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.