the CRAY T90 and CRAY J90 instruction sets has been added.
- *UNICOS Standard Shell Reference Card*, publication SQ–2115 9.0, formerly titled *UNICOS Korn Shell Reference Card*. The card has been updated to reflect changes made to the shell to comply with the XPG4 standard.
- *Online Maintenance Tools Guide for Cray PVP Systems*, publication SD–1012 9.0, formerly titled *CRAY Y-MP, CRAY X-MP EA, and CRAY X-MP Computer Systems UNICOS Online Diagnostic Maintenance Manual*. Information on CRAY X-MP EA and CRAY X-MP systems has been removed. Information on CRAY T90 systems has been added to the `olhpa`(8) section of this manual.

- *UNICOS Installation/Configuration Menu System User's Guide*, publication SG–2412 9.0, formerly titled *UNICOS Installation Tool Menus and Help Files Reference Manual*. The manual now focuses exclusively on the UNICOS installation tool menu system interface. The sections that reproduced the installation tool menus and help files have been deleted.
- *UNICOS Basic Administration Guide for CRAY J90 Series and CRAY EL Series*, publication SG–2416 9.0, formerly titled *UNICOS Basic Administration Guide for the CRAY EL Series*. Information on administering CRAY J90 systems has been added.

The following online diagnostics publications have been reclassified from proprietary to private. These publications can be ordered by any Cray Research customer with a UNICOS System Software license. The publication prefix has changed from SPM to SD to reflect this change in classification.

- *Online Maintenance Tools Guide for Cray PVP Systems*, publication SD–1012 9.0
- *OLNET Online Diagnostic Network Communications Program Maintenance Manual for UNICOS*, publication SD–1021 9.0; this publication supports all Cray Research systems except the CRAY J90 series and the CRAY EL series.

5.2 Publications no longer supporting the UNICOS release package

The following subsections list publications that were previously released with the UNICOS system that are now included in a different software release or are no longer supported.

5.2.1 *Publications now included in programming environment releases*

The following publications were previously released with the UNICOS system but are now included with the programming environment releases (except where noted).

Note: These publications have been updated since the UNICOS 8.0 release. If your site is running these products, please make sure that you are using the correct version of the publication for your site's software level.

- *UNICOS Performance Utilities Reference Manual*, publication SR–2040, has been replaced by *Tuning Guide to Parallel Vector Applications*, publication SG–2182.
- *UNICOS Fortran Library Reference Manual*, publication SR–2079, has been split into the following two publications:
  - *Application Programmer's Library Reference Manual*, publication SG–2165, which contains information on the FFIO library routines, most Fortran library routines, Fortran intrinsics, the I/O routines, search routines, and synchronization routines.
  - *UNICOS System Libraries Reference Manual*, publication SR–2080, which contains information on the majority of C routines, and on Fortran sort and multitasking routines. This publication will continue to be released with the UNICOS system and will be available beginning with UNICOS 9.0.
- *UNICOS Fortran Library Ready Reference*, publication SQ–2145, has been split into the following two publications:
  - *Introducing CrayLibs*, publication IN–2167, which can be used as a ready reference for all libraries released with the programming environments.
  - *UNICOS System Libraries Ready Reference*, publication SQ–2147, which contains ready reference information on the majority of C routines and on Fortran sort and multitasking routines. This publication will continue to be released with the UNICOS system and will be available beginning with UNICOS 9.0.
- *I/O User's Guide*, publication SG–3075, and *Advanced I/O User's Guide*, publication SG–3076, have been replaced by *Application Programmer's I/O Guide*, publication SG–2168.

5.2.2 *Publications now included in the support system and IOS-E release*

The following publications were previously released with the UNICOS system but are now released with the support system and IOS-E release. See the *Support System and IOS-E Release Overview*, publication RO–5060, for information on ordering these manuals. The following publications support all Cray Research systems except the CRAY J90 series and the CRAY EL series:

- *Support System Reference Manual*, publication SR–3077
- *Support System Operator's Guide*, publication SG–3078
- *Support System Administrator's Guide*, publication SG–3079
- *Support System Ready Reference*, publication SQ–3080
- *Support System and IOS-E Release Overview*, publication RO–5060

5.2.3 *Publications no longer supported*

The following publications are no longer supported:

- The *UNICOS Trusted Network Interface Specification*, publication SN–2133
- *UNICOS Index for Man Pages*, publication SR–2049
- *UNICOS Tuning Guide*, publication SR–2099
- *UNICOS Installation and Configuration Tool Reference Manual*, publication SR–3090

5.3 Online documentation for UNICOS 9.0

The following types of online information products are available to UNICOS 9.0 release customers:

- CrayDoc, which is a workstation-based electronic documentation reader. For more information, see subsection 5.3.1, page 5–10.

- Man pages, which describe a particular element of the UNICOS operating system or a compatible product. To see a detailed description of a particular command or routine, use the `man`(1) command. For more information, see subsection 5.3.3, page 5–15.
- UNICOS message system, which provides explanations of error messages. To see an explanation of a message, use the `explain`(1) command.
- Cray Research online glossary, which explains the terms used in a manual. To view a definition, use the `define`(1) command.
- Docview text-viewer system, which lets you see the text of a manual online. The Docview system is available on the Cray Research mainframe. To start the Docview system, use the `docview`(1) command on the Cray Research mainframe.

  For more information, see subsection 5.3.2, page 5–13.

For detailed information on these topics, see the *User's Guide to Online Information*, publication SG–2143.

5.3.1 *CrayDoc*

The following subsections describe the CrayDoc electronic documentation reader and list the UNICOS 9.0 documents available for viewing in CrayDoc.

5.3.1.1 *What is CrayDoc?*

CrayDoc is a workstation-based electronic documentation reader that includes graphics, hypertext links, and quick information retrieval searches. You can use CrayDoc to view documentation at your workstation, to print selected sections of a book, to print an entire book, to print to a PostScript file for viewing by using a PostScript viewer, or to export the Standard Generalized Markup Language (SGML)-tagged information for further filtering or viewing.

CrayDoc is delivered on a CD-ROM disk that contains the reader and the associated documentation.

For more information about CrayDoc, see the following documents:

- *CrayDoc Reference Card*, publication SQ–6101
- *CrayDoc Installation Guide*, publication SG–6103
- *Reader Guide to UNIX* (available online in CrayDoc)
- *User's Guide to Online Information*, publication SG–2143
- cdoc(1) man page

5.3.1.2 *UNICOS 9.0 release publications distributed through CrayDoc*

- *General UNICOS System Administration*, publication SG–2301 9.0
- *UNICOS Resource Administration*, publication SG–2302 9.0
- *UNICOS Configuration Administrator's Guide*, publication SG–2303 9.0
- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304 9.0
- *UNICOS NQS and NQE Administrator's Guide*, publication SG–2305 9.0
- *Kerberos Administrator's Guide*, publication SG–2306 9.0
- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307 9.0
- *UNICOS Station Call Processor (USCP) Administrator's Guide*, publication SG–2308 9.0
- *UNICOS Installation/Configuration Tool User's Guide*, publication SG–2412 9.0
- *UNICOS Message System Programmer's Guide*, publication SG–2121 9.0
- *NQE User's Guide*, publication SG–2148 2.0
- *NQE Administrator's Guide*, publication SG–2150 2.0
- *Introducing NQE*, publication IN–2153 2.0
- *UNICOS under UNICOS Administrator's Guide*, publication SG–2156 9.0

- *Segment Loader (SEGLDR) and ld Reference Manual*, publication SR–0066 9.0
- *Remote Procedure Call (RPC) Reference Manual*, publication SR–2089 9.0
- *UNICOS X Window System Reference Manual*, publication SR–2101 8.0
- *TCP/IP Network User's Guide*, publication SG–2009 9.0
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051 9.0
- *Network Queuing System (NQS) User's Guide*, publication SG–2105 9.0
- *UNICOS Multilevel Security (MLS) Feature User's Guide*, publication SG–2111 9.0
- *UNICOS System Security Overview for Administrators*, publication SG–2141 9.0
- *FTA User and Administrator Manual*, publication SG–2144 5.0
- *Kerberos User's Guide*, publication SG–2409 9.0
- *User's Guide to Online Information*, publication SG–2143 8.0
- *Online Maintenance Tools Guide for Cray PVP Systems*, publication SD–1012 9.0
- *OLNET Online Diagnostic Network Communications Program Maintenance Manual for UNICOS*, publication SD–1021 9.0.
- *UNICOS Shared File System (SFS) Administrator's Guide*, publication SG–2114 9.0
- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169 9.0
- *Asynchronous Transfer Mode (ATM) Administrator's Guide*, publication SG–2193 9.0
- *Cray Assembly Language (CAL) for Cray PVP Systems Reference Manual*, publication SR–3108
- *UNICOS Visual Interfaces User's Guide*, publication SG–3094 8.0

- *CRAY IOS-V Messages*, publication SQ–2172 9.0†
- *UNICOS Basic Administration Guide for CRAY J90 Series and CRAY EL Series*, publication SG–2416 9.0†
- *Software Overview for Users*, publication SG–2052 9.0†

5.3.2 *Docview*

The Docview program provides online access to a library of printed Cray Research documents and local documents supplied by your site. Use Docview to find information in a publication or publications, or to query available documents for information on a specified topic. You can view the information online, write it to disk, or (in the X Window System version) print a hard copy.

For more information on the Docview utility, see the *User's Guide to Online Information*, publication SG–2143 8.0.

Some UNICOS publications are available in Docview. The `docexec` command builds and maintains the database of documents. Customers can use `docexec`(1) to add their own documentation into the Docview library. The `docexec`(1) utility is documented in *General UNICOS System Administration*, publication SG–2301, "Administration of Online Documentation" section, and on the `docexec`(1) man page.

The following UNICOS publications have been updated in Docview for the UNICOS 9.0 release.

> **Note:** The UNICOS 9.0 release is the last release for which documentation will be delivered in Docview format. You will be able to access documents already in Docview format until software support for the UNICOS 9.0 release ends.

- *General UNICOS System Administration*, publication SG–2301 9.0
- *UNICOS Resource Administration*, publication SG–2302 9.0
- *UNICOS Configuration Administrator's Guide*, publication SG–2303 9.0

† These publications will be provided in CrayDoc at the time UNICOS 9.0 is available for CRAY J90 systems.

- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304 9.0
- *UNICOS NQS and NQE Administrator's Guide*, publication SG–2305 9.0
- *Kerberos Administrator's Guide*, publication SG–2306 9.0
- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307 9.0
- *UNICOS Station Call Processor (USCP) Administrator's Guide*, publication SG–2308 9.0
- *UNICOS Installation/Configuration Menu System User's Guide*, publication SG–2412 9.0
- *UNICOS under UNICOS Administrator's Guide*, publication SG–2156 9.0
- *UNICOS Shared File System (SFS) Administrator's Guide*, publication SG–2114 9.0
- *Segment Loader (SEGLDR) and* `ld` *Reference Manual*, publication SR–0066 9.0
- *Remote Procedure Call (RPC) Reference Manual*, publication SR–2089 9.0
- *UNICOS X Window System Reference Manual*, publication SR–2101 8.0
- *TCP/IP Network User's Guide*, publication SG–2009 9.0
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051 9.0
- *Network Queuing System (NQS) User's Guide*, publication SG–2105 9.0
- *UNICOS Multilevel Security (MLS) Feature User's Guide*, publication SG–2111 9.0
- *UNICOS Message System Programmer's Guide*, publication SG–2121 9.0
- *UNICOS System Security Overview for Administrators*, publication SG–2141 9.0
- *User's Guide to Online Information*, publication SG–2143 8.0

- *FTA User and Administrator Manual*, publication SG–2144 5.0
- *Kerberos User's Guide*, publication SG–2409 9.0
- *Front-end Protocol Internal Reference Manual*, publication SM–0042 6.0
- *Trusted UNICOS Trusted Computing Base (TCB) Definition* (available through Docview only)
- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169 9.0
- *Asynchronous Transfer Mode (ATM) Administrator's Guide*, publication SG–2193 9.0
- *Cray Assembly Language (CAL) for Cray PVP Systems Reference Manual*, publication SR–3108 9.0
- *UNICOS Visual Interfaces User's Guide*, publication SG–3094 8.0
- *CRI Software Documentation Map*
- *UNICOS Basic Administration Guide for CRAY J90 Series and CRAY EL Series*, publication SG–2416 9.0†
- *Software Overview for Users*, publication SG–2052 9.0†
- *UNICOS 9.0 Release Overview*, publication RO–5000 9.0†

5.3.3 *Man pages*

Some reference information for the UNICOS system is available with the UNICOS release package as online, pre-formatted files called manual (man) pages. The man pages can be accessed by using the `man`(1) command.

> **Note:** For the UNICOS 9.0 release, Cray Research continues to distribute formatted files (`catman` files) of the man pages, but nroff/troff source files are no longer orderable. This change follows the trend of other UNIX vendors and reduces support costs.

† These publications will be provided in Docview in a UNICOS 9.0 update.

The online versions of man pages contain the most current technical information. Updated online man pages are distributed for each UNICOS revision release. The updated printed man pages are available only with UNICOS major releases.

> **Note:** The *CRAY EL Series IOS Commands Reference Manual*, publication SR–2408, was not reprinted; only the online version of the man pages are provided with the UNICOS 9.0 release.

The following ready reference documents contain brief man page descriptions and will be shipped with the UNICOS 9.0 release:

- *UNICOS User Commands Ready Reference*, publication SQ–2056 9.0
- *UNICOS Administrator Commands Ready Reference*, publication SQ–2413 9.0
- *UNICOS System Libraries Ready Reference*, publication SQ–2147 9.0

The following printed publications contain man pages:

- *UNICOS User Commands Reference Manual,* publication SR–2011 9.0
- *UNICOS Administrator Commands Reference Manual*, publication SR–2022 9.0
- *CRAY IOS-V Commands Reference Manual*, publication SR–2170 9.0
- *UNICOS File Formats and Special Files Reference Manual*, publication SR–2014 9.0
- *UNICOS System Libraries Reference Manual*, publication SR–2080 9.0
- *UNICOS System Calls Reference Manual*, publication SR–2012 9.0
- *UNICOS Macros and Opdefs Reference Manual*, publication SR–2403 9.0

The UNICOS 9.0 release includes functional indexes in online form. These indexes are accessed by using the `man` command-line options `-k` and `-i`, respectively. These options search the indexes for keywords and functional descriptions.

Both online and printed man pages include vertical change bars to indicate recent technical changes. In the UNICOS 9.0 release, change bars indicate all technical changes made since the previous printing of the publication.

5.3.4 *Release overview distribution*

You can access this release overview electronically; ASCII, PostScript, and Docview files are available on the Cray Research CRInform system, which is an online information and problem-reporting system for Cray Research customers and Cray Research personnel.

For more information on CRInform, see subsection 6.3, page 6–2.

If you do not have access to the CRInform system but would like a copy of the files, contact your Cray Research representative.

For more information on the Docview program, see subsection 5.3.2, page 5–13.

5.4 Printed documentation available for the UNICOS release

The printed documentation listed in the following subsections is available to support the UNICOS 9.0 release.

The core set of printed documentation is included with the UNICOS 9.0 release package. Additional printed documentation for the UNICIOS 9.0 release is available for purchase from Cray Research. (This documentation is provided with the release in one or more of the online forms.)

The core set and the additional documents available for purchase are listed in the following subsections.

5.4.1 *Core set of documentation included with the release package*

The following publications are the core set of documentation included with the UNICOS 9.0 release package. The core set of documentation contains information that is needed by the

administrator or analyst to install or configure the system when it is not convenient to access the man command or an online documentation viewer.

- *UNICOS 9.0 Release Overview*, publication RO–5000 9.0
- The appropriate UNICOS installation guide for your system:
  - *UNICOS Installation Guide*, publication SG–2112 9.0
  - *UNICOS Installation Guide for the CRAY J90 Series*, publication SG–5271 9.0
  - *UNICOS Installation Guide for the CRAY EL Series*, publication SG–5201 9.0
- *UNICOS Installation Menu System Reference Card*, publication SQ–2411 9.0
- *UNICOS Installation/Configuration Menu System User's Guide*, publication SG–2412 9.0
- *General UNICOS System Administration*, publication SG–2301 9.0
- *UNICOS Resource Administration*, publication SG–2302 9.0
- *UNICOS Configuration Administrator's Guide*, publication SG–2303 9.0
- *UNICOS Networking Facilities Administrator's Guide*, publication SG–2304 9.0
- *UNICOS NQS and NQE Administrator's Guide*, publication SG–2305 9.0
- *UNICOS Tape Subsystem Administrator's Guide*, publication SG–2307 9.0
- *UNICOS Administrator Commands Ready Reference*, publication SQ–2413 9.0
- *UNICOS User Commands Ready Reference*, publication SQ–2056 9.0
- *UNICOS System Libraries Ready Reference*, publication SQ–2147 9.0
- *User's Guide to Online Information*, publication SG–2143 8.0

- *Online Maintenance Tools Guide for Cray PVP Systems*, publication SD–1012 9.0
- *OLNET Online Diagnostic Network Communications Program Maintenance Manual for UNICOS*, publication SD–1021 9.0; this publication does not support the CRAY J90 series or the CRAY Y-MP EL series.

CRAY J90 sites also receive the following publications:

- *UNICOS Basic Administration Guide for CRAY J90 Series and CRAY EL Series*, publication SG–2416 9.0
- *CRAY IOS-V Messages*, publication SQ–2172 3/95

CRAY EL sites also receive the following publications:

- *UNICOS Basic Administration Guide for CRAY J90 Series and CRAY EL Series*, publication SG–2416 9.0
- *CRAY EL Series IOS Commands Ready Reference* publication SQ–2162 8.0
- *CRAY EL Series IOS Messages*, publication SQ–2402 8/93

5.4.2 *Additional documents available for purchase*

The following printed manuals support the UNICOS 9.0 release, are distributed online in one or more forms, but must be purchased in hardcopy.

- *UNICOS Administrator Commands Reference Manual*, publication SR–2022 9.0
- *UNICOS File Formats and Special Files Reference Manual*, publication SR–2014 9.0
- *UNICOS User Commands Reference Manual*, publication SR–2011 9.0
- *CRAY IOS-V Commands Reference Manual*, publication SR–2170 for the CRAY J90 series
- *CRAY EL Series IOS Commands Reference Manual*, publication SR–2408 8.0

- *Segment Loader (SEGLDR) and ld Reference Manual*, publication SR–0066 9.0
- *UNICOS System Calls Reference Manual*, publication SR–2012 9.0
- *UNICOS System Libraries Reference Manual*, publication SR–2080 9.0
- *Remote Procedure Call (RPC) Reference Manual*, publication SR–2089 9.0
- *UNICOS X Window System Reference Manual*, publication SR–2101 8.0
- *ONC+ Technology for the UNICOS Operating System*, publication SG–2169 9.0.
- *UNICOS Macros and Opdefs Reference Manual*, publication SR–2403 9.0
- *Cray Assembly Language (CAL) for Cray PVP Systems Reference Manual*, publication SR–3108 9.0
- *Kerberos Administrator's Guide*, publication SG–2306 9.0
- *UNICOS under UNICOS Administrator's Guide*, publication SG–2156 9.0; this publication does not support the CRAY Y-MP EL system or the CRAY EL98 system.
- *UNICOS Shared File System (SFS) Administrator's Guide*, publication SG–2114 9.0
- *Asynchronous Transfer Mode (ATM) Administrator's Guide*, publication SG–2193 1.0
- *UNICOS Station Call Processor (USCP) Administrator's Guide*, publication SG–2308 9.0
- *TCP/IP Network User's Guide*, publication SG–2009 9.0
- *UNICOS Tape Subsystem User's Guide*, publication SG–2051 9.0
- *Network Queuing System (NQS) User's Guide*, publication SG–2105 9.0
- *UNICOS Multilevel Security (MLS) Feature User's Guide*, publication SG–2111 9.0

- *UNICOS Message System Programmer's Guide*, publication SG–2121 9.0
- *UNICOS System Security Overview for Administrators*, publication SG–2141 9.0
- *FTA User and Administrator Manual*, publication SG–2144 5.0
- *Kerberos User's Guide*, publication SG–2409 9.0
- *UNICOS Visual Interfaces User's Guide*, publication SG–3094 8.0
- *Segment Loader (SEGLDR) and `ld` Ready Reference*, SQ–0303 9.0
- *UNICOS `vi` Reference Card*, publication SQ–2054
- *UNICOS `ed` Reference Card*, publication SQ–2055 A
- *UNICOS Environment Variables Ready Reference*, publication SQ–2117 7.0
- *UNICOS `nmake` Reference Card*, publication SQ–2146 8.0
- *X Window System Resources Ready Reference*, publication SQ–2123 8.0
- *UNICOS Standard Shell Reference Card*, publication SQ–2115 9.0†
- *Software Documentation Ready Reference*, publication SQ–2122 9.0†
- *Front-end Protocol Internal Reference Manual*, publication SM–0042 6.0; this publication does not support CRAY J90 series or CRAY EL series.
- *DCA-2 and DCA-3 Disk Error Recovery Technical Note*, publication SPN–2102 8.0; this publication does not support CRAY J90 series or CRAY EL series.
- *Cray Assembly Language (CAL) for Cray PVP Systems Ready Reference*, publication SQ–3110 9.0
- *Software Overview for Users*, publication SG–2052 9.0†

† These publications will available for purchase shortly after the release of UNICOS 9.0.

5.4.3 *Publications ordering information*

Publications not included in the core set of materials for the UNICOS 9.0 release can be ordered in the following ways:

- The CRInform online ordering service. The publications order form can be accessed by the following steps from the CRInform home page:
  - Under the heading of **General Service Information**, choose *Publications*.
  - On the *Publications* page, choose **[Order Form]**.
- Call the Cray Research Distribution Center in Mendota Heights, MN, using one of the following telephone numbers:
  - 1–800–284–2729, extension 35907
  - +1–612–683–5907
- Fax your order to +1–612–452–0141.
- Send electronic mail to: `orderdsk@sdiv.cray.com`
- Contact your Cray Research representative.

Compatibilities and Differences [3]

This chapter describes the user and system administration issues that are involved in the upgrade from the UNICOS 9.0 release to the UNICOS 10.0 release.

Each compatibility and difference documented in this section lists the type of user and type of hardware affected. For definitions of the terms used, see the Conventions section in the Preface.

3.1 Compatibility statement

To meet user requirements for compatibility between UNICOS 9.0 and UNICOS 10.0, upward compatibility is provided in subsequent releases of the system and products in the following areas:

- Upgrade paths
- UNICOS user commands
- Standard language syntax, semantics, and Cray Research extensions
- Absolute binary code
- Relocatable binary code

This section describes any changes introduced since UNICOS 9.0 for the following reasons:

- Hardware changes
- Third-party software changes
- Improved software design or numerical techniques
- Bug fixes

3.2 UNICOS 10.0 support for J90 VME-based and J90se GigaRing-based systems

Initial release: UNICOS 10.0

Users affected: all

Hardware supported: CRAY J90 systems with VME I/O and CRAY J90se systems with GigaRing based I/O.

UNICOS 10.0 is the first release to support both J90 systems with VME I/O and J90se systems with GigaRing based I/O. In addition, customers with J90se CPUs and VME I/O can now compile as if the system is a J90se rather than a CRAY Y-MP.

3.3 Tested and supported upgrade paths

Sites running any version of UNICOS 9.0 or any 9.X IDS restricted releases on one of the supported hardware platforms can upgrade directly to UNICOS 10.0.

Customers running any version prior to UNICOS 9.0 must first perform an upgrade installation to the UNICOS 9.0 release, then upgrade to UNICOS 10.0.

Warning: Checkpoint and restart are not supported across upgrades from the UNICOS 9.0 operating system (or revisions) to the UNICOS 10.0 operating system. Make sure all running job requests are complete before you upgrade to the UNICOS 10.0 operating system.

Initial installs of GigaRing-based systems have been supported since UNICOS 9.2; while support of initial installs of Model-E based systems stopped after UNICOS 9.1.

Note: If you have a *non*-GigaRing system and you wish to upgrade to a GigaRing-based system, you must perform an initial install.

For more information, see the following publications:

- *UNICOS Installation Guide for CRAY J90 Model V based Systems*, Cray Research publication SG–5271 10.0
- *UNICOS Installation Guide for CRAY J90se GigaRing based Systems*, Cray Research publication SG–5296 10.0
- *UNICOS Installation Guide for CRAY C90, CRAY T90, and CRAY T90 IEEE Model E based Systems*, Cray Research publication SG–5297 10.0
- *UNICOS Installation Guide for CRAY T90 and CRAY T90 IEEE GigaRing based Systems*, Cray Research publication SG–5298 10.0

Contact your Cray Research representative for further information.

3.4 Operating system

The following sections describe operating system changes for UNICOS 10.0 that differ from UNICOS 9.0.

3.4.1 UNICOS 8.0 release no longer supported

Initial release: UNICOS 9.1 (announced)

Users affected: all

Hardware supported: all Cray Research systems

Support for the UNICOS 8.0 release ended on September 30, 1996.

For Cray systems with an IOS model D, UNICOS 8.0 and its related products were supported with updates, as needed, from September 30, 1996, through September 30, 1997.

3.4.2 Continued support for GigaRing

Initial release: UNICOS 9.3

Users affected: system administrators and site analysts

Hardware supported: Cray T90 systems with GigaRing-based I/O, Cray J90 systems with GigaRing-based I/O

The UNICOS 10.0 system supports the sending and receiving of message and memory-mapped register (MMR) packets to GigaRing I/O nodes, introduced with UNICOS 9.3. The `/dev/fmsg` directory contains the character special nodes that provide a general purpose interface from the UNICOS system to the GigaRing message complex. These nodes are created with the `mkfm`(8) command. For information on the files in `/dev/fmsg`, see the `fmsg`(8) man page.

The `fping`(8) command sends an echo packet to a GigaRing node. The `mmr`(8) command reads or writes a GigaRing MMR register. These commands use the files in the `/dev/fmsg` directory.

For more information, see the `fmsg`(4), `fping`(8), `mkfm`(8), and `mmr`(8) man pages.

3.4.3 Ability to disable core files reinstated

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: all Cray Research systems

The `limit` command has been changed to allow you to disable the creation of core files. This feature was removed from UNICOS 8.0, but was reinstated in the UNICOS 9.3 release.

This feature adds an extra option to the `limit`(1) command and `limit`(2) system call. These options allow you to disable core file creation.

The `limit`(1) command syntax for this feature is as follows:

```
limit -d nocore
```

The `limit`(2) system call syntax has been enhanced to accept a new limit of `NO_CORE_FILES`. For example:

```
limit (C_PROC, 0, LCORE, NO_CORE_FILES)
```

For more information, see the `limit`(1) and `limit`(2) man pages.

3.4.4 Support removed for `libwatch.a` library

Initial release: UNICOS 9.3

Users affected: all

Hardware supported: all Cray Research systems

The `libwatch.a` library and the `watchword`(7) man page are no longer supported. They have been removed with the CDBX debugger and CF77 compiler.

3.4.5 New capability added to UNICOS source manager (USM)

Initial release: UNICOS 10.0

Users affected: administrators

Hardware supported: all Cray Research systems

The UNICOS source manager has been upgraded for UNICOS 10.0: a new PL type, "`f`", has been added to support Editions.

See Section 2.4.8, page 13 for more information. Also, see *UNICOS Source Manager (USM) User's Guide*, Cray Research publication SG–2097 10.0.

3.5 Installation, configuration and utilities

This section describes installation, configuration and utilities changes for UNICOS 10.0 that differ from UNICOS 9.0.

3.5.1 Checkpoint / restart warning

Warning: Checkpoint and restart are not supported across upgrades from the UNICOS 9.0 operating system (or revisions) to the UNICOS 10.0 operating system. Make sure all running job requests are complete before you upgrade to the UNICOS 10.0 operating system.

3.5.2 Common installation tool (CIT)

Initial release: UNICOS 9.2, UNICOS 9.3 for CRAY T90 Model E based systems and GigaRing based systems, UNICOS 10.0 for CRAY C90 systems and CRAY J90 Model V based systems

Users affected: administrators

Hardware affected: all Cray Research systems

The Common Installation Tool (CIT) is now the required tool for all hardware platforms for initial and upgrade software installations. Subsequently, no other installation tools are supported.

As a result of the CIT use requirement, sites must address several issues to upgrade to UNICOS 10.0:

- The OWS or console must be on the same network as the Cray mainframe to install UNICOS 10.0. If you wish, you can remove the console from the network after the software has been installed.
- You site's security requirements may demand dedicated time to install or upgrade to UNICOS 10.0.

For more information, see the *Common Installation Tool (CIT) Reference Card*, Cray Research publication SQ–2218.

3.5.2.1 CD-ROM media

Initial release: UNICOS 10.0

Users affected: administrators

Hardware affected: all Cray Research systems supported by UNICOS 10.0

Beginning with UNICOS 10.0 and the requirement to use CIT, DAT media will be discontinued, and all Cray software will be shipped on CD-ROM media. As a result, all asynchronous software ordered after you upgrade to UNICOS 10.0 will be packaged on CD-ROM, and can only be loaded through CIT.

3.5.3 Docview utilities not supported

Initial release: UNICOS 9.2

Users affected: all

The UNICOS 9.0 release was the final major release that delivered documentation in Docview format.

Cray Research now provides online versions of manuals through the DynaWeb online information server.

A DynaWeb CD-ROM containing the documentation is included with the release.

As a result of this change in support, the following configuration files are now obsolete:

- `/etc/config/docpath`
- `/etc/config/docview_config`

See Chapter 4, page 81 for more information.

3.5.4 File manager, `xfm`(1), not supported

Initial release: UNICOS 9.2

Users affected: end user

Hardware supported: all Cray Research systems

The UNICOS 9.0 release was the final major release supporting the File Manager, `xfm`(1). The `xfm`(1) utility is a prototype that provides a visual too, based on the X Window System, to perform file management for the UNICOS system. When `xfm`(1) is retired, there will be no X Window System-based file manager tool on the UNICOS operating system. In the future, the Common Desktop Environment (CDE) will provide a file manager as part of the desktop; however, CDE may not be available at the time `xfm`(1) is retired.

3.5.5 Process monitor, `xproc`(1), not supported

Initial release: UNICOS 9.2

Users affected: end users

Hardware supported: all Cray Research systems

The UNICOS 9.0 release was the final major release supporting the process monitor `xproc`(1). The `xproc`(1) utility provides a visual tool, based on the X Window System, that displays and controls UNICOS processes and NQE jobs. Users who install NQE will be able to display and control NQS jobs. The `ps`(1) and `kill`(1) commands can be used to display and control UNICOS processes.

3.5.6 `getconf`(1) user command moved

Initial release: UNICOS 9.2

Users affected: administrators, programmer, end users

Hardware supported: all Cray Research systems

The `getconf`(1) user command has been moved from `/usr/bin` to `/bin`. If the entire *pathname* of this command is used in any application, this directory change must be noted. This change was made so that `getconf` would be available for use during startup when the `/usr` directory is not yet mounted.

3.5.7 Build menu support for J90 source packages

Initial release: UNICOS 9.3

Users affected: system administrators

Hardware supported: CRAY J90 systems

The install tool build menu now allows full system builds for CRAY J90 systems from within the install tool. A new selection, `Release Type`, has been added to the main build menu for this purpose. This allows you to specify which system components have been installed in `/usr/src`, and to control which components will be built.

If you select `Executable`, only the `uts` component of the system will be built. Otherwise, all standard components of `/usr/src` are built whether or not the system is a CRAY J90.

Note: On CRAY J90 systems, the default release type is `executable`. The default on all other systems is `source`.

3.5.8 MLS and Security Privileges for Installation and Upgrades

Initial release: UNICOS 10.0

Users affected: administrators

Hardware affected: all Cray Research systems supported by UNICOS 10.0

You must have appropriate MLS and security privileges to upgrade to UNICOS 10.0. Accordingly, there are several issues which can determine whether or not you are able to upgrade in multi-user mode, or in dedicated time with networks up and running:

- If your site does not run MLS, or if you run MLS `PRIV_SU` with PALS, you only need super-user (root) privileges to install UNICOS 10.0.
- If you are running MLS TFM, you must have super-user (root) privileges to install UNICOS 10.0. You must also have the `reclsfy`, `install` and `suidgid` permissions, authorized categories `secadm` and `sysfil`, and maximum integrity class 16.
- If you are running Trusted UNICOS, you must reboot your system with the `PRIV_SU` kernel before you can install UNICOS 10.0. Once your system is rebooted, you will need super-user (root) privileges to install UNICOS 10.0.

  Note: You may need dedicated time to reboot your system.
- If you run UNICOS without the `NNETW_RCMD_COMPAT` bit set in the `SECURE_NET_OPTIONS` bit mask, you must reboot your system with this bit enabled. This is because CIT uses `.rhosts` to facilitate the transfer of packages from the J90 console to the Cray mainframe.

If you plan to upgrade from UNICOS 10.0 to the next release of UNICOS 10.0 and your site is running with PAL only and no PRIV_SU, you must:

1. Reboot your system with a PRIV_SU kernel during dedicated time.
2. Perform the software upgrade.
3. Go back to running PAL only with out PRIV_SU.

Cray Research does not support direct upgrades from PAL-only to PAL-only systems.

3.6 Multilevel Security

The following sections describe the differences between UNICOS 9.0 and UNICOS 10.0 regarding multilevel security (MLS).

Note: All of these items were first announced in the *UNICOS Release Overview*, Cray Research publication RO–5000 9.0.

3.6.1 PRIV_TFM support removed from multilevel security

Users affected: administrators, end users, operators

Hardware supported: all Cray Research systems

Support for UNICOS MLS systems with PRIV_TFM have been dropped as of UNICOS 10.0, and the PRIV_TFM configuration option is no longer available through the UNICOS Installation/Configuration Menu system.

Support for the tsubcmd(8) and udbcmd(8) commands and their associated man pages have been dropped. Also, all references to 7.0 TFMgmt and or PRIV_TFM have been removed from UNICOS 10.0 documentation.

Support for the SYSTEM_ADMIN, SECURE_SYSTEM_CONSOLE, and SECURE_OPERATOR_CONSOLE configuration parameters has been dropped with UNICOS 10.0.

System calls and commands that manage PRIV_TFM user classes, file classes, and file categories are still available in UNICOS 10.0. However, setting user class, file class, and file category attributes are no longer useful because UNICOS no longer uses those attributes to make security-related decisions.

3.6.2 Password required for sysadm category to su

Users affected: administrators

Hardware supported: all Cray Research systems

A user with an active `sysadm` category can no longer use the `su`(1) command without supplying a password. This change affects sites using UNICOS MLS systems with privilege assignment lists (PALs). The supported PAL for `/bin/su` was updated to remove the `sysadm` PAL category record. The `su`(1) man page was updated to reflect this change.

This change was introduced to prevent users with a `sysadm` category from gaining other types of administrative capabilities by invoking the `su`(1) command without a password. This would enable them to assume the identity of another administrator, and subsequently use facilities that perform reauthentication.

Sites that do not approve of the new restriction and are willing to assume the risks of preserving the previous functionality, can add the original `/bin/su` PAL definition to the `/etc/config/localpriv.db` file.

3.6.3 UNICOS non-MLS and MLS systems merged

Users affected: administrators, end users

Hardware supported: all Cray Research systems

With the UNICOS 9.2 release, support for the `CONFIG_SECURE` parameter was dropped, and all MLS features were incorporated into the UNICOS system.

Combining the non-MLS and MLS systems makes the security features, such as access control lists (ACLs) and security auditing, available to all Cray Research customers. Use of these security features is still optional. Sites can choose to use only those features that are applicable to their sites.

For sites that have been using a UNICOS non-MLS system, this feature provides a UNICOS configuration that has the same behavior as the former UNICOS non-MLS system. For sites that have been using a UNICOS MLS system, this feature provides a UNICOS configuration that has the same behavior as the former UNICOS MLS system. Commands, libraries, and system calls have not changed. However, interfaces which were formerly available only on UNICOS MLS systems are now generally available on all UNICOS systems.

Changes have been made to some of the default settings of options in the UNICOS Installation/Configuration Menu System. These changes do not impact sites that import their previous configurations.

3.6.4 Trusted UNICOS configuration option removed

Users affected: administrators

Hardware supported: all Cray Research systems

As of UNICOS 10.0, the functionality of the Trusted UNICOS system has been retained, but the `CONFIG_TRUSTED` option, which enforces conformance to the strict B1 configuration, is no longer available.

All references to Trusted UNICOS systems have been removed from UNICOS 10.0 documentation.

3.6.5 Supported system management configurations in UNICOS 10.0

Users affected: administrators

Hardware supported: all Cray Research systems

System management now supports the option of the all-powerful root administrative role. It also supports the definition of roles by assigning each role an administrative category. For example, the security administrator role is assigned the `secadm` category, while the operator role is assigned the `sysops` category. Categories are used in conjunction with the UNICOS privilege assignment list (PAL) based privilege mechanism to assign different administrative tasks to each administrative role.

UNICOS 10.0 MLS systems support the following mechanisms to enforce the assigning of privileges:

- a super user (`PRIV_SU`) system with PALs
- a non-super user (non-`PRIV_SU`) system with PALs

As of UNICOS 10.0, PALs are applied on all systems and continue to support only a subset of UNICOS software.

Sites must decide which UNICOS 10.0 system management configuration they want to use. Sites that do not need the strict separation of administrative roles will probably wish to use the `PRIV_SU` system with PALs. Sites that need more strict security measures will probably wish to use the non-`PRIV_SU` system

with PALs. Regardless, PALs must be assigned on all UNICOS 10.0 systems. Once assigned, their effect is transparent on systems administered only by the root user.

The PRIV-SU system without PALs that was supported in UNICOS 8.0 and UNICOS 9.0 is not supported in UNICOS 10.0.

3.6.6 Reduction of security-related configuration options

Users affected: end users, administrators

Hardware supported: all Cray Research systems

The number of configuration options related to security has been reduced for UNICOS 10.0.

The configuration options that will be deleted are as follows:

- MAC_COMMAND
- MLS_INTEGRITY
- PRIV_TFM
- SECURE_MLSDIR
- SECURE_MOUNT
- SECURE_REMOTE
- STAT_RESTRICT

Removal of these configuration options may cause migration issues for sites that upgrade from a UNICOS 9.0 MLS system to a UNICOS 10.0 system. All UNICOS 10.0 documentation has been updated to reflect the removal of these options.

The following list describes the impact of removing these configuration options. Restrictions, where appropriate, can be bypassed by an authorized administrator.

Option	Impact
MAC_COMMAND	With this option removed, subjects are permitted to view information for an object only when the subject dominates the object. This is consistent with MLS mandatory access control (MAC) policy.

MLS_INTEGRITY	This UNICOS MLS option is not currently used.
PRIV_TFM	See Section 3.6.1, page 53 for more information.
SECURE_MLSDIR	With this option removed, a user with a label that dominates but does not equal the label of the parent directory is no longer allowed to create a subdirectory in that parent directory. Instead, a user at the label of the parent directory can create a subdirectory with a higher label, or upgrade an existing subdirectory, provided that the subdirectory is empty and is initially at the same label as the user.
SECURE_MOUNT	This option is obsolete with UNICOS 10.0 because UNICOS non-MLS and MLS systems have been merged (see Section 3.6.3, page 54). All file systems are now treated as labeled file systems.
SECURE_REMOTE	This option is not used.
STAT_RESTRICT	With this option removed, a subject can perform a stat(2) operation for only an object that the subject dominates. This is consistent with MLS mandatory access control (MAC) policy.

3.6.7 Default value of the FSETID_RESTRICT configuration parameter changed

Users affected: administrators

Hardware supported: all Cray Research systems

Beginning with UNICOS 10.0, the default value of the FSETID_RESTRICT configuration parameter is OFF. The default value on UNICOS 9.0 MLS systems was ON.

3.6.8 Changes to su password use for system administrators

Users affected: administrators

Hardware supported: all Cray Research systems

A user with an active sysadm category can no longer use the su(1) command without first supplying a password. This change affects UNICOS MLS systems with privilege assignment lists (PALs). The supported PAL for /bin/su was

updated to remove the `sysadm` PAL category record. In addition, the `su`(1) man page has been updated to reflect this change.

This change was introduced to prevent users with a `sysadm` category from gaining other types of administrative capabilities by invoking the `su` command without a password to assume the identity of another administrator, and subsequently use facilities that perform reauthentication with that new user ID.

Sites that do not approve the new restriction, and are willing to assume the risks of preserving the previous functionality, can add the original `/bin/su` PAL definition to the `/etc/config/localpriv.db` file.

3.7 Diagnostics

The following sections describe compatibility issues affecting online diagnostics.

3.7.1 Diagnostics installed

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

Beginning with the UNICOS 9.2 release, the online diagnostics are delivered as part of the UNICOS release.

3.7.2 Change of installation location and usage for diagnostics

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

The online diagnostics have typically been installed into `/ce` and have used `/ce` as their working directory (with the exception of `ddms` and `dgdemon`, which were installed in `/etc` and used `/ce` for log file and temporary file storage). With the release of UNICOS 9.2, the online diagnostics were integrated into the system directories so that administrators could more easily use the diagnostics. The diagnostic binaries will now reside in `/etc/diag` with the exception of `dgdemon`, `ddms`, `diagserver`, `oldmon`, `xdi`, and `xdms`, which will be installed in `/etc`. A `/usr/spool/diag` directory is created at

installation for logs, seeds, and other files created by the diagnostics. The `/tmp` directory will be used instead of `/ce/tmp` for temporary files.

The `/ce` directory will remain and be used as a basic user account for diagnostics. With UNICOS 10.0, however, sites can move the `/ce` user account to `/usr` if desired. Formerly, diagnostic binaries were linked to `/ce/bin`.

3.7.3 Changed network diagnostic directory tree

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems except CRAY J90 series

The release directory structure for the network diagnostics has been extended to allow the integration of additional network diagnostic applications. The directory tree beginning at `/usr/src/diag/dgnet` previously contained the subdirectories `netC` and `netF`. It now contains the subdirectories `olnet`, `vst`, and `vht`.

See the *OLNET Online Diagnostic Network Communications Program Maintenance Manual for UNICOS*, Cray Research publication SD–1021, for general `OLNET` information.

3.7.4 UNICOS 10.0 final release to support `olnet`(8) for HIPPI and FDDI

Initial release: UNICOS 9.1

Users affected: administrators, system analysts

Hardware supported: Cray PVP systems, except CRAY J90 series

Beginning with the UNICOS 10.0 release, `olnet`(8) support for the High Performance Parallel Interface (HIPPI) and the Fiber Distributed Data Interface (FDDI) will end. In UNICOS 10.0, the equivalent diagnostic capabilities are provided for HIPPI by `vht`(8) and for FDDI by `vft`(8).

Additional diagnostic support will be added for Asynchronous Transfer Mode (ATM) by `vat`(8) and by `vet`(8) for Ethernet. The remaining functionality of `olnet`(8), which includes FDR-4, NSC, FEI-3, and MPP I/O support, will be in maintenance mode until hardware support for those devices ends. In maintenance mode, only critical and selected urgent bugfixes are provided.

For more information see the vht(8), vst(8) and olnet(8) man pages, and the *OLNET Online Diagnostic Network Communications Program Maintenance Manual for UNICOS*, Cray Research publication SD–1021.

3.7.5 Square root and divide functions

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The online IEEE CPU diagnostics do not test the IEEE floating-point square root or floating-point divide functions against simulated results.

IEEE floating-point square root and divides are tested in olcsvc, where scalar results are compared against vector results. olcsvc will detect intermittent failures, but will not detect a solid failing functional unit.

Cray Research is committed to including these diagnostic functions in future UNICOS releases.

3.7.6 vht(8) command modified for GigaRing based systems

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems with GigaRing based I/O

Due to driver changes, the vht(8) command on a GigaRing system cannot be used in conjunction with vht(8) on a Mode E system. Users can access the new vht(8) command through the xdi(8) graphical user interface. A compatibility mode is available to allow the use of Model E style options.

For more information, see the vht(8) and xdi(8) man pages.

3.7.7 unitap(8) command is not supported on GigaRing systems

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems with GigaRing based I/O

On Cray Research systems with GigaRing based I/O, the `unitap`(8) command has been replaced by the `vtt`(8) utility. The `vtt`(8) utility can be accessed through the `xdi`(8) graphical user interface.

For more information, see the `vtt`(8) and the `xdi`(8) man pages.

3.7.8 `vtt`(8) replaces `unitap`(8)

Initial release: UNICOS 10.0

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems with GigaRing-based I/O

On GigaRing-based systems, `vtt`(8) replaces `unitap`(8) in UNICOS 10.0.

For more information see the `vtt`(8) man page.

3.7.9 `olhpa(8)` not supported

Initial release: UNICOS 10.0

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems with GigaRing-based I/O.

`olhpa`(8) will not be supported on GigaRing-based systems in UNICOS 10.0. Instead, error information can be viewed through `errpt`(8) (see Section 2.9.3, page 40) and the GUI `sysmon`(8) interface on the SWS.

For more information, see the *SWS-ION Administration and Operations Guide*, Cray Research publication SG–2204, and the `errpt`(8) and `sysmon`(8) man pages.

3.8 Programming environments

The following sections describe compatibility issues affecting programming environments.

3.8.1 Support for CF77 Programming Environment ending

Initial release: 9.1

Users affected: all

Hardware supported: all Cray Research systems

The CF77 Programming Environment (PE) is no longer available with UNICOS operating system releases. Support for the CF77 PE ended on September 30, 1996.

3.8.1.1 Fortran rules for `make` and `nmake` changed

As a result of the removal of the CF77 `gen` compiler, the Fortran rules for `make` and `nmake` have been changed to use `f90` as the default.

For more information, see the `make`(1) and `nmake`(1) man pages.

3.8.2 CAL assembler separate from UNICOS

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems except CRAY T90 IEEE

The Cray Assembly Language (CAL) assembler is no longer included with the UNICOS operating system. Instead, CAL must be ordered with Programming Environment (PE) release packages. (For the CRAY T90 series with IEEE floating-point arithmetic, this change began with the UNICOS 9.1 release.)

CAL is still licensed as part of the UNICOS operating system — if customers are licensed for UNICOS, they are licensed for CAL.

3.9 Networking and communications

The following sections describe compatibility issues affecting network connectivity and communications.

3.9.1 `netmon`, `xnetmon`, and `xsnmpmon` networking tools support removed

Initial release: 9.1

Users affected: all

Hardware supported: all Cray Research systems

Beginning with UNICOS 10.0, the following networking tools will not be supported: `netmon`, `xnetmon`, and `xsnmpmon`.

Beginning with UNICOS 10.0, user displays that provide monitoring capabilities will no longer be supported. Instead, status information will be provided with Simple Network Management Protocol (SNMP) software. This software will support standard management information bases (MIBs) for these industry devices.

User displays providing monitoring information will only be available from third-party management stations.

For more information, see *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304 10.0, or contact your Cray Research representative.

3.9.2 4.4BSD upgrade to routing

Initial release: UNICOS 9.1

Users affected: administrators, operators, system analysts

Hardware supported: all Cray Research systems

Beginning with the UNICOS 9.1 release, the new `sactl`(2) system call has been added to support and emulate the 4.4BSD-lite `sysctl`(3) system call. This upgrades the routing code to 4.4BSD-lite. This has resulted in the following changes:

- `intro`(4) man page

  Changed routing table entry format

- `netstat`(1B) man page

  Added `-k` option, which forces `netstat`(1B) to use `/dev/kmem` to obtain data, rather than system calls.

  Added `-A` option, which causes the kernel memory addresses of route data structures to be printed.

- Removed section 2.4, "Circuit-switched network support," from the *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304

- `rlogin`(1) man page

  Added `-E` option, which stops any character from being recognized as an escape character.

  Added `-L` option, which allows `rlogin`(1B) to be run in `-opost` mode.

- `traceroute`(8) man page

  "University of California" portion of the copyright notice changed.

- `ping`(8) man page

  "University of California" portion of the copyright notice changed.

  The following options were added:

Option	Description
`-c`	Count
`-f`	Floods ping
`-i`	Wait
`-l`	Preload
`-n`	Numeric output
`-p`	Pattern
`-q`	Quiet output
`-R`	Records route
`-s`	Packet size

- Support for data size and count options was removed. Information was added about Internet control message protocol (ICMP) packets, duplicate and damaged packets, different data patterns, and transistor-transistor logic (TTL) details.

- `klogin`(1) man page

  Added the following options:

`-E`	Stops any character from being recognized as an escape character.
`-K`	Turns off all Kerberos authentication.
`-L`	Allows the `klogin` process to be run in the `-opost` mode.

For more information, see the `intro`(4), `netstat`(1B), `rlogin`(1B), `traceroute`(8), `ping`(8), and `klogin`(1) man pages.

3.9.3 OSI no longer supported

Initial release: 9.1

Users affected: users of the OSI optional product

Hardware supported: all Cray Research systems

UNICOS 9.0 was the final major release supporting the Open Systems Interconnection (OSI) protocol family, `AF_ISO`, at the socket level. Support for OSI lower layers in the UNICOS operating system and for the OSI unbundled product will not be available at UNICOS 10.0.

All OSI references have been removed from the *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304, and from the following man pages:

- `accept`(2)
- `airlog`(3C)
- `airlogger`(1)
- `fta`(8)
- `fta.conf`(5)
- `ftp`(1B)
- `gethost`(3C)
- `gethostinfo`(3C)
- `getnet`(3C)
- `getnetinfo`(3C)
- `hosts`(5)
- `hyroute`(8)
- `ifconfig`(8)
- `initif`(8)
- `intro`(4D)
- `intro`(5)
- `mknod`(8)
- `netstart`(8)
- `netstat`(1B)

- nettest(8)
- network(3C)
- networks(5)
- nfs(4P)
- rcmd(3C)
- route(4P)
- route(8)
- services(5)
- trcollect(8)
- trformat(8)

3.9.4 OSI name resolution code removed from libc

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The support of OSI name resolution code has been removed from libc. The following external and documented entry points have been removed:

- endhostinfo()
- endnetinfo()
- endservinfo()
- getnetinfo()
- getservinfo()
- sethostinfo()
- setnetinfo()
- setservinfo()

A new entry point, `sethostlookup`(), has been added to the `gethostbyaddr`(3) routine. The following definitions have been removed from the `netdb.h` file:

- `struct hostinfo`
- `struct hostserv`
- `struct netinfo`
- `GHI_HOST_ADDR`
- `GHI_SERV_ADDR`

These changes will enable the `getnetby*`() routines to inquire for network name mappings from the name server, in addition to using `/etc/networks`.

3.9.5 Station and USCP networking products not supported

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The UNICOS 9.0 release was the final major release supporting Cray Research station products and the UNICOS station call processor (USCP).

The following USCP man pages were removed for the UNICOS 9.2 release:

- `acquire`(1)
- `dispose`(1)
- `fetch`(1)
- `uscpblock`(1)
- `uscpmsg`(1)
- `uscpping`(1)
- `uscpqsub`(1)
- `uscproute`(1)
- `uscp_config`(5)
- `uscp.rc`(5)

- uscpssaf(5)
- uscpcore(8)
- uscpd(8)
- uscpdevs(8)
- uscpdump(8)
- uscpfix(8)
- uscplink(8)
- uscpops(8)
- uscpques(8)
- uscpssaf(8)
- uscpstat(8)
- uscpstrs(8)
- uscpterm(8)
- uscptrace(8)

3.9.6 DCE/DFS version upgraded to 1.1

Initial release: UNICOS 9.2

Users affected: administrators, programmers, system analysts

Hardware supported: all Cray Research systems

The Distributed Computing Environment/Distributed File System (DCE/DFS) has been updated to the 1.1 version for this UNICOS release. This upgrade includes the following new Open Software Foundation (OSF) and Cray Research features:

- Improved and simplified DCE administration
- Security enhancements
- Generic Security Service Application Program Interface (GSS_API)
- Internationalized interfaces

New Cray Research features:

- DFS ID mapping
- Multilevel security (MLS)
- Integrated DCE login and enhanced authentication configuration
- Single sign-on

The CRAY DCE Client Services 1.1 release and Cray DCE DFS Server 1.1 release are separately licensed products with charges attached. These products use are licensed by FLEXlm.

3.9.7 Routing upgraded to BIND 4.9.3 release

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The network routing in the UNICOS operating system has been upgraded from BIND 4.9.3beta9, which the UNICOS 9.0 release was based upon, to the BIND 4.9.3 release, the current release level of BIND. This upgrade does not include any additional functionality or documentation.

3.9.8 `sendmail` upgraded to version 8.7.5

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The `sendmail`(8) command was upgraded to version 8.7.5 for the UNICOS 9.2 release. This upgrade brings the UNICOS `sendmail` utility up to the current released version.

The following options have been added to `sendmail`:

Option	Description
`-b`	Specifies a minimum number of disk blocks
`-h`	Specifies a maximum hop count
`-k`	Specifies connection cache size

`-K`	Specifies connection cache time-out
`-p`	Set SMTP privacy flags

The following list describes the mailer flags that have been added to `sendmail`:

`-a`	Specifies use of ESMTP when creating a connection
`-b`	Adds a blank line to the end of each message
`-c`	Strips comments from address headers
`-o`	Adds sender as recipient of each message
`-w`	User must have a password file entity

For more information about `sendmail` 8.7.5, see the *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304.

For sites upgrading from a previous UNICOS release, the upgrade in `sendmail` may cause some incompatibilities.

3.9.9 NQS `config.h` file removed

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

The NQS `/usr/src/net/nqe/src/nqs/include/config.h` file is no longer available. The configuration settings in the `config.h` file were moved to the `/etc/nqeinfo` file, which is included with the Network Queuing Environment (NQE) product. The `/etc/nqeinfo` file provides the capability to customize NQS without recompiling NQS programs. The settings within the `/etc/nqeinfo` file are available at run time.

This change was made to support Cray Research's continuing move towards binary releases, to provide a more consistent interface for NQS and to simplify NQS customization across NQE platform.

3.9.10 NQS and FTA NQE components removed from the UNICOS package

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The Network Queuing System (NQS) and File Transfer Agent (FTA) subset of the Network Queuing Environment (NQE) are no longer included with the UNICOS release package. As of the NQE 3.1 release, the NQE product is packaged and released separately from the UNICOS release.

The complete NQE product is available beginning with the NQE 3.1 release for all Cray Research UNICOS systems. The NQE product consolidates the NQX, NQS, and FTA software components; they are now distributed as one product.

To provide continuity for systems currently using only NQS and/or FTA, CRAY PVP UNICOS customers that do not have an NQE license still have the option to run the NQE subset (NQS and FTA). The NQE subset (NQS and FTA) continues to be available at no additional charge for CRAY PVP systems. However, all new NQE features will be available only on systems licensed for NQE. For example, Distributed Computing Environment (DCE) support is available if you have an NQE license.

The NQE 3.1 release provides a consistent product for all supported platforms, and it consolidates the support for NQE and the NQE subset products.

3.9.10.1 NQS, NQX, and FTA commands repackaged

The following NQS, NQX, and FTA commands and related man pages were removed from the UNICOS release package and are included with the NQE release package only:

- `cevent`(1)
- `cload`(1)
- `cqdel`(1)
- `cqstat`(1)
- `cqstatl`(1)
- `cqsub`(1)
- `ftua`(1)
- `qalter`(1)
- `qchkpnt`(1)
- `qdel`(1)
- `qlimit`(1)

- qmsg(1)
- qping(1)
- qstat(1)
- qsub(1)
- rft(1)
- nqeapi(3)
- nqe_get_policy_list(3)
- nqe_get_request_ids(3)
- nqe_get_request_info(3)
- fta.conf(5)
- cs_support(7)
- nqe(7)
- ccollect(8)
- csuspend(8)
- fta(8)
- nlbconfig(8)
- nlbpolicy(8)
- nlbserver(8)
- nqeinit(8)
- nqestop(8)
- nqsdaemon(8)
- nqsfts(8)
- qconfigchk(8)
- qmgr(8)
- qstart(8)
- qstop(8)

NQS and FTA are now documented only in the NQE documentation set.

3.9.11 Support for full X11 clients removed

Initial release: UNICOS 9.2 (announced at UNICOS 9.1)

Users affected: all

Supporting hardware: all Cray Research systems

The X Consortium has decided to discontinue support of a number of programs as of X11 release 6. Therefore, Cray Research no longer supports the affected features with X11 release 6.

The following clients will still be available to the public in the X Consortium `contrib` directory:

Client	Description
`listres`	List resources in widgets
`viewres`	Graphical class browser for Xt
`xcalc`	Scientific calculator for Xt
`xditview`	Display distroff output
`xdpr`	Dump an X window directly to a printer
`xedit`	Simple text editor for X Window System
`xfontsel`	Point and click interface for selecting X11 fonts
`xload`	System load average display for X Window System
`xpr`	Print an X window dump

The `contrib` directory will remain available through anonymous `ftp` at `ftp.x.org`.

Note: The X Consortium is also discontinuing support for `xman`, a manual page display for the X Window System. Cray Research will continue to support `xman` in UNICOS 10.0 and in future Cray Visualization Toolkit (CVT) releases.

3.9.12 X11 removed from the UNICOS source tree

Initial release: 9.3

Users affected: all

Hardware supported: all Cray Research systems

Customers will no longer receive source code for X11 release 6 with UNICOS releases.

The X Consortium discontinued support of a number of programs as of X11 release 6. As a result, Cray Research discontinued support of the affected features in UNICOS 9.2 (see Section 3.9.11, page 73).

3.9.13 Pre-UNICOS 9.2 `sendmail` queue files incompatible with UNICOS 9.2 and later

Initial release: UNICOS 9.2

Users affected: all

Supported hardware: all Cray Research systems

After UNICOS 9.2, queue files generated by `sendmail` became incompatible with those generated before UNICOS 9.2. As a result, pre-UNICOS 9.2 `sendmail` queue files can be delivered by the new version of sendmail (see Section 3.9.8, page 69), but queue files generated by the new `sendmail` can not be delivered by the older version.

For further information, see the *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304.

3.10 Tape subsystem

The following sections describe changes to the tape subsystem since UNICOS 9.0.

3.10.1 Tape subsystem released as separate product, packaging change introduced

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

Beginning with the UNICOS 9.2 release, the UNICOS tape subsystem is packaged as a separate product in binary form and shipped with the UNICOS operating system. There are otherwise no changes in the way that it is used.

During the configuration process, the `tpinit`(8) command reads the tape configuration file and initializes the tape driver. The default tape configuration file is now `text_tapeconfig`, and the `text_tapeconfig`(5) man page replaces the `tapeconfig`(5) man page.

In addition, the character-special tape interface enables users to access online tape devices independent of the tape subsystem. This interface provides tape access similar to the access available on other UNIX systems: users can open a tape device, write to or read from a tape, close the device, and issue `ioctl`(2) requests.

Besides the packaging change, this UNICOS release includes some new command options, user exits, and the `mvf`(1) command.

For more information, see *Tape Subsystem Administration*, Cray Research publication SG–2307.

3.10.2 SCSI error report update

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: Cray Research systems with scalable I/O hardware

The SCSI error report entries have been combined with the block multiplexer (mux) and ESCON error report entries.

For more detail, see the troubleshooting information on `errpt`(8) usage in the *Tape Subsystem Administration*, Cray Research publication SG–2307.

3.10.3 `tpconvert`(8) command not supported

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The UNICOS system no longer supports the `tpconvert`(8) command.

3.10.4 SCSI error report update

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: Cray Research systems with scalable I/O hardware

The SCSI error report entries have been combined with the block multiplexer (mux) and ESCON error report entries.

For more information, see the troubleshooting information on `errpt`(8) usage in the *Tape Subsystem Administration*, Cray Research publication SG–2307.

3.10.5 New tape subsystem command options

Initial release: UNICOS 9.2

Users affected: administrators, system analysts

Hardware supported: all Cray Research systems

The following new tape subsystem command options provide users with more output control.

- `-t` on `rsv`(1) specifies the placement of the message file.
- `-a` on `tplist`(1) verifies the output from a `tplist`(1) copy operation.
- The `-N` option is no longer available.
- `-a` on `tpstat`(1) outputs device status for all tape devices, except those with `DOWN` status.
- `-a` on `tpgstat`(8) provides status information for device groups that are reserved or active.

For more information, see the `rsv`(1), `tplist`(1), `tpstat`(1), `text_tapeconfig`(5), `tape`(7), `tpgstat`(8), and `tpinit`(8) man pages.

3.10.6 New required `rcoptions` entry for tapes

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

The `rcoptions` file must contain the following entry if the system supports tape usage:

```
RC_TAPE="YES"
```

Formerly, tape usage was available by default; now the `rcoptions` entry is required to activate the tape software. This entry is necessary for users to access tapes through either the character-special tape interface, or the Cray Tape Management Facility, which is the tape daemon-assisted interface.

For information about tape configuration, see the *Tape Subsystem Administration*, Cray Research publication SG–2307.

3.10.7 New tape filter: `mvf`(1)

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

The `mvf`(1) command is a tape filter that handles input, output, and volume switches. For users of the character-special tape interface who need to dump and restore file systems that span multiple tape volumes, this command makes the volume switch transparent. Used with the tape subsystem, `mvf`(1) can handle labeled tapes and can transfer data at high rates.

For more information, see the `mvf`(1) man page.

3.10.8 USCP support removed from UNICOS tape subsystem

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

Support for the UNICOS station call processor (USCP) has been removed from the UNICOS tape subsystem. USCP options are no longer available on the `LOADER` or `OPTIONS` statements.

For more information, see the `text_tapeconfig`(5) man page.

3.10.9 Tape list I/O removed from UNICOS

Initial release: UNICOS 10.0

Users affected: all

Hardware affected: all Cray Research systems

The tape list I/O has been removed in favor of UNICOS list I/O in UNICOS 10.0. The tape list I/O was originally developed for Fortran read-and-write blocks using Model-D IOS. As a result, users can not issue an `ioctl`(2) system call with a `TPC_LIST` or `TPC_MULTLIST` request.

The UNICOS list I/O replaces all of the read/write functionality of tape list I/O. The exception is that the ability to read/write tapemarks and to do end-of-volume (EOV) processing must now be requested using `ffio` library functions.

Note: Cray Research customers that use CrayLibs for I/O will effectively see no change by the removal of this feature. However, user programs must be relinked in which a `TPC_LIST` or `TPC_MULTLIST` request has been replaced with a FFIO library routine.

3.11 Packaging

The following section describes changes in the media, licensing, or packaging.

3.11.1 Distribution medium limited to CD-ROM

Initial release: UNICOS 9.2

Users affected: administrators

Hardware supported: all Cray Research systems

CD-ROM is the only supported release media for all present and future releases and platforms.

3.11.2 `mtdump`(1) and `segldr`(1) packaging change

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The UNICOS 9.0 release was the final major release containing both source and binary code for the `mtdump`(1) and `segldr`(1) utilities. The `mtdump` and `segldr` utilities are now packaged in binary form only, even for sites that have

a source license. The generation compiler necessary to build these utilities is not part of the UNICOS release package.

3.11.3 CAL assembler to be packaged separately from UNICOS

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems except CRAY T90 IEEE

The Cray Assembly Language (CAL) assembler is no longer automatically shipped with the UNICOS operating system. Instead, CAL must be ordered with Programming Environment (PE) release packages. (For the CRAY T90 series with IEEE floating-point arithmetic, this change began with the UNICOS 9.1 release.)

CAL is still licensed as part of the UNICOS operating system — if customers are licensed for UNICOS, they are licensed for CAL.

3.11.4 UNICOS tape subsystem packaged separately

Initial release: UNICOS 9.2

Users affected: all

Hardware supported: all Cray Research systems

The UNICOS tape subsystem is now packaged in binary form only and shipped with the UNICOS operating system.

3.11.5 General packaging changes

Initial release: UNICOS 9.2 for CRAY T90 systems, UNICOS 10.0 for CRAY PVP systems.

Users affected: administrators

Hardware supported: CRAY T90 systems and CRAY PVP systems

The packaging changes can be broken down into three categories:

- Full replacement of `root` and `usr` files. Previously, these were installed by a build.

- Full replacement of source file relocatables. Previously, only partial replacement of source file relocatables was available.
- Full replacement of source code. Previously, only source code modifications (mods) were available.

Full replacement of `root` and `usr` impacts customers as follows:

- There is no need for a complete system build. This implies less margin for error. (The kernel, optional products, and local changes still require a build.)
- Files used for production can be verified, or assured to match what was shipped.
- Installation time and complexity is greatly reduced.
- Full replacement allows for the removal of obsolete files.

Full replacement of source code has the following customer impacts:

- A customer does not need to rely upon code to determine what mods were introduced in order to generate the modified source. Therefore, any errors associated with such mods are eliminated. (This is a packaging issue.)
- A customer does not require code to apply mods on site. Thus, such code related errors are eliminated.
- Local mods **must** be removed before the next release is loaded, and reapplied afterward. (This was required in the past, but not enforced. Now, it will be enforced.)

6. Customer Services

This section describes the customer services Cray Research offers to support your UNICOS 9.0 release.

6.1 Training support

The *Software Training Catalog*, TR-CUSTCAT, describes all Cray Research Software Training support. The *Software Training Catalog* lists Cray Research training office locations, describes the available training services and facilities, and provides curriculum charts for employees and customers. It also contains the current course schedule and a complete description and outline for each course.

You can access the *Software Training Catalog* online on the CRInform system. You can also use the CRInform system to register for classes. For additional information about CRInform, see subsection 6.3, page 6–2. Also, customers can order a *Software Training Catalog* from their Cray Research software training coordinator or from the Cray Research Distribution Center. To order a *Software Training Catalog* from the Cray Research Distribution Center, call (800) 284–2729, extension 5901 or 5907. When ordering, specify the TR–CUSTCAT document.

All courses described in the training catalog are available at the Cray Research Software Training facility in Eagan, Minnesota. This facility provides a complete, hands-on learning environment equipped with terminals, front-end batch systems, and both interactive and network access to all Cray Research mainframe types. Regional training locations can provide comparable learning environments; Cray Research also offers on-site, customized training. See your local training coordinator for details.

Cray Research provides a full range of training to support the UNICOS 9.0 release. The Software Education Services department offers start-up classes for first-time users of the UNICOS system, as well as detailed classes for experienced

customers and Cray Research analysts. Classes are targeted for scientists, engineers, application programmers, systems programmers, systems administrators, and systems analysts. Special-focus offerings on languages, optimization, and other aspects of the UNICOS system are also offered.

Most of the courses described in the *Software Training Catalog* will be updated to reflect the UNICOS 9.0 release on the first offering after the UNICOS 9.0 release.

Approximately one month after the UNICOS 9.0 release, the Software Education Services department will make videotape training available through the Cray Research Distribution Center. The tapes supplement this *UNICOS 9.0 Release Overview*, publication RO–5000 9.0, and highlight only the most significant enhancements and changes of the release. Additional content and pricing information is available from CRInform or you can contact your training coordinator for the information.

6.2 Software problem reporting and resolution process

If you experience problems with the UNICOS 9.0 release, contact your Cray Research service representative; your service representative will work with you to resolve the problem. If your maintenance agreement provides for full-time or part-time on-site support, your on-site support personnel are your primary contacts for service. If your maintenance agreement provides for off-site support, please call your designated support group for assistance.

6.3 Cray Research CRInform system

The Cray Inform system (CRInform) is an online information and problem-reporting service for Cray Research customers.

Version 4.0 of the CRInform program is available through the World Wide Web (WWW). You need access to the CRInform Web server and a browser (such as Mosaic, NetScape, or Lynx), which

allows you to view information or make service requests. You can use your own site's browser, or use either the Mosaic or Lynx browsers available on the CRInform system.

The CRInform service includes the following features:

- Global access to all CRInform information
- Technical suppport
- Software Problem reports
- Software information and ordering
- General service information
- Cray Research home page

To sign up for the CRInform program, request a CRInform Program Agreement from your Cray Research service representative. Sign and return the form. After receipt of this signed agreement, a CRInform administrator will send you the following:

- *Introducing the CRInform System*, publication number IN–2125 4.0
- User validation information

Documentation [4]

This chapter describes documentation that supports the UNICOS 10.0 release:

- New publications
- Online documentation for UNICOS 10.0
- Printed documentation included with the UNICOS 10.0 release package (core set of documentation)
- Printed documentation available for purchase that supports the UNICOS 10.0 release

Note: For the UNICOS 10.0 release, a core set of printed documentation is included with the release package; all other documentation is included as online documentation only. For a list of the core set of printed documentation, see Section 4.3, page 86. For lists of all online documentation that is included with the release package, see Section 4.2, page 82.

Printed copies of documentation that you receive online as man pages may be purchased through Cray Research. If you elect to purchase a printed version of any online documentation that is included with the release package, you must order the publications separately from the UNICOS 10.0 release package.

4.1 New publications

The following publications are new since the UNICOS 9.0 base release:

- *UNICOS Basic Administration Guide for CRAY J90se GigaRing based Systems*, Cray Research publication SG–2210. This guide is written for system administrators of CRAY J90se systems running UNICOS 9.3. It includes information required for basic system administration.
- *UNICOS Installation Guide for CRAY J90se GigaRing based Systems*, Cray Research publication SG–5296. This guide is written for system administrators and operators of CRAY J90se computer systems. It shows you how to install the UNICOS operating system on a CRAY J90se mainframe.
- *UNICOS Installation Guide for CRAY C90, CRAY T90, and CRAY T90 IEEE Model E based Systems*, Cray Research publication SG–5297. This guide is written for system administrators and operators of CRAY C90, CRAY T90,

and CRAY T90 IEEE Model E based Systems. It explains the procedures for installing the UNICOS operating system on the CRAY C90, CRAY T90, and CRAY T90 IEEE Model E based mainframe.

- *UNICOS Installation Guide for CRAY T90 and CRAY T90 IEEE GigaRing based Systems*, Cray Research publication SG–5298. This guide is for system administrators of CRAY T90 and CRAY T90 IEEE GigaRing based computer systems. It explains the procedures for installing the UNICOS operating system on the CRAY T90 mainframe.

4.2 Online documentation and information for UNICOS 10.0

The following types of online information products are available to UNICOS 10.0 release customers:

- Man pages, which describe a particular element of the UNICOS operating system or a compatible product. To see a detailed description of a particular command or routine, use the `man`(1) command.
- UNICOS message system, which provides explanations of error messages. To see an explanation of a message, use the `explain`(1) command.
- Cray Research online glossary, which explains the terms used in a manual. To view a definition, use the `define`(1) command.
- The Cray DynaWeb server, which makes Cray Research documents available to World Wide Web browsers.

4.2.1 Man pages

Some reference information for the UNICOS 10.0 operating system is available with the UNICOS 10.0 release package as online, pre-formatted files called manual (man) pages. The man pages can be accessed by using the `man`(1) command.

The online version of man pages contains the most current technical information. Updated online man pages are distributed for each UNICOS revision release. The updated printed man page manuals are available only with UNICOS major releases and must be ordered from the Cray Research Distribution Center.

The following publications which include man pages are available on the Cray DynaWeb for the UNICOS 10.0 operating system release:

- *UNICOS User Commands Reference Manual*, Cray Research publication SR–2011 10.0
- *UNICOS System Calls Reference Manual*, Cray Research publication SR–2012 10.0
- *UNICOS File Formats and Special Files Reference Manual*, Cray Research publication SR–2014 10.0
- *UNICOS Administrator Commands Reference Manual*, Cray Research publication SR–2022 10.0
- *UNICOS System Libraries Reference Manual*, Cray Research publication SR–2080 10.0

See Section 4.3.2, page 87 for a list of man page ready reference manuals. These publications are available in printed format only.

4.2.2 Platform-specific documentation available online

The Cray DynaWeb server makes Cray Research documents available to World Wide Web browsers. It is based on DynaWeb software produced by Electronic Book Technologies, Inc. (EBT). DynaWeb is a commercial-grade Web server that serves documents marked up in Standard Generalized Markup Language (SGML) to Web browsers for rapid navigation and searching. Documents in DynaWeb are stored in SGML and converted to hypertext markup language (HTML) when a Web browser requests the document.

This following sections list publications available on the Cray DynaWeb server for Cray Research platforms as indicated. Individual publications may indicate otherwise. (See Section 1.3, page 1 for a list of hardware supported by the UNICOS 10.0 operating system release.)

4.2.2.1 Online documentation for CRAY J90se GigaRing based systems

The following are core the publications for CRAY J90se GigaRing based systems available via the DynaWeb:

- *UNICOS Basic Administration Guide for CRAY J90se GigaRing based Systems*, Cray Research publication SG–2210 10.0
- *Common Installation Tool (CIT) Reference Card*, Cray Research publication SQ–2218 8/97

- *UNICOS Configuration Administrator's Guide*, Cray Research publication SG–2303 10.0
- *UNICOS Release Overview*, Cray Research publication RO–5000 10.0
- *Kerberos Enigma Installation Guide*, Cray Research publication SG–5294 9.3
- *UNICOS 10.0 Notes/Errata for Cray GigaRing Based Systems*, Cray Research publication ER–5302 10.0

4.2.2.2 Online documentation for CRAY J90 Model V based systems

The following are the core publications for CRAY J90 Model V based systems are available via the DynaWeb:

- *UNICOS Basic Administration Guide for CRAY J90 Model V based Systems*, Cray Research publication SG–2416 10.0
- *UNICOS Release Overview*, Cray Research publication RO–5000 10.0

4.2.2.3 Online documentation for CRAY T90 GigaRing based systems

The following are the core publications for CRAY T90 GigaRing based systems are available via the DynaWeb:

- *Common Installation Tool (CIT) Reference Card*, Cray Research publication SQ–2218 8/97
- *UNICOS Configuration Administrator's Guide*, Cray Research publication SG–2303 10.0
- *UNICOS Release Overview*, Cray Research publication RO–5000 10.0
- *Kerberos Enigma Installation Guide*, Cray Research publication SG–5294 9.3
- *UNICOS 10.0 Notes/Errata for Cray GigaRing Based Systems*, Cray Research publication ER–5302 10.0

4.2.2.4 Online documentation for CRAY T90 Model E based systems

The following are the core publications for CRAY T90 Model E based systems are available via the DynaWeb:

- *Common Installation Tool (CIT) Reference Card*, Cray Research publication SQ–2218 8/97

- *UNICOS Configuration Administrator's Guide*, Cray Research publication SG–2303 10.0
- *UNICOS Release Overview*, Cray Research publication RO–5000 10.0
- *Kerberos Enigma Installation Guide*, Cray Research publication SG–5294 9.3
- *UNICOS 10.0 Notes/Errata for CRAY T90 Model E Systems*, Cray Research publication ER–5301 10.0

4.2.3 Other documentation available on the Cray DynaWeb server

This following list of publications available on the Cray DynaWeb server applies to all Cray Research platforms supported by the UNICOS 10.0 operating system, unless otherwise indicated. (See Section 1.3, page 1 for a list of hardware supported by the UNICOS 10.0 operating system release.)

- *Segment Loader (SEGLDR) and ld Reference Manual*, Cray Research publication SR–0066 9.0
- *OLNET Online Diagnostic Network Communications Program Maintenance Manual for UNICOS*, Cray Research publication SD–1021 10.0
- *TCP/IP Network User's Guide*, Cray Research publication SG–2009 9.0
- *Tape Subsystem User's Guide*, Cray Research publication SG–2051 10.0
- *Remote Procedure Call (RPC) Reference Manual*, Cray Research publication SR–2089 9.0
- *UNICOS X Window System Reference Manual*, Cray Research publication SR–2101 8.0
- *UNICOS Multilevel Security (MLS) Feature User's Guide*, Cray Research publication SG–2111 10.0
- *Cray Message System Programmer's Guide*, Cray Research publication SG–2121 9.0
- *UNICOS under UNICOS Administrator's Guide*, Cray Research publication SG–2156 10.0
- *Asynchronous Transfer Mode (ATM) Administrator's Guide*, Cray Research publication SG–2193 1.0
- *General UNICOS System Administration*, Cray Research publication SG–2301 10.0

- *UNICOS Resource Administration*, Cray Research publication SG–2302 10.0
- *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304 10.0
- *Kerberos Administrator's Guide*, Cray Research publication SG–2306 9.0
- *Tape Subsystem Administration*, Cray Research publication SG–2307 10.0
- *Kerberos User's Guide*, Cray Research publication SG–2409 9.0
- *Cray Assembly Language (CAL) for Cray PVP Systems Reference Manual*, Cray Research publication SR–3108 9.1

4.3 Printed documentation available for the UNICOS 10.0 release

The printed documentation listed in the following sections is available to support the UNICOS 10.0 operating system release.

Printed supplemental documentation not included with the UNICOS 10.0 release package may be purchased from the Cray Research Distribution Center.

4.3.1 Core set of printed documentation included with the release package

The following publications are the core set of printed documentation included with the UNICOS 10.0 release package. The core set of documentation contains information that is needed administrators or analysts to install or configure the system when it is not convenient to access the `man` command or the DynaWeb.

- *UNICOS Release Overview*, Cray Research publication RO–5000 10.0
- The appropriate UNICOS installation guide for your system:
  - *UNICOS Installation Guide*, Cray Research publication SG–2112 10.0
  - *UNICOS Installation Guide for CRAY J90 Model V based Systems*, Cray Research publication SG–5271 10.0
  - *UNICOS Installation Guide for CRAY J90se GigaRing based Systems*, Cray Research publication SG–5296 10.0
  - *UNICOS Installation Guide for CRAY C90, CRAY T90, and CRAY T90 IEEE Model E based Systems*, Cray Research publication SG–5297 10.0
  - *UNICOS Installation Guide for CRAY T90 and CRAY T90 IEEE GigaRing based Systems*, Cray Research publication SG–5298 10.0

- The appropriate notes/errata for your system:
  - *UNICOS 10.0 Notes/Errata for CRAY T90 Model E Systems*, Cray Research publication ER–5301
  - *UNICOS 10.0 Notes/Errata for Cray GigaRing Based Systems*, Cray Research publication ER–5302
- *UNICOS Basic Administration Guide for CRAY J90se GigaRing based Systems*, Cray Research publication SG–2210 10.0 (for CRAY J90se GigaRing based systems only)
- *Common Installation Tool (CIT) Reference Card*, Cray Research publication SQ–2218 8/97
- *UNICOS Configuration Administrator's Guide*, Cray Research publication SG–2303 10.0
- *UNICOS System Configuration Using ICMS*, Cray Research publication SG–2412 10.0
- *UNICOS Basic Administration Guide for CRAY J90 Model V based Systems*, Cray Research publication SG–2416 10.0 (for CRAY J90 Model V based systems only)
- *Kerberos Enigma Installation Guide*, Cray Research publication SG–5294 9.3

4.3.2 Man page ready references

The following printed ready reference documents, which can be ordered from the Cray Research Distribution Center, contain brief man page descriptions:

- *UNICOS User Commands Ready Reference*, Cray Research publication SQ–2056 10.0
- *UNICOS System Libraries Ready Reference*, Cray Research publication SQ–2147 10.0
- *UNICOS System Calls Ready Reference*, Cray Research publication SQ–2215 10.0
- *UNICOS Administrator Commands Ready Reference*, Cray Research publication SQ–2413 10.0

4.3.3 Man page manuals

The following man page manuals may be ordered from the Cray Research Distribution Center in printed format, or printed from PostScript files provided on the DynaWeb:

- *UNICOS User Commands Reference Manual*, Cray Research publication SR–2011 10.0
- *UNICOS System Calls Reference Manual*, Cray Research publication SR–2012 10.0
- *UNICOS File Formats and Special Files Reference Manual*, Cray Research publication SR–2014 10.0
- *UNICOS Administrator Commands Reference Manual*, Cray Research publication SR–2022 10.0
- *UNICOS System Libraries Reference Manual*, Cray Research publication SR–2080 10.0

4.3.4 General printed documentation

The following publications apply to all Cray Research systems running the UNICOS 10.0 operating system. They are available in printed form and are orderable from the Cray Research Distribution Center (see also Section 4.2.1, page 82):

- *UNICOS Source Manager (USM) User's Guide*, Cray Research publication SG–2097 7.0
- *DCA-2 and DCA-3 Disk Error Recovery Technical Note*, Cray Research publication SPN–2102 8.0 (IOS-E systems only)
- *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304 10.0
- *UNICOS Installation Menu System Reference Card*, Cray Research publication SQ–2411 9.0

4.3.5 Special print orders

If you wish, you may special-order online publications in print format from the Cray Research Distribution Center. Contact your Cray Research representative for more information.

7. Release Package

This section contains the following information about the UNICOS 9.0 release package:

- UNICOS hardware and software requirements
- Licensing information
- Optional software orderable with UNICOS 9.0 release package
- Release package contents
- Release package ordering information

7.1 UNICOS 9.0 hardware and software requirements

The following subsections list the Cray Research systems supported with this release package, the programming environments supported with the UNICOS 9.0 release package, the software that the UNICOS 9.0 release requires, and the tested and supported upgrade paths.

7.1.1 *Cray Research systems supported with this release package*

The UNICOS 9.0 release supports the following series of Cray Research systems:

- CRAY T90 series: all models including CRAY T94, CRAY T916, and CRAY T932 systems
- CRAY Y-MP E series: all models including CRAY Y-MP 2E, CRAY Y-MP 4E, CRAY Y-MP 8E, and CRAY Y-MP 8I systems
- CRAY Y-MP M90 series: all models including CRAY Y-MP M92, CRAY Y-MP M94, and CRAY Y-MP M98 systems

- CRAY C90 series: all models including CRAY C916, CRAY C92A, CRAY C94, CRAY C94A, and CRAY C98 systems
- CRAY C90D series: all models including CRAY C92AD, CRAY C94D, and CRAY C98D systems
- CRAY J90 series: all models including CRAY J916 and CRAY J932 systems
- CRAY EL series: all models including CRAY Y-MP EL, CRAY EL92, CRAY EL94, and CRAY EL98 systems

7.1.2 *OWS and IOS-E software*

For Cray Research systems with an IOS-E and for the CRAY T90 series, it is recommended that you upgrade to the IOS-E 9.0 and the OWS 9.0 releases. For information about ordering the IOS-E 9.0 and OWS 9.0 releases, see the *Support System and IOS-E Release Overview*, publication RO–5060 9.0.

For the CRAY J90 series and CRAY EL series, the UNICOS 9.0 release package automatically includes the correct IOS release software.

7.1.3 *Fortran run-time libraries*

Sites installing the UNICOS 9.0 release must upgrade to a programming environment 1.2 or later release to obtain Fortran run-time libraries because these libraries are no longer released with the UNICOS system beginning with UNICOS 9.0.

Note: Sites running the UNICOS 8.3 restricted release also had this requirement because these libraries were not released with UNICOS 8.3.

7.1.4 *Tested and supported upgrade paths*

Customers running any version of UNICOS 8.0 or running the UNICOS 8.3 restricted release on one of the supported hardware platforms can upgrade directly to UNICOS 9.0.

Customers running any version of UNICOS prior to UNICOS 8.0 must first perform an initial installation of the UNICOS 8.0 release, and then upgrade to UNICOS 9.0.

Initial installations of UNICOS 9.0 are supported also.

7.1.5 *Cray Research software products supported with this release package*

The following subsections list the software products most commonly used in conjunction with the UNICOS operating system. The product release level required with UNICOS 9.0 is specified. For information about other products, contact your Cray Research representative.

7.1.5.1 *Programming environments supported with this release package*

The UNICOS 9.0 release supports the following Cray Research programming environments, which are released separately from the UNICOS 9.0 release.

> **Note:** For each programming environment release after the release level designated below, ensure your Cray Research system is supported before ordering an upgrade programming environment release package.

- CF90 Programming Environment 1.2.1 for Cray PVP and MPP systems. See the *Programming Environment 1.2 Release Letter*, RL–5212 1.2.2, for additional information.
- Standard C Programming Environment 1.2.1 for Cray PVP and MPP systems. See the *Programming Environment 1.2 Release Letter*, RL–5212 1.2.2, for additional information.
- CF77 6.2.1 Programming Environment for Cray PVP and MPP systems. See the *Programming Environment 1.2 Release Letter*, RL–5212 1.2.2, for additional information.
- Cray C++ 1.0.3 for Cray PVP and MPP systems. See the *C++ 1.0.2 for MPP Release Letter*, RL–5160 1.0.2, and the *Programming Environment 1.2 Release Letter*, RL–5212 1.2.2, for additional information.
- C++ MathPack 1.0 for Cray PVP systems. See the *Cray C++ Library Products Technical Note*, SN–2129 1.0.2, for additional information.

- C++ MathPack 1.0.1 for Cray MPP systems. See the *Cray C++ Library Products Technical Note*, SN–2129 1.0.2, for additional information.
- C++ Tools 1.0 for Cray PVP systems. See the *Cray C++ Library Products Technical Note*, SN–2129 1.0.2, for additional information.
- C++ Tools 1.0.1 for Cray MPP systems. See the *Cray C++ Library Products Technical Note*, SN–2129 1.0.2, for additional information.
- CAM 2.1 (Cray Assembler for MPP). See the *Cray Assembler for MPP (CAM) Reference Manual*, publication SR–2510 2.1, for additional information.
- CRAY T3D Emulator 1.0.4 (on all platforms except CRAY T90 series). See the *CRAY T3D Emulator User's Guide*, publication SG–2500, for additional information.
- Cray Ada Environment 3.1.1 for CRAY Y-MP series and CRAY EL series; also for CRAY C90 series in compatibility mode.
- Pascal compiler 4.2.3 for CRAY Y-MP series, CRAY EL series, CRAY J90 series, and CRAY T90 series (non–IEEE systems only); also for CRAY C90 series in native mode.

7.1.5.2 *Other software supported with this release package*

- Data Migration Facility 2.3

  Data Migration Facility (DMF) 2.3 is the level of DMF required with UNICOS 9.0 on all platforms. For information on ordering DMF, contact your Cray Research representative.

- System Maintenence and Remote Testing Environment 5.0

  SMARTE 5.0 is the level of System Maintenance and Remote Testing Environment (SMARTE) required with UNICOS 9.0. For information on ordering SMARTE, contact your Cray Research representative.

- ND40 Network Disk Support Software

  Cray Research will supply ND40 Network Disk support software free of charge to customers purchasing disks from Cray Research. If a customer chooses to purchase their disks from another vendor, HIPPI disk software will be separately available and licensed for those customers. For more information about ND40 licensing or to purchase an ND40 license, contact your Cray Research representative. For information describing this product, see subsection 2.3.8, page 2–13, or contact your Cray Research representative.

- Distributed Computing Environment

  Customers wishing to use the Cray Distributed Computing Environment (DCE) Client Services, must purchase a DCE license. For more information about DCE licensing or to purchase a DCE license, contact your Cray Research representative. For information describing this product, see subsection 2.5.6, page 2–22, or contact your Cray Research representative.

- Distributed File system

  To use the Cray DCE Distributed File System, sites must purchase a DFS license. For more information about DFS licensing or to purchase a DFS license, contact your Cray Research representative. For information describing this product, see subsection 2.5.6, page 2–22 or contact your Cray Research representative.

For additional software availability, contact your Cray Research representative.

7.2 Licensing information

UNICOS is licensed under a software contract by Cray Research to its customers. For all Cray Research systems except CRAY J90 and CRAY EL systems, customers may select either a source code or a binary code license for the UNICOS 9.0 release; only a binary code license is available for CRAY J90 and CRAY EL systems.

Note: Customers planning to run this UNICOS release package on a Cray Research system purchased before May 12, 1992, require a UNICOS Set license; customers with a UNICOS Set license also need a TCP/IP license for this UNICOS release.

Customers planning to run this UNICOS release package on a Cray Research system purchased after May 12, 1992, require a UNICOS System Software license; customers with a UNICOS System Software license do not require any additional Cray Research licenses to receive the standard UNICOS 9.0 release package. Software for programming environments (compilers) and the Data Migration Facility (DMF), previously licensed with the UNICOS Set, are licensed separately from the UNICOS System Software license.

Other functionality is offered as separately licensed products.

Customers outside the United States and Canada must sign a Letter of Assurance before software can be shipped. Address all questions regarding which customers have signed a Letter of Assurance, or which software requires this letter to Christine Miller, at the following address:

Christine Miller
Cray Research, Inc.
1440 Northland Drive
Mendota Heights, MN 55120

Telephone: 1–612–683–7476
1–800–284–2729
Fax: 1–612–683–7485

7.2.1 *UNICOS source code license*

To receive a UNICOS 9.0 source code license, customers must first obtain a UNIX source code license for the UNIX System V, Release 4.0 (SVR 4.0). Customers can obtain these rights through Cray Research, Inc. or through Novell, Inc.

A UNICOS source code license is not supported for the CRAY J90 series or for the CRAY EL series.

Note: Customers with UNIX rights that allow them to receive the UNICOS 8.0 release do not need additional UNIX licensing for the UNICOS 9.0 release.

For information on who to contact if you have licensing questions, or if your site has not signed all appropriate Cray Research software license agreements, see subsection 7.2.4, page 7–10, or subsection 7.2.5, page 7–10.

For information about available optional software products that are included with your UNICOS license but which you must order to receive them with your UNICOS 9.0 release package, see subsection 7.3, page 7–12.

For more information about the flexible license manager (FLEXlm), or for information about products that are included in the UNICOS 9.0 release software but which require separate licenses and a FLEXlm license key to access the product, see subsection 7.2.3, page 7–8.

7.2.2 *UNICOS binary code license*

A binary code license is available for all UNICOS 9.0 supported systems.

> **Note:** For the CRAY J90 series and the CRAY EL series, a binary license is required.

Customers who need a binary code license must obtain licenses directly from Cray Research, Inc. Cray Research sublicenses the appropriate binary license rights. These rights must be specified on the Cray Research software contract. There is a fee for binary rights.

For information on who to contact if you have licensing questions, or if your site has not signed all appropriate Cray Research software license agreements, see subsection 7.2.4, page 7–10, or subsection 7.2.5, page 7–10.

For information about available optional software products that are included with your UNICOS license but which you must order to receive with your UNICOS 9.0 release package, see subsection 7.3, page 7–12.

For more information about the flexible license manager (FLEXlm), or for information about products that are included in the UNICOS 9.0 release software but which require separate licenses and a FLEXlm license key to access the product, see the following subsection.

7.2.3 *Separately licensed products*

The UNICOS 9.0 release includes the Flexible License Manager (FLEXlm), which controls the use of certain products in the UNICOS operating system. In UNICOS 9.0, the following products are licensed through FLEXlm:

- NQX product
- ONC+ technology
- StorageTek autoloader cartridge system support
- CRIBM/IBM 3495†/3494 support
- EMASS robotic and ER90 device product

Whether products are packaged with the UNICOS system or separately packaged, the license keys are generated by the Cray Research order desk during the product order cycle. After the order desk has received notice of the order, it issues the contracted license keys. The license keys and instructions about installing them are sent to you by electronic mail.

If a licensed product has been installed and a problem arises that is suspected to be related to the license key, it is possible to get an emergency key from the Technical Support Center in the U.S. or from the service organization in other countries.

For a complete list of Cray Research products that operate with UNICOS software, contact your Cray Research representative.

7.2.3.1 *NQX software*

The NQX component of the Cray Network Queuing Environment (NQE) requires a separate license for each Cray Research system on which it will run. For more information about NQX licensing or to purchase an NQX license, contact your Cray Research representative.

For information describing this product, see subsection 2.5.1, page 2–18, or contact your Cray Research representative.

† Implementation of IBM 3495 Tape Library Dataserver support is deferred.

7.2.3.2 *ONC+ technology*

To use ONC+ technology, sites must purchase an ONC+ license. For more information about ONC+ licensing or to purchase an ONC+ license, contact your Cray Research representative.

For information describing this product, see subsection 2.5.17, page 2–30, or contact your Cray Research representative.

7.2.3.3 *UNICOS shared file systems*

To use UNICOS shared file systems (SFS), sites must purchase an SFS license. For more information about SFS licensing or to purchase an SFS license, contact your Cray Research representative.

For information describing this product, see subsection 2.9.21, page 2–75, or contact your Cray Research representative.

7.2.3.4 *StorageTek Autoloader Cartridge Systems (ACS) support*

To use StorageTek RedWood drive autoloader cartridge system support, sites must purchase a CRSTK/STKRED license. For more information about CRSTK/STKRED licensing or to purchase a CRSTK/STKRED license, contact your Cray Research representative.

For additional information, see subsection 3.3, page 3–4, or contact your Cray Research representative.

7.2.3.5 *IBM 3495*† */IBM 3494*

To use IBM 3495† and 3494 support software, sites must purchase a CRIBM/IBM 3495 license. For more information about CRIBM/IBM 3495 licensing or to purchase a CRIBM/IBM 3495 license, contact your Cray Research representative.

For information describing this product, see subsection 2.3.2, page 2–10, or contact your Cray Research representative.

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† Implementation of IBM 3495 Tape Library Dataserver support is deferred.

7.2.3.6 *EMASS robotic and ER90 device support*

To use the EMASS robotic and ER90 device products, sites must purchase a CREMS/DTDL or CREMS/ER90 license. For more information about CREMS/DTDL and CREMS/ER90 licensing or to purchase either license, contact your Cray Research representative.

For information describing this product, see subsection 2.3.6, page 2–12, or contact your Cray Research representative. For additional information on compatibility issues associated with these products, see subsection 3.3, page 3–4.

7.2.4 *Licensing contacts for customers in the U.S. and Canada*

For more information on the licensing and pricing of the UNICOS 9.0 release, customers in the United States and Canada should see their account representative or contract administrator, or contact Sarah White at the following address:

Sarah White
Cray Research, Inc.
655F Lone Oak Drive
Eagan, MN 55121 USA

Telephone: +1–612–683–5604
Fax: +1–612–683–5599

7.2.5 *Licensing contacts for customers outside the U.S. and Canada*

Customers outside the U.S. and Canada may obtain further licensing and export information by contacting their account representative or the individuals listed in the following subsections.

7.2.5.1 *Cray European Regional Contract Administrators*

Customers in Europe can direct licensing inquiries to the following Regional Contract Administrators:

Europe North Sales Region	Nick Jacobs Cray Research (UK) Ltd. Oldbury Bracknell Berkshire, RG12 4TQ England	Telephone: Fax:	+44–1344–722121 +44–1344–861715
Europe Central Sales Region	Christian Schaub Cray Research GmbH Riesstraße 25 80992 Munich Germany	Telephone: Fax:	+49–89–14903 +49–89–1415959
Europe South Sales Region	Anne Daniel Cray Research France, S.A. 7, Rue de Tilsitt 75017 Paris France	Telephone: Fax:	+33–1–44–09–14–00 +33–1–44–09–14–05

7.2.5.2 *Cray Japan Contract Administrator*

Customers in Japan can direct licensing inquiries to Tsukasa Sasaki at the following address:

Tsukasa Sasaki
Cray Research (Japan), Ltd.
Nikko Ichibancho Building
13–3, Ichiban-cho
Chiyoda-ku, Tokyo 102
Japan

Telephone: +81–3–3239–6109
Fax: +81–3–3239–1322

7.2.5.3 *Other customers*

Customers outside Europe and Japan can direct licensing inquiries to Rodgers Naylor at the following address:

Rodgers Naylor
Director, Contracts Administration
Cray Research, Inc.
1440 Northland Drive
Mendota Heights, MN 55120 USA

Telephone: +1–612–683–7403
Fax: +1–612–683–7297

7.3 Optional software orderable with UNICOS 9.0 release package

You can order the following software products on your UNICOS 9.0 software order form as optional software when you order your UNICOS 9.0 release package.

> **Note:** These products are included with your UNICOS license, but they are not automatically shipped as part of the UNICOS 9.0 release package. If you want either of the following products, you must order them on the UNICOS 9.0 order form.

The products described are as follows:

- Kerberos Enigma software
- DWB

For a complete list of Cray Research products that operate with UNICOS software, contact your Cray Research representative.

7.3.1 *Kerberos Enigma software*

The Kerberos Enigma software contains software for CRYPT and Kerberos. This tape replaces the CRYPT and RPC Enigma tapes. The Kerberos Enigma software is available in both binary and source code, depending on the license terms with each customer and on-site location.

7.3.1.1 *Kerberos Enigma software shipped within the U. S. and Canada*

For shipments within the U.S. and Canada, if you require Kerberos Enigma software, order it as optional software on the UNICOS 9.0 software order form.

Customers in the U.S. and Canada receive tapes that include versions of the Kerberos programs that support data stream encryption. The software is available in either source or binary form, depending on the license terms with each customer.

7.3.1.2 *Kerberos Enigma software shipped outside of the U.S. or Canada*

Customers outside the U.S. or Canada receive binary software regardless of whether their site has a source or binary UNICOS license. With this software, customers outside the U.S. and Canada can run Kerberos without support for the data stream encryption features. To order this software, use the UNICOS 9.0 software order form.

An export license from the U.S. Department of State is required for software shipments outside the U.S. or Canada. This export license is required in addition to the Department of Commerce export license necessary for Cray Research hardware. If a U.S. Department of State export license is **not** in place for the customer serial number for which the Kerberos Enigma software is desired, a U.S. Department of State Application Request for Kerberos Enigma is required before an export license can be processed. If an export license already exists, the statement is **not** required. The Kerberos Enigma binary software order form contains a U.S. Department of State Application Request for Kerberos Enigma.

You can obtain U.S. Department of State export licenses for UNICOS from Christine Miller at the following address:

Christine Miller
Cray Research, Inc.
1440 Northland Drive
Mendota Heights, MN 55120 USA

Telephone: 1–800–284–2729
+1–612–683–7476
Fax: +1–612–683–7485

7.3.2 *DWB*

DWB is based on Documenter's Workbench from Novell, Inc. Only binary software is provided.

DWB is packaged separately from the UNICOS operating system. To receive DWB, order it using the "Additional Software" section of the UNICOS 9.0 software order form.

Note: A separate license is not required for DWB. UNICOS System Software and UNICOS Set licenses include binary licenses for DWB (Documenter's Workbench).

7.4 Release package contents

The UNICOS 9.0 release package will include the following:

- Software media that contains the UNICOS 9.0 release. For CRAY J90 systems, the release package also includes the IOS release software and the system console software CD. For CRAY EL systems, the release package also includes the IOS release software.
- One copy of the *UNICOS 9.0 Release Overview*, publication RO–5000 9.0.
- The UNICOS installation guide for your system.
- Online man page files. To display these files, use the `man`(1) command.
- Online diagnostics, providing system hardware tests.
- A CD-ROM that contains the CrayDoc viewer and the UNICOS publications. For a list of CrayDoc publications updated for this release, see subsection 5.3.1.2, page 5–11.
- A set of the UNICOS publications provided online through the Docview utility. For a list of updated Docview publications for this release, see subsection 5.3.1.2, page 5–11.
- The updated core set of printed UNICOS publications. For more information about the core set of printed UNICOS publications included with your release package, see subsection 5.4.1, page 5–17.

7.5 Release package ordering information

The UNICOS 9.0 release is distributed by order only to sites that have signed the appropriate Cray Research and UNIX software license agreements or to Cray Research personnel at Cray Research offices. The most current revision of the release package is supplied.

You can order UNICOS 9.0 in one of the following ways. Software will be shipped by ground service or 5-day international service unless otherwise requested.

- Use the CRInform online ordering service, which is accessible from the CRInform home page.

  Under the **Cray Research Software** section, choose *Order Cray Software*.

- Call the Cray Research Distribution Center in Mendota Heights, MN, using one of the following telephone numbers:

  – 1–800–284–2729, extension 35907

  – +1–612–683–5907

- Fax your order to +1–612–452–0141.

- Send electronic mail to: `orderdsk@sdiv.cray.com`

- Customers outside the U.S. and Canada should contact their local service organization for ordering and documentation information.

  Customers outside of the United States and Canada must sign a Letter of Assurance before software can be shipped. Address all questions regarding which customers have signed a Letter of Assurance, or which software requires this letter to Christine Miller, at the following address:

  Christine Miller, International Administration
  Cray Research, Inc.
  1440 Northland Drive
  Mendota Heights, MN 55120 USA.

  Telephone: 1–800–284–2729
  +1–612–683–7476
  Fax: +1–612–683–7485

Customer Services [5]

This chapter describes the customer services Cray Research offers to support your UNICOS 10.0 release.

5.1 Training support

The *Software Training Catalog*, TR-CUSTCAT, describes all Cray Research Software Training support as follows:

- Lists Cray Research training office locations
- Describes available training services and facilities
- Provides curriculum charts for employees and customers
- Contains a current course schedule with a description and outline for each course

You can access the Software Training Catalog online on the CRInform system. You can also use the CRInform system to register for classes. For additional information about CRInform, see Section 5.3, page 90. Also, customers can order a *Software Training Catalog* from their Cray Research software training coordinator or from the Cray Research Distribution Center. To order a *Software Training Catalog* from the Cray Research Distribution Center, call (800) 284-2729, extension 5901 or 5907. When ordering, specify the TR-CUSTCAT document.

All courses described in the training catalog are available at the Cray Research Software Training facility in Eagan, Minnesota. This facility provides a complete, hands-on learning environment equipped with terminals, front-end batch systems, and both interactive and network access to all Cray Research mainframe types. Regional training locations can provide comparable learning environments; Cray Research also offers on-site, customized training. See your local training coordinator for details.

Cray Research provides a full range of training to support the UNICOS 10.0 release. The Software Education Services department offers start-up classes for first-time users of the UNICOS system, as well as detailed classes for experienced customers and Cray Research analysts. Classes are targeted for scientists, engineers, application programmers, systems programmers, systems administrators, and systems analysts. Special-focus offerings on languages, optimization, and other aspects of the UNICOS system are also offered.

Most of the courses described in the Software Training Catalog will be updated to reflect the UNICOS 10.0 release on the first offering after the UNICOS 10.0 release.

5.2 Software problem reporting and resolution process

If you experience problems with the UNICOS 9.0 release, contact your Cray Research service representative; your service representative will work with you to resolve the problem. If your maintenance agreement provides for full-time or part-time on-site support, your on-site support personnel are your primary contacts for service. If your maintenance agreement provides for off-site support, please call your designated support group for assistance.

5.3 Cray Research CRInform system

The Cray Inform system (CRInform) is an online information and problem-reporting service for Cray Research customers.

Version 5.0 of the CRInform program is available through the World Wide Web. You need access to the CRInform Web server and a browser (such as Mosaic, NetScape, or Lynx), which allows you to view information or make service requests. You can use your own site's browser, or use either the Mosaic or Lynx browsers available on the CRInform system.

The CRInform service includes the following features:

- Global access to all CRInform information
- Technical support
- Software Problem reports
- Software information and ordering
- General service information
- Cray Research home page

To sign up for the CRInform program, request a CRInform Program Agreement from your Cray Research service representative. Sign and return the form. After receipt of this signed agreement, a CRInform administrator will send you the following:

- *Introducing the CRInform System*, Cray Research publication IN–2125 5.0

- User validation information

Release Package [6]

Note: The full contents of the UNICOS 10.0 release package are yet to be determined. As information becomes available, it will be added to this chapter.

This section contains the following information about the UNICOS 10.0 release package:

- UNICOS hardware and software requirements
- Licensing information
- Optional software which can be ordered with the UNICOS 10.0 release package
- Release package contents
- Release package ordering information

6.1 UNICOS 10.0 hardware and software requirements

The following sections list the following, supported with the UNICOS 10.0 release:

- Cray Research hardware platforms supported with UNICOS 10.0 (see Section 6.1.1, page 93)
- IOS-E and OWS software levels supported (see Section 6.1.2, page 94)
- Programming environments supported with the UNICOS 10.0 release package (see Section 6.1.3, page 94)
- Tested and supported upgrade paths (see Section 3.3, page 46)
- Cray Research software products supported (see Section 6.1.5, page 96)
- Cray Research asynchronous software products supported (see Section 6.1.5.2, page 98)

6.1.1 Cray Research systems supported with UNICOS 10.0

The UNICOS 10.0 release initially supports the following Cray Research systems:

- CRAY J90 systems with Model-V IOS
- CRAY C90, T90–CFP and T90–IEEE systems with Model-E IOS
- CRAY T90–CFP, T90–IEEE, and J90se systems with GigaRing IOS.
- Cray Research hosts for CRAY T3D systems, specifically CRAY T90 series with Cray floating-point CPUs and CRAY C90 series.

Note: CRAY J90++ and T90P (PV+) systems will be supported in a later release of UNICOS 10.0.

6.1.2 OWS and IOS-E software

For Cray Research systems with an IOS-E and for the CRAY T90 series, UNICOS 10.0 includes the IOS 9.0.1.3/015 release and the OWS 9.0.1.3/015 release.

GigaRing sites will also receive the current level of SWS-ION with UNICOS 10.0.

Note: If your site is licensed for supported UNICOS source code, you will receive a source code package, which lets your modify your code locally. For UNICOS 10.0, you can load source into your system together with binary code packages before generation.

For more information about ordering the IOS and OWS releases, see the *Support System and IOS-E Release Overview*, Cray Research publication RO–5060.

6.1.3 Programming environments supported with UNICOS 10.0

The UNICOS 10.0 release supports the following programming environments. These are asynchronous products, and therefore must be purchased and licensed separately from UNICOS 10.0. For more information, contact your Cray Research representative.

Note: You must make sure that your Cray Research system supports product upgrades beyond the release levels listed here, should you decide to purchase them.

- CF90 Programming Environment 3.0 or later for Cray PVP and MPP systems. See the *Programming Environment Releases Overview*, Cray Research publication RO–5212 3.0, for additional information.
- Cray C++ Programming Environment 3.0 or later for Cray PVP and MPP systems. This package includes Cray Standard C. See the *Programming*

Environment Releases Overview, Cray Research publication RO–5212, for additional information.

- C++ MathPack 3.0 or later for Cray PVP and MPP systems. See the *Cray C++ Library Products Technical Note*, Cray Research publication SN–2129 3.0, for additional information.
- C++ Tools 3.0 or later for Cray PVP and MPP systems. See the *Cray C++ Library Products Technical Note*, Cray Research publication SN–2129 3.0, for additional information.

6.1.3.1 Fortran run-time libraries

Sites that install the UNICOS 10.0 release must upgrade to a Programming Environment 1.2 or later release to obtain Fortran run-time libraries. This is because these libraries were no longer released with the UNICOS system beginning with UNICOS 9.0.

Note: Sites running the UNICOS 8.3 *restricted* release that upgrade to UNICOS 10.0 (via the upgrade path through UNICOS 9.0) also have this requirement. These libraries were not released with UNICOS 8.3. (See Section 3.3, page 46 for more information.)

6.1.4 Tested and supported upgrade paths

Sites running any version of UNICOS 9.0 or any 9.X IDS restricted releases on one of the supported hardware platforms (see Section 6.1.1, page 93) can upgrade directly to UNICOS 10.0.

Customers running any version prior to UNICOS 9.0 must first perform an upgrade installation to the UNICOS 9.0 release, then upgrade to UNICOS 10.0.

Initial installs of GigaRing-based systems have been supported since UNICOS 9.2; while support of initial installs of Model-E based systems stopped after UNICOS 9.1.

Note: If you have a *non*-GigaRing system and you wish to upgrade to a GigaRing-based system, you must perform an initial install.

For more information, see the following installation and upgrade publications:

- *UNICOS Installation Guide for CRAY J90 Model V based Systems*, Cray Research publication SG–5271 10.0

- *UNICOS Installation Guide for CRAY J90se GigaRing based Systems*, Cray Research publication SG–5296 10.0
- *UNICOS Installation Guide for CRAY C90, CRAY T90, and CRAY T90 IEEE Model E based Systems*, Cray Research publication SG–5297 10.0
- *UNICOS Installation Guide for CRAY T90 and CRAY T90 IEEE GigaRing based Systems*, Cray Research publication SG–5298 10.0

Contact your Cray Research representative for further information.

6.1.5 Cray Research software products supported

The following sections list the software products other than programming environments most commonly used in conjunction with the UNICOS operating system. The product release level required with UNICOS 10.0, if any, is specified. For information about other products, contact your Cray Research representative.

6.1.5.1 Distributed computing and networking software supported

The UNICOS 10.0 release supports the following Cray Research distributed computing and networking software products, which are released asynchronously or otherwise separately from the UNICOS 10.0 release.

- Distributed Computing Environment

  Customers wishing to use the Cray Distributed Computing Environment (DCE) Client Services, must purchase a DCE Client Services license. DCE 1.1 is the level of DCE required with UNICOS 10.0. For more information about DCE licensing or to purchase a DCE license, contact your Cray Research representative. For information describing this product, see the *Cray DCE Client Services/Cray DCE DFS Server Release Overview*, Cray Research publication RO–5225 1.1, or contact your Cray Research representative.

- Distributed File System

  To use the Cray DCE Distributed File System (DFS), sites must purchase a DFS Servers license, as well as a DCE Client Services prerequisite license. For more information about DFS licensing or to purchase a DFS license, contact your Cray Research representative. For information describing this product, see the *Cray DCE Client Services/Cray DCE DFS Server Release Overview*, Cray Research publication RO–5225 1.1, or contact your Cray Research representative.

- Network Queuing Environment

  The Cray Network Queuing Environment (NQE) is a set of clients and servers that allow batch requests to be executed across a load-balanced network of hosts. UNICOS 10.0 supports NQE version 3.2 or later. For more information about NQE or to purchase an NQE license, contact your Cray Research representative, or see the *NQE Release Overview*, Cray Research publication RO–5237.

- SUPERLINK/VMS

  SUPERLINK for DEC VAX/VMS Systems provides a link between DEC VAX/VMS systems and the UNICOS operating system on Cray Research PVP systems. UNICOS 10.0 supports the 1.4 version of SUPERLINK/VMS.

  Note: You must purchase a SUPERLINK / VMS license to use this product.

  For information describing this product, see the *SUPERLINK for DEC VAX OpenVMS and Alpha AXP Systems 1.4 Release OVerview*, Cray Research publication RO–5090.

- Cray Visualization Toolkit (CVT)

  The Cray Visualization Toolkit is a collection of tools that allows users to create visual interfaces for Cray Research-based applications. CVT software is appropriate for all CRAY C90, CRAY T90, CRAY J90 and CRAY T3E computer systems. UNICOS 10.0 supports the 3.1 version of CVT.

  Note: You must purchase a CVT license to use this product.

- Remote Queuing System (RQS/VMS)

  The Remote Queuing System (RQS) for DEC VAX/VMS Systems is used for remote job submission and control to Cray Research PVP systems from a DEC VAX/VMS running VMS 5.4 or later. UNICOS 10.0 supports the 2.0 release of RQS/VMS.

  Note: You must purchase an RQS/VMS license to use this product.

  For information describing this product, see the *RQS for DEC VAX/VMS Systems Release Overview*, Cray Research publication RO–5105.

- Front End Servicing for IBM/MVS Systems (FES MVS)

  The Front End Servicing for IBM/MVS Systems (FES MVS) integrates UNICOS on-line tape management on CRAY Y-MP, CRAY J90, CRAY C90 or

CRAY T90 systems running UNICOS with tape management system for other computer systems running the IBM/MVS operating system. UNICOS 10.0 supports the 2.0 version of this product.

Note: You must purchase an FES/MVS license to use this product.

For information on FES MVS see the *FES MVS Installation and Administration Guide*, Cray Research publication SG–5251.

6.1.5.2 Storage management software supported

The UNICOS 10.0 release supports the following Cray Research software products. These are released asynchronously or otherwise separately from the UNICOS 10.0 release.

Note: Each of these products is licensed separately from UNICOS 10.0. For purchasing and licensing information, see your Cray Research representative.

- Data Migration Facility 2.5.4.4

  The Cray Data Migration Facility (DMF) ensures the availability of file system space by moving selected files from online disk to an offline storage medium. DMF 2.5.4.4 is the level of DMF supported by UNICOS 10.0.

- HIPPI disk support software

  Cray Research will supply HIPPI disk software free of charge to customers purchasing disks from Cray Research. If customers purchase their disks from a third party, HIPPI disk support software must be licensed and purchased from Cray Research.

- Cray REELibrarian (CRL)

  CRL is a client/server volume management system that controls a centrally stored library of tapes (or volumes) and allows requests for tape mounts. UNICOS 10.0 supports the 2.0.8 release of CRL.

For additional software availability, contact your Cray Research representative.

6.2 Licensing information

The UNICOS operating system is licensed under a software contract by Cray Research to its customers. The UNICOS 10.0 release is available as follows:

- For CRAY T90 systems, UNICOS 10.0 is available in source and binary formats.
- For all CRAY J90 systems, including J90se, UNICOS 10.0 is available in binary format only. CRAY J90 customers may, however, obtain an optional J90 UNICOS Source Materials package, providing they obtain a separate J90 UNICOS Source Materials license.

  Note: UNICOS 10.0 release package requires a UNICOS System Software license; customers with a UNICOS System Software license do not need additional Cray Research licenses to receive the standard UNICOS 10.0 release package (see Section 6.2.2, page 102 for information on UNCOS source code license requirements, and Section 6.2.3 and Section 6.2.4 for information on licensing contacts). Software for programming environments (compilers) and the Data Migration Facility (DMF) are licensed separately from the UNICOS System Software license. Other functionality is also offered as separately licensed products.

Customers outside the United States and Canada must sign a Letter of Assurance before software can be shipped. Address all questions regarding which customers have signed a Letter of Assurance, or which software requires this letter to Christine Miller, at the following address:

Christine Miller
Cray Research, Inc.
655F Lone Oak Drive
Eagan, MN 55121
Telephone: +1–612–683–7476
Fax: +1–612–683–7297

6.2.1 Products that require Flexible License Manager keys

The UNICOS 10.0 release includes the Flexible License Manager (FLEXlm), which controls the use of certain products in the UNICOS operating system. The following products, packaged with UNICOS 10.0, are licensed through FLEXlm:

- ONC+
- UNICOS shared file system
- CRSTK/STKRED
- CRIBM/IBM 3495 (implementation of IBM 3495 Tape Library Dataserver support is deferred)

- CREMS/DTDL and CREMS/ER90
- BDS (Bulk Data Services) Server
- BDS (Bulk Data Services) Client
- NQE (Network Queuing Environment)

  Note: Unlike other FLEXlm products, NQE is no longer packaged with the UNICOS operating system.

Whether products are packaged with the UNICOS operating system or separately packaged, the license keys are generated by the Cray Research order desk during the product order cycle. After the order desk has received notice of the order, it issues the contracted license keys. The license keys and installation instructions are sent by electronic mail.

For a complete list of Cray Research products that operate with UNICOS software, contact your Cray Research representative.

If a licensed product has been installed and a problem arises that is suspected to be related to the license key, it is possible to get an emergency key from the Customer Service Call Center in the United States or from the service organization in other countries.

6.2.1.1 ONC+

To use ONC+ technology, sites must purchase an ONC+ license. For more information about ONC+ licensing or to purchase an ONC+ license, contact your Cray Research representative.

For information describing this product, see *ONC+ Technology for the UNICOS Operating System*, Cray Research publication SG–2169, and the *UNICOS Networking Facilities Administrator's Guide*, Cray Research publication SG–2304, or contact your Cray Research representative.

6.2.1.2 UNICOS Shared File Systems

To use UNICOS shared file systems (SFS), sites must purchase an SFS license. For more information about SFS licensing or to purchase an SFS license, contact your Cray Research representative.

For information describing this product, see the *Shared File System (SFS) Administrator's Guide*, Cray Research publication SG–2114, or contact your Cray Research representative.

6.2.1.3 CRSTK/STKRED

To use StorageTek RedWood drive autoloader cartridge system support, sites must purchase a CRSTK/STKRED license. For more information about CRSTK/STKRED licensing or to purchase a CRSTK/STKRED license, contact your Cray Research representative.

6.2.1.4 CRIBM/IBM 3495

To use IBM 3495 support software, sites must purchase a CRIBM/IBM 3495 license. For more information about CRIBM/IBM 3495 licensing or to purchase a CRIBM/IBM 3495 license, contact your Cray Research representative.

Implementation of IBM 3495 Tape Library Dataserver support is deferred.

6.2.1.5 CREMS/DTDL and CREMS/ER90

To use the EMASS robotic and ER90 device products, sites must purchase a CREMS/DTDL license. For more information about CREMS/DTDL licensing or to purchase a license, contact your Cray Research representative.

For more information describing these products, see *Tape Subsystem Administration*, Cray Research publication SG–2307 and *Tape Subsystem User's Guide*, Cray Research publication SG–2051, or contact your Cray Research representative.

6.2.1.6 BDS (Bulk Data Services) Server

BDS Server data transfer product is available for Cray PVP systems for UNICOS 10.0. BDS Server is controlled by FLEXlm and requires a separate license for access.

For more information on this product, see the `bds`(8) man page, or contact your Cray Research representative.

6.2.1.7 BDS (Bulk Data Services) Client

BDS Client data transfer product is available for Cray PVP systems for UNICOS 10.0. BDS Client is controlled by FLEXlm and requires a separate license for access.

For more information on this product, see the `bds`(8) man page, or contact your Cray Research representative.

6.2.1.8 NQE (Network Queuing Environment)

Unlike other FLEXlm products, NQE is no longer packaged with the UNICOS operating system. It is delivered as a separate media which includes the following functionality:

- NQE functionality: This requires a separate NQE license and FLEXlm key in order to access.
- NQS and FTA functionality: This does not require a separate FLEXlm key. Rights to use the NQS and FTA functionality are included with the UNICOS System Software license. The NQE media is automatically shipped with UNICOS 10.0 so that customers will have access to NQS and FTA functionality.

For information describing this product, see the *NQE Release Overview*, Cray Research publication RO–5237, or contact your Cray Research representative.

6.2.2 UNICOS source code license

To receive a UNICOS 10.0 source code license, customers must first obtain a UNIX source code license for the UNIX System V, Release 4.0 (SVR 4.0). Customers can obtain these rights through Cray Research, or through The Santa Cruz Operation, Inc. (SCO).

> **Note:** Customers with UNIX rights that allow them to receive the UNICOS 9.0 release do not need additional UNIX licensing for the UNICOS 10.0 release.

For information on who to contact if you have licensing questions, or if your site has not signed all appropriate Cray Research software license agreements, see Section 6.2.3 or Section 6.2.4.

For information about available optional software products that are included with your UNICOS license but which you must order to receive them with your UNICOS 10.0 release package, see Section 6.3, page 105.

For more information about the FLEXlm license manager, or for information about products that are included in the UNICOS 10.0 release software but which require a FLEXlm license key to access the product, see Section 6.3, page 105.

6.2.2.1 UNIX System V licenses for CRAY J90 systems

CRAY J90 customers that have a standard binary release of UNICOS 10.0 must have a UNIX System V, Release 4.0 *binary* license, available only through Cray Research.

CRAY J90 customers with the J90 Source Materials Option need an additional UNIX System, Release 4.0 *source* license, available through Cray Research, or through The Santa Cruz Operation, Inc. (SCO).

6.2.3 Licensing contact for customers in the U.S. and Canada

For more information on the licensing and pricing of the UNICOS 10.0 release, customers in the United States and Canada should see their account representative or contract negotiator, or contact Sarah White at the following address:

Sarah White
Cray Research
655F Lone Oak Drive
Eagan, MN 55121 USA
Telephone: +1–612–683–5604
Fax: +1–612–683–7145

6.2.4 Licensing contacts for customers outside the U.S. and Canada

Customers outside the U.S. and Canada may obtain further licensing and export information by contacting their account representative or the individuals listed in the following sections.

6.2.4.1 Cray European Regional Contract Negotiators

Customers in Europe can direct licensing inquiries to the following Regional Contract Administrators:

Europe North Sales Region (including UK / Ireland / Russia / Poland / Denmark / Finland / Norway / Sweden / Netherlands)
Nick Jacobs
Cray Research (UK) Ltd.
Oldbury
Bracknell
Berkshire, RG12 4TQ, England
Telephone: +44–1189–257041

Fax: +44–1189–257106
Email: niknik@cray.com

Rest of Europe and South Africa
Simon Locke
Cray Research (UK) Ltd., c/o SGI Ltd
1530 Lakeside, Arlington Bus. Park
Theale Berkshire
Reading, RG7 4SB, England
Telephone: 44–1189–257049
Fax: 44–1189–257946
Email: srl@cray.com

Europe Central (including Germany and Austria)
Thomas Wegener
Silicon Graphics GmbH
Am Hochacker 3
85630 Grasbrunn–Neukeferloh
Germany
Telephone: +089–46108–321
Fax: +089–46108–322
Email: thomas@munich.sgi.com

Europe South Sales Region (including France)
Cecile Goachet / Patricia Guillerm-Brillet
Silicon Graphics France
21, rue Albert Calmette
78351 Jouy en Josas
France
Telephone: +33–01–34–88–82–51
Fax: +33–01–34–65–96–19
Email: cecile@cray.com and pguiller@paris.sgi.com

6.2.4.2 Cray Japan Contracts / Legal

Customers in Japan can direct licensing inquiries to Shinji Uekusa or Yuko Hizume at the following addresses:

Shinji Uekusa
Nihon Silicon Graphics Cray K.K.
31F, Yebisu Garden Place, 4–20–3
Ebisu, Shibuya-ku
Tokyo
Japan 150

Telephone: +81–3–5488–5692
Fax: +81–3–5420–1867
Email: uekus@nsg.sgi.com

Yuko Hizume

Nihon Silicon Graphics Cray K.K.

P.O. Box 5011 Yebisu Garden Place Tower

4–20–3, Ebisu

Shibuya-ku, Tokyo 150

Japan

Telephone: +81–3–5488–1819

Fax: +81–3–5420–7020

Email: hizume@nsg.sgi.com

6.2.4.3 Other customers

International customers outside Europe and Japan can direct licensing inquiries to Rodgers Naylor at the following address:

Rodgers Naylor
Director of Contracts
Cray Research, a Silicon Graphics Company
655F Lone Oak Drive
Eagan, MN 55121 USA
Telephone: +1–612–683–7403
Fax: +1–612–683–7297
Email: naylorgr@cray.com

6.3 Optional software

You can order the following software products on your UNICOS 10.0 software order form as optional software when you order your UNICOS 10.0 release package.

Note: These products are included with your UNICOS license, but they are not automatically shipped as part of the UNICOS 10.0 release package. If you want any of the following products, you must order them on the UNICOS 10.0 order form.

The products described are as follows:

- Kerberos Enigma software
- DWB

For a complete list of Cray Research products that operate with the UNICOS 10.0 operating system, contact your Cray Research representative.

6.3.1 Kerberos Enigma software

The Kerberos Enigma software contains software for CRYPT and Kerberos. The Kerberos Enigma tape replaces the CRYPT and RPC Enigma tapes. The Kerberos Enigma software is available in both binary and source code, depending on the license terms with each customer and on-site location.

6.3.1.1 Kerberos Enigma software shipped within the U.S. and Canada

For shipments of Kerberos Enigma software within the United States and Canada, order it as optional software on the UNICOS 10.0 software order form.

Customers in the United States and Canada receive tapes that include versions of the Kerberos programs that support data stream encryption. The software is available in either source or binary form, depending on the license terms with each customer.

6.3.1.2 Kerberos Enigma software shipped outside of the U.S. or Canada

Customers outside the United States and Canada receive binary software regardless of whether their site has a source or binary UNICOS license. With this software, customers outside the United States and Canada can run Kerberos without support for data stream encryption. To order this software, use the UNICOS 10.0 software order form.

An export license from the U.S. Department of Commerce is required for Cray Research hardware and software shipments outside the United States or Canada. If a U.S. Department of Commerce export license is **not** in place for the customer serial number for which the Kerberos Enigma software is desired, a U.S. Department of Commerce Application Request for Kerberos Enigma is required before an export license can be processed. If an export license already exists, the statement is **not** required. The Kerberos Enigma binary software order form contains a U.S. Department of Commerce Application Request for Kerberos Enigma.

Note: Jurisdiction for exporting Kerberos has recently changed from the U.S. Department of State to the U.S. Department of Commerce. Customers who currently hold export licenses with the Department of State do not need to re-apply for new licenses with the Department of Commerce. Current Department of State licenses are still valid through the expiration date listed on the license, or until we have shipped the maximum number of copies of Kerberos allowed under the license.

You can obtain a U.S. Department of Commerce export licenses for UNICOS from Christine Miller at the following address:

Christine Miller
Cray Research, Inc.
655F Lone Oak Drive
Eagan, MN 55121
Telephone: +1–612–683–7476
Fax: +1–612–683–7297
Email: `millercm@cray.com`

6.3.2 DWB

DWB is based on Documenter's Workbench from Novell, Inc. Only binary software is provided.

DWB is packaged separately from the UNICOS operating system. To receive DWB, order it using the "Additional Software" section of the UNICOS 10.0 software order form.

Note: A separate license is not required for DWB. UNICOS System Software and UNICOS Set licenses include binary licenses for DWB.