Cray XT3™ Systems 1.3 Software Release Overview

S–2425–13
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This document is intended to give application programmers and system administrators an overview of the Cray XT3 systems 1.3 software releases.

1.1 Emphasis for the Cray XT3 Systems Software Releases

The key enhancements in the Cray XT3 systems 1.3 software releases are:

- MPI performance improvements.
- Improved Portals processing to allow reliable scaling past 256 nodes.
- Support for up to 8 GB of memory per node.
- Capability to select the page mapping size (4 Kbytes or 2 Mbyte) to overcome Opteron translation lookaside buffer (TLB) implementation limitations.
- Support for the GNU 3.2.3 C and Fortran 77 compilers.
- Support of the Etnus TotalView 7.0 debugger at larger scale (up to 512 nodes).
- Improved system shutdown process.
- Fixed problems and limitations of the Cray XT3 systems 1.2 software releases.

For additional information about all software enhancements for the Cray XT3 systems 1.3 software releases, see Chapter 2, page 5.

1.2 Supported Upgrade Path

The supported upgrade path is from the base Cray XT3 1.2 release or Cray XT3 1.2 updates to the Cray XT3 1.3 release.
Note: We have had experience running the Cray XT3 1.3 release with the following system components:

- Systems with up to 44 cabinets.
- Applications running on 4,100 nodes.
- System memory size of up to 8 GB.
- Service nodes: 1-10 login nodes, 1 boot node, 1 database node, 1 syslog node, and 10 network nodes.
- Systems with up to 32 Lustre object storage servers (OSSs) and 64 object storage targets (OSTs) configured in a single Lustre file system.
- TotalView running on a maximum of 512 nodes; TotalView requires 1 suitably configured service node for each 64 compute nodes to be debugged.

1.3 Support Policy

Cray supports each Cray XT3 systems software release by providing update packages. Updates are provided for one month beyond the next release as needed to allow customers time to upgrade.

Binary compatibility is maintained from release to release, with the following exceptions: to fix a reliability or performance problem, to support new hardware, or to provide continued support of third-party software included with the Cray XT3 systems software release package. Changes made that affect compatibility are documented with the release.
1.4 Reader Comments

Contact us with any comments that will help us to improve the accuracy and usability of this document. Be sure to include the title and number of the document with your comments. We value your comments and will respond to them promptly. Contact us in any of the following ways:

**E-mail:**
docs@cray.com

**Telephone (inside U.S., Canada):**
1–800–950–2729 (Cray Customer Support Center)

**Telephone (outside U.S., Canada):**
+1–715–726–4993 (Cray Customer Support Center)

**Mail:**
Software Publications
Cray Inc.
1340 Mendota Heights Road
Mendota Heights, MN 55120–1128
USA
This chapter describes the enhancements that have been made with this release.

For compatibility issues and differences that you should be aware of when installing this release or using these products, see Chapter 3, page 19.

For a list of all documentation provided with the Cray XT3 systems 1.3 release package, see Chapter 4, page 23.

The Cray XT3 Systems 1.3 Release Errata describes temporary limitations of this release and changes identified after the documentation for this release was packaged.

The Cray XT3 System Overview gives a high-level description of Cray XT3 software and hardware components.

2.1 Operating System

The UNICOS/lc operating system includes the following enhancements with this release:

- Support for up to 8 GB of physical memory per compute node.
  
  **Note:** For usage limitations, see Section 3.3, page 20.

- Variable application page mapping size selection. A new `yod` option, `-small_pages`, allows users to specify 4 KB pages instead of the default 2 MB. Locality of reference affects the optimum choice between the default and 4 KB pages. Because it is often difficult to determine how the compiler is allocating a user’s data, the best approach is to try both the default and the `-small_pages` option and compare performance numbers.
  
  **Note:** For each 1 GB of memory, 2 MB of page table space is required.

- Load balancing for multiple login nodes. Users are given a single host name that they use to connect to login nodes. The `lbnamed` load balancer distributes user logins to login nodes, directing them to the least heavily used login node.
The `lbnamed` load balancer runs on the SMW; therefore, the SMW must be connected to the network from which users log in to the login nodes. In addition, an NS record must be added to the primary DNS server configuration so that name lookups for Cray XT3 login nodes are redirected to the `lbnamed` server running on the SMW.

For more information, see the *Cray XT3 Software Installation and Configuration Guide* and the `1bcd(8)`, `lbnamed(8)`, and `lbnamed.conf(5)` man pages.

- **32-bit UID support.** Customers requiring 32-bit UIDs no longer need to use the workaround configuration.
  
  **Note:** Use of the $2^{32}$-1 value is not allowed.

- **Support for TotalView debugging at larger scale.** The TotalView 7.0 debugger from Etnus, LLC, provides source-level debugging of applications. Running on a Cray XT3 1.3 release system, TotalView can debug applications running on 1-512 compute nodes.

- **New shutdown procedure.** The new mainframe `xtshutdown` command runs on the boot node to shut down the service nodes of the Cray XT3 system. It executes a series of commands on the boot node and on the service nodes to bring down the system in an orderly fashion.

  A system administrator defines the sequence of shutdown steps and the nodes on which to execute them in the `/etc/xtshutdown.conf` file or in the file specified by the `XTSHUTDOWN_CONF` environment variable.

  **Note:** You must be root user to run the `xtshutdown` command. Passwordless ssh must be enabled for the root user from the boot node to all service nodes.

  The `xtshutdown` command uses `pdsh` to run commands on the service nodes selected; for example, the boot node, the SDB node, a class of nodes, or a single host. By using the file `/etc/xt_shutdown_local` or the file defined by the `XTSHUTDOWN_LOCAL` environment variable, a system administrator may also define functions to execute when the system is shut down.

  For additional information, see the `xtshutdown(8)` man page and the *Cray XT3 System Management* manual.
2.2 Programming Environment

The Cray XT3 Programming Environment includes the following enhancements with this release:

- MPI performance improvements. Better latency for very short messages by default; increased bandwidth for long messages by default.

- MPI based on Cray MPICH-2 and upgraded to v1.0.2, which includes improvements and fixes.

- GNU 3.2.3 gcc and g77 compilers (the GNU g++ compiler is not supported). See the gcc(1) and g77(1) man pages for usage information.

  Note: The module file, PrgEnv, has been replaced with the module files PrgEnv-pgi, PrgEnv-gnu, and Base-opts. After a user loads the PrgEnv-gnu module file, the cc and f77 commands may be used instead of the gcc and g77 commands. Users should see Section 3.2, for additional information about this change.

  Note: The GNU version of Cray XT3 LibSci is not yet supported.

- PGI version 6.0-5.

  Note: The module file, PrgEnv, has been replaced with the module files PrgEnv-pgi, PrgEnv-gnu, and Base-opts. Users should see Section 3.2, for additional information about this change.

- AMD Core Math Library version 2.7; new features in Version 2.7 include:
  - Most ACML FFT routines now allow the user to generate an optimal plan to get best performance for a given problem size. The interfaces for two expert drivers, cfft3dx and zfft3dx, have been modified to allow this improvement. For more information, see the *AMD Core Math Library (ACML) Guide*.

  – GNU 3.2.3 versions of ACML are provided with this release.

- Performance API (PAPI) 3.1 on service and compute nodes.
2.3 Input/Output System

The Cray XT3 I/O system includes the following enhancements with this release:

- Enhanced Portals. Portals has been enhanced to reliably handle systems exceeding 256 nodes. Portals messages are generated when processes execute node-to-node communication functions (such as MPI and SHMEM calls). The SeaStar ASIC is limited to receiving a maximum of 256 simultaneous messages on a given node. When this limit is exceeded, the node is said to have experienced “CAM overflow” (CAM refers to an internal Content Addressable Memory resource in the SeaStar ASIC).

Before the Cray XT3 systems 1.3 release, on systems with more than 256 nodes, CAM overflow could be encountered under several circumstances where heavy communication was required. In these systems, this event normally resulted in an application hang. When CAM overflow occurred, a message was produced on the system console log to indicate the error.

In the Cray XT3 systems 1.3 release, a CAM overflow also causes a message to be sent to the system console log; however, the receiving node that overflowed also sends a request to the sender to retransmit the message, and the retransmission is transparent to the application.

- (This capability was added initially in the Cray XT3 systems 1.2.14 Update.) Portals heap size is set automatically at boot time when the Portals Linux kernel module is loaded. The size of the Portals heap on a running system can be determined by looking at the /proc/portals/heapinfo file; however, heap settings should not be changed unless directed by Cray service personnel. For additional information, see the Cray XT3 System Management manual.

- MPI-IO with Lustre locks. By default, users of MPI-IO will take advantage of Lustre locks, which allow efficient parallel I/O.

  Note: MPICH-2 incorporates ROMIO, which is a high-performance, portable implementation of the MPI-IO.

- Lustre parallel file system 1.3. Lustre now supports secondary group permission through setting up the group_upcall to use the utility l_getgroups. It is also possible to override this at startup time with a --group_upcall option to the lconf command.
• Optional IPv6 support; IPv4 remains the default. Note that with the Cray XT3
1.3 release, the following limitations apply:

  – The IPv6 capability in the Cray XT3 1.3 release is limited to the Ethernet
    interfaces and localhost. IPPO is not supported. This means that IPv6
    connectivity is limited to service nodes that have Ethernet cards installed.
    Routing of IPv6 traffic between service nodes across the internal mesh is
    not supported.

  – The `ip6tables` utility, which does packet-level filtering of network data,
    is not supported for the Cray XT3 1.3 release.

• (Deferred implementation until a Cray XT3 1.3 update) Persistent `/var`
  file system. Each Cray XT3 service node may now have a persistent, writable
  `/var` directory served via NFS. If the administrator configures the values
  `VAR_SERVER` and `VAR_PATH` in the `/etc/xt.conf` file, the service nodes
  will NFS mount that path at boot time. The `xtopview` utility will respect
  these configuration values and mount the correct `/var` directory used with a
  node view. This feature is active only after manual configuration. By default,
  service nodes still have `/var` as a RAM-based file system.

### 2.4 CRMS

The following enhancements have been made to the Cray RAS and Management
System (CRMS):

• (This capability was added initially in the Cray XT3 systems 1.2.17 Update.)
  New SMW `xtnn2` offline diagnostic (an enhanced version of `xtnn`). The
  `xtnn2` offline diagnostic runs an all-to-all node, high-speed network packet
  test. The `xtnn2` diagnostic runs firmware on the SeaStar PowerPC processor
  (PPC) that performs DMA packet transfers to other nodes. Each Cray SeaStar
  chip transmits a set number of packets to all specified Cray SeaStar chips,
  including itself. Each chip also handles the receipt of all messages transmitted
  to it. Each message contains the data pattern specified by the user. Data
  integrity is checked by the SeaStar PPC when data is received using several
  different methods, including data comparisons and cyclic redundancy checks.

  The `xtnn2` diagnostic displays progress information for each pass: elapsed
  time, percentage complete, and the remaining Cray SeaStar chips that are still
  transmitting. The information redraws itself on the same line to minimize
  screen clutter.

  For further information, see the `xtnn2(8)` and the `xtbounce(8)` man pages.
• `seacheck` diagnostic. The `seacheck` diagnostic, which provides functional testing of the Cray SeaStar chip, is no longer deferred. For further information, see the `xtcli(8)` man page.

• New `xtsync` command. The new `xtsync` command restores proper states for powered-up cabinets and slots after the state has been lost following a state manager restart on the SMW. In the past, it was necessary to fully power cycle all cabinets in the system to restore proper states. For further information, see the `xtsync(8)` man page.

2.5 Optional Products

The Cray XT3 system supports the following optional products:

• CrayPat 1.2 performance analysis tool (available from Cray)

• Cray Apprentice² 2.5 performance data visualization tool (available from Cray)

• Etnus TotalView 7.0 debugger (available from Etnus, LLC)

• PBS Pro 5.3.3xt (available from Cray)

2.6 Added Commands

The following commands were added with this release.

<table>
<thead>
<tr>
<th>Command or Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>gcc(1)</code></td>
<td>Invokes the GNU C compiler in the Cray XT3 Programming Environment</td>
</tr>
<tr>
<td><code>g77(1)</code></td>
<td>Invokes the GNU Fortran 77 compiler in the Cray XT3 Programming Environment</td>
</tr>
<tr>
<td><code>lbcd(8)</code></td>
<td>Load balancer client daemon for multiple login nodes</td>
</tr>
<tr>
<td><code>lbnamed(8)</code></td>
<td>Load balancer service daemon for multiple login nodes</td>
</tr>
<tr>
<td><code>xtnxn2(8)</code></td>
<td>SMW high-speed network offline diagnostic</td>
</tr>
</tbody>
</table>
Command or Function | Description
---|---
xshutdown(8) | Shuts down the Cray XT3 service nodes in an orderly fashion
xtsync(8) | Restores proper states for powered-up cabinets and slots after the state has been lost following a state manager restart on the SMW

**Note:** The GNU g++ command is not supported.

### 2.7 Enhanced Commands and Functions

The following commands and functions were enhanced with this release.

**Table 2. Enhanced Commands and Functions**

<table>
<thead>
<tr>
<th>Command or Function</th>
<th>Description</th>
</tr>
</thead>
</table>
yod(1) | Added `-small_pages` option, which allows users to specify 4 KB pages instead of the default 2 MB.

shmem_broadcast(3) | The input parameters `PE_start`, `logPE_stride`, and `PE_size` are no longer ignored.

rtr(8) | Added `-IR` option, which displays the physical route between two nodes in the system; called as `-IR start-node-dest-node`, such as: `-IRc0-0c0s0-c2-1c1s4s1`. Users can examine routes between any two individual nodes in the entire system to gain a better understanding of how packets are routed through the system.

xtbootsys(8) | A user can choose the `xtnetwatch` interval; default is 60. `xtbootsys` has a new file that lets the output of `xtnetwatch` be directed to it: `/opt/craylog/bootlogs/netwatch.YYDDMMhhmm`.

xbounce(8) | Added `mezz_millivolts` and `portals` options.
<table>
<thead>
<tr>
<th>Command or Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xtcdr2proc(8)</td>
<td>Changed to generate the correct XYZ coordinates. The correct XYZ coordinates are loaded into the SDB via an RCA library call, and the xtshowcabs and xtshowmesh commands display correctly for all topology classes.</td>
</tr>
<tr>
<td>xtcli(8)</td>
<td>The seachek diagnostic, which provides functional testing of the Cray SeaStar chip, is no longer deferred.</td>
</tr>
<tr>
<td>xtdumpsys(8)</td>
<td>Added --snapshot and --summary; added --noprompt argument that will proceed through the dumping process without pausing for user interaction; added analysis features, such as searching for MCA errors, health bit errors, panic messages, Portals firmware death signatures, voltages that have fallen and special console messages; added synonyms for the single-letter, command-line arguments; added ability to gather ptltrace output.</td>
</tr>
<tr>
<td>xtfwstat(8)</td>
<td>Now displays the high-water mark for CAM slots used on a node, which provides more information about the pressure exerted on the CAM under a load.</td>
</tr>
<tr>
<td>xtlogfilter(8)</td>
<td>Added --tally, --f filename, --file filename, --session session-id; added synonyms for the single-letter, command-line arguments. This command is no longer a pure &quot;filter&quot; because it does not read from stdin; you must specify file names or let the command find the event log files that pertain to a boot session.</td>
</tr>
<tr>
<td>xtprocadmin(8)</td>
<td>Removed the -t option; changed the -n option to specify nid as decimal, hex, or nodename.</td>
</tr>
<tr>
<td>xtptltrace(8)</td>
<td>Added -t seconds option to indicate the number of seconds to wait before timing out during a memory operation across the CRMS network. Default is 30 seconds.</td>
</tr>
<tr>
<td>xtshowcabs(8)</td>
<td>Displays correctly for all topology classes.</td>
</tr>
<tr>
<td>xtshowmesh(8)</td>
<td>Displays correctly for all topology classes.</td>
</tr>
</tbody>
</table>
2.8 Fixed Cray XT3 1.2 Limitations

The following limitations and problems noted in the Cray XT3 1.2 Release Errata have been fixed with the 1.3 release.

2.8.1 Do Not Use kill -KILL Command to Terminate Job

Running the Cray XT3 1.2 release, if a user ended a job abnormally using the `kill -KILL` command to terminate `yod` (`kill -KILL` is equivalent to `kill -9`), the command killed `yod` but `yod` did not finish cleanup activities, leaving orphaned compute nodes. This problem has been fixed.

Associated SPRs: 732873 and 732677

2.8.2 Short Incoming Messages May Cause Node to Crash

The Cray XT3 1.2 release had a problem with all-to-1 communication of very short messages; if enough of the short messages came into a node very quickly, the node would crash. The problem could occur when the SeaStar chip (the system's message processor) allocated "pending" structures faster than the host CPU could free them. When the structures were exhausted, the SeaStar chip would panic. As a workaround, it was recommended that applications doing a lot of all-to-1 traffic be changed to use another algorithm. This problem has been fixed.

Associated SPR: 732751

2.8.3 Signal Handling Problems

The Cray XT3 1.2 release had obstacles to the use of signals with the `yod` command. The issues could have been encountered whenever signals were used with `yod`. The issues varied somewhat, depending on the state of the job, but generally would cause compute nodes to be marked as down. While the status was not generally accurate, the system would adhere to it and refuse to allocate such nodes to future jobs until the next boot. This problem has been fixed.

Associated SPR: 732997
2.8.4 Deadlock Routing Problem

The Cray XT3 1.2 release had a problem with routing when there were too many SeaStar chips and/or links disabled. This resulted in parts of the system hanging, with the only symptom being the report of deadlocks via the \texttt{xtnetwatch} command. This problem has been fixed.

Associated SPR: 733031

2.8.5 JTAG Operation Failures May Cause 2.6 GHz Opteron Processors to Hang

With the Cray XT3 1.2 release, during blade initialization, the blade control processor (L0 controller) would perform JTAG operations (that is, testing interconnects) on the Opteron processors to determine their revisions. If for any reason this JTAG operation failed, the L0 controller changed certain Opteron/memory interface settings to Opteron revision 'C' settings. Only Cray XT3 systems with 2.6 GHz Opteron processors have revision 'E' settings as standard settings; improper setting of these memory interface registers would result in the processor hanging and the CRMS reporting heartbeat failures on the node for no apparent reason. This problem has been fixed.

Associated SPR: 732994

2.8.6 Power Up of Large Numbers of Cabinets Causes L0 Heartbeat Failures

With the Cray XT3 1.2 release, when attempting to power up several cabinets at once, the status returned by \texttt{xtcli power up} indicated an L0 heartbeat fault for several of the blades. Since the L0s had these faults, the power manager stopped sequencing any blade with this fault so that the nodes and SeaStar chips did not get powered up. There was no physical failure of the blades in this case; there was a fault in communications between cabinet controllers (L1) and the blades (L0s). This problem has been fixed.

Associated SPR: 733033

2.8.7 \texttt{truncate} and \texttt{ftruncate} System Calls Do Not Work When Called by a Compute Node Program

In the Cray XT3 1.2 release, the \texttt{truncate} and \texttt{ftruncate} system calls did not work when called by a compute node program operating on a file within a Lustre file system. Although the call appeared to succeed, the file size did not change to the value requested by the user. This problem has been fixed.

Associated SPR: 733038
2.8.8 umask(2) Fails to Change Mask Bits Correctly for Files

In the Cray XT3 1.2 release, setting a umask() and then using creat() to create a file resulted in incorrect default permissions. This problem was observed for both VFS Lustre and liblustre. This problem has been fixed.

Associated SPR: 728977

2.9 Fixed Critical and Urgent SPRs

The following customer-filed critical and urgent SPRs are closed with this release. For a list of all SPRs closed with this release, access the Cray SPR database.

<table>
<thead>
<tr>
<th>SPR Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>727385</td>
<td>INCORRECT INFORMATION IN START_RCA_SERVICES SCRIPTS ON RSLALG[1-3],RSLADB[1,2]</td>
</tr>
<tr>
<td>729580</td>
<td>DOING A PTLNININIT ON THE UKBRIDGE WITH AN INVALID NAL RETURNS SUCCESS</td>
</tr>
<tr>
<td>731624</td>
<td>1024 LSMS RUN HANGS (RX PACKET SEQUENCE NUMBER ERROR)</td>
</tr>
<tr>
<td>731729</td>
<td>LINUX UID LIMIT OF 65535 SHOULD BE INCREASED</td>
</tr>
<tr>
<td>731794</td>
<td>YOD LACKS SUPPORT FOR VARIABLE TLB PAGE SIZE</td>
</tr>
<tr>
<td>732062</td>
<td>SEGFAULT REFERENCING POINTER DUMMY ARGUMENT [3554]</td>
</tr>
<tr>
<td>732072</td>
<td>SYSTEM HANG - COULD NOT BOOT BECAUSE 40 L0 WOULD TIMEOUT</td>
</tr>
<tr>
<td>732268</td>
<td>PGI COMPILER HANGS IN VKP.F [TPR 3565]</td>
</tr>
<tr>
<td>732344</td>
<td>L1 INCORRECTLY POWERS DOWN SYSTEM</td>
</tr>
<tr>
<td>732433</td>
<td>PGF90 ALLOCATABLE AND AUTOMATIC ARRAYS CAUSING MEMORY CORRUPTION [3581]</td>
</tr>
<tr>
<td>732673</td>
<td>RSMS RESTART DOESN'T SYNCH WITH XTCLI STATUS OUTPUT</td>
</tr>
<tr>
<td>732689</td>
<td>LIBSYSIO/LIBLUSTRE O_EXCL ALWAYS FAILS</td>
</tr>
<tr>
<td>732760</td>
<td>CAM OVERFLOW RUNNING VASP AT 512 NODES</td>
</tr>
</tbody>
</table>
### 2.10 Fixed SUSE LINUX Security-related SPRs

The following SUSE LINUX security-related SPRs are closed with this release.

**Note:** SPRs 732612 and 733079 are addressed with Field Notices (FNs).

<table>
<thead>
<tr>
<th>SPR Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>732612</td>
<td>NEED TO INTEGRATE SUSE SUDO SECURITY FIX SUSE-SA:2005:036</td>
</tr>
<tr>
<td>732696</td>
<td>INSTALL SUSE KERNEL SECURITY PATCH SUSE-SA:2005:044</td>
</tr>
</tbody>
</table>

---

**SPR Number Description**

<table>
<thead>
<tr>
<th>SPR Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>732764</td>
<td>XTBOOTSYS WON'T BOOT NODES WITH NON-FATAL ALERTS</td>
</tr>
<tr>
<td>732922</td>
<td>NOT ALL LUSTRE EVICTION NOTICES ARE BEING RECEIVED</td>
</tr>
<tr>
<td>732934</td>
<td>SDB HANGS WITH &quot;SSNAL: LOOPING TOO LONG&quot; SOON AFTER HPCC ON 1024 CPUs STARTS</td>
</tr>
<tr>
<td>732988</td>
<td>OPTERON STOPS WHILE RUNNING LUSTRE</td>
</tr>
<tr>
<td>733047</td>
<td>CAM OVERFLOW PROBLEM SEEN ON ERDC BENCHMARKS</td>
</tr>
<tr>
<td>733109</td>
<td>HPCC PINGPONG BANDWIDTH SHOWS REGRESSION (AND IS UNSTABLE), COMPARED TO 1.1.08</td>
</tr>
<tr>
<td>733157</td>
<td>STBROWN MEMORY LEAK IN MPI_ALLTOALL, RELATED TO CPMD</td>
</tr>
<tr>
<td>733181</td>
<td>PRESENCE OF DEBUG INFORMATION IN LIBRARIES CONFUSES CRAYPAT</td>
</tr>
<tr>
<td>733243</td>
<td>XTGENACCT(8) WRONG PATH FOR SET_ACCOUNT.*SH</td>
</tr>
<tr>
<td>733349</td>
<td>USERS JOB HANGS AT START OF JOB</td>
</tr>
<tr>
<td>733350</td>
<td>HPCC &quot;MPI RANDOM ACCESS&quot; SECTION CRASHES ALL USED NODES (ABOVE 320 CPUS)</td>
</tr>
<tr>
<td>733379</td>
<td>LOGIN NODE 1 BECAME UNRESPONSIVE, LAST XTCONSOLE MESSAGE WAS FROM &quot;PING_LIST&quot;</td>
</tr>
<tr>
<td>SPR Number</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>732924</td>
<td>INSTALL SUSE KERNEL SECURITY PATCH SUSE-SA:2005:029</td>
</tr>
<tr>
<td>733079</td>
<td>INSTALL UNICOS/LC FIX FOR SUSE SECURITY ANNOUNCEMENT SUSE-SA:2</td>
</tr>
</tbody>
</table>
This chapter describes compatibility issues and functionality changes to be aware of when using this software after upgrading from the previous release of this software. For temporary limitations of this release and changes identified after the documentation for this release was packaged, see the *Cray XT3 Systems 1.3 Release Errata*.

3.1 Users Must Recompile Applications

Because of required changes made in the Cray XT3 1.3 release, users **must** recompile applications when moving from the base Cray XT3 1.2 release or a Cray XT3 1.2 update to the Cray XT3 1.3 release or from any Cray XT3 1.3 prerelease version to the official Cray XT3 1.3 release.

**Caution:** Not recompiling an application will result in undefined behavior and may cause the application to fail or hang or may cause a Cray XT3 node to fail.

3.2 Modulefile, *PrgEnv*, Replaced with Modulefiles *PrgEnv-pgi*, *PrgEnv-gnu*, and *Base-opts*

Beginning with this Cray XT3 release, the GNU gcc and g77 compilers are also provided with the release package (NOTE: the GNU g++ compiler is not supported). As a result, both the PGI and GNU compiler environments are now available with Modules.

To accommodate this environment change, the *PrgEnv* modulefile that was previously loaded by default has been replaced with a default load of two modulefiles *Base-opts* and *PrgEnv-pgi*. These two modulefiles are an exact replacement of the *PrgEnv* modulefile. The *Base-opts* modulefile loads the OS modules in a versioned set that is provided with the release package. *Base-opts* should always be loaded, whereas *PrgEnv-pgi* and *PrgEnv-gnu* exist to configure a compile environment.

To switch from a PGI product environment to a GNU product environment, users need to replace the *PrgEnv-pgi* modulefile with the *PrgEnv-gnu* modulefile.

The *acml-gnu* library is part of the *PrgEnv-gnu* modulefile; as more library products become available in GNU format, Cray will add them to the *PrgEnv-gnu* modulefile.
Note: The GNU version of Cray XT3 LibSci is not yet supported.

System administrators note: To support customer-specific needs, system administrators may create their own modulefiles of a product set for their users to load to go with the current modulefile Base-opts. The Cray XT3 System Management manual provided with the Cray XT3 systems 1.3 release package describes how to create a modulefile and how to change a user's default environment.

3.3 Restrictions on Large Data Objects When Using PGI Compilers

The PGI compilers support data objects larger than 2 GB. However, the Cray XT3 1.3 Programming Environment has restrictions in this area. To operate on large data sets, an application must:

- Be compiled for the small memory model (this is the default).
- Limit static data (.text + .bss) sections to less than 2 GB.
- Allocate data objects that are larger than 2 GB dynamically.
- Be compiled with the -Mlarge_arrays option.
- Restrict library accesses to objects less than 2 GB (that is, MPI, SHMEM, and Cray XT3 LibSci library calls must be on data objects less than 2 GB in size).
- Due to a limit of 32-bit Portals memory descriptors, SHMEM programs are limited to 4 GB heap, even on systems with more than 4 GB of memory per compute node.

The Cray XT3 1.3 user-level libraries are compiled in the small memory model format. For more information about memory models, see the PGI Server 6.0 and Workstation 6.0 Installation and Release Notes and the PGI User’s Guide.

3.4 PGI -Mipa Option May Cause Node to Hang

In some cases, users compiling very large programs with the -Mipa option may cause a PGI process to use all the available memory on the login node, creating an out-of-memory situation and causing the node to hang. The workaround is to remove the -Mipa option and recompile.

Associated SPR: 732505. This problem has been submitted to PGI; they are currently investigating the problem.
3.5 Maximum Number of Open Files Using yod I/O is Limited

The Cray XT3 1.3 system limits the number of open unique files in any job that uses yod for application I/O. The number of unique files that yod can open is 1024.

Note: This limitation does not apply to Lustre I/O using the Lustre file system.

3.6 Additional System Management Compatibility Issues and Differences

When upgrading to the Cray XT3 1.3 release, system administrators should also note the following compatibility issues and differences.

3.6.1 Upgrade Note about RPMs

Some RPMs do not get installed as part of the procedure when upgrading to the official Cray XT3 1.3 release package. To install these RPMs, see Chapter 3, Upgrade Installation, in the Cray XT3 Software Installation and Configuration Guide, S–2444–13.

3.6.2 Network Protocol Incompatibility

The protocol by which liblustre communicates with the MDS and OSTs changed, making it incompatible with previous versions. See the Cray XT3 Software Installation and Configuration Guide and the Cray XT3 System Management manual for information about updating servers and clients to run the new version and updating the configuration logs.

3.6.3 xtnetwatch Command Supersedes xtlcbsnap Command

As was noted in the 1.2 Cray XT3 Systems Software Release Overview, the xtnetwatch command has superseded the xtlcbsnap command as of the Cray XT3 1.3 release. The xtnetwatch command is used to watch the Cray XT3 system interconnection network for LCB and router errors. Although the xtlcbsnap command is included with the Cray XT3 1.3 release, it will be removed as of a future release.
3.6.4 Default Operating Voltage of Mezzanine Has Changed

The default operating voltage of the mezzanine is now set to 1600mV, unless over-ridden. The prompts for checking and setting the mezzanine voltage have been removed from the xtbootsys command.
This chapter describes the documentation that supports the Cray XT3 systems software releases.

4.1 CrayDoc Documentation Delivery System

The CrayDoc documentation delivery system, along with product documentation, is provided with each Cray software release. The CrayDoc software runs on any operating system based on UNIX systems or systems like UNIX including Mac OS X, Linux, BSD, and anywhere else that Perl and Apache can be compiled from source code with freely available (GNU) tools. The installation and administration of the CrayDoc server software and Cray documentation are described in the CrayDoc Installation and Administration Guide.

4.2 Accessing Product Documentation

With each software release, Cray provides books and man pages, and in some cases, third-party documentation. These documents are provided in the following ways:

**CrayDoc**

The Cray documentation delivery system that allows you to quickly access and search Cray books, man pages, and in some cases, third-party documentation. Access this HTML and PDF documentation via CrayDoc at the following locations:

- The local network location defined by your system administrator
- The CrayDoc public website: docs.cray.com

**Man pages**

Access man pages by entering the `man` command followed by the name of the man page. For more information about man pages, see the `man(1)` man page by entering:

```
$ man man
```

**Third-party documentation**

Access third-party documentation not provided through CrayDoc according to the information provided with the product.
4.3 Books Provided with This Release

The books provided with this release are listed in Table 5 and in Table 6, which also note whether each book was updated. Many books are provided in HTML and all are provided in PDF.

Note: The Cray XT3 Systems 1.3 Release Errata includes a description of temporary limitations of this release and changes identified after the documentation for this release was packaged. A printed copy of the errata is included with the release package and is also available from your Cray representative. You should also contact your Cray representative for other possible problems addressed in Field Notices (FNs).

Table 5. Cray-developed Books Provided with This Release

<table>
<thead>
<tr>
<th>Book Title</th>
<th>Number</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cray XT3 Systems Software Release Overview (this document)</td>
<td>S–2425–13</td>
<td>Yes</td>
</tr>
<tr>
<td>Cray XT3 Software Installation and Configuration Guide</td>
<td>S–2444–13</td>
<td>Yes</td>
</tr>
<tr>
<td>Cray XT3 System Overview</td>
<td>S–2423–13</td>
<td>Yes</td>
</tr>
<tr>
<td>Cray XT3 System Management</td>
<td>S–2393–13</td>
<td>Yes</td>
</tr>
<tr>
<td>Cray XT3 Programming Environment User’s Guide</td>
<td>S–2396–13</td>
<td>Yes</td>
</tr>
<tr>
<td>CrayDoc Installation and Administration Guide</td>
<td>S–2340–40</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6. Third-party Books Provided with This Release

<table>
<thead>
<tr>
<th>Book Title</th>
<th>Number</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGI User’s Guide</td>
<td>S–6516–60</td>
<td>No</td>
</tr>
<tr>
<td>PGI Fortran Reference</td>
<td>S–6518–60</td>
<td>No</td>
</tr>
<tr>
<td>PGI Tools Guide</td>
<td>S–6517–60</td>
<td>No</td>
</tr>
<tr>
<td>PGI Server 6.0 and Workstation 6.0 Installation and Release Notes</td>
<td>S–6539–60</td>
<td>No</td>
</tr>
<tr>
<td>AMD Core Math Library (ACML)</td>
<td>S–6511–27</td>
<td>Yes</td>
</tr>
<tr>
<td>PAPI User’s Guide</td>
<td>S–6515–306</td>
<td>No</td>
</tr>
</tbody>
</table>
If your site has ordered the PBS Pro product for your Cray XT3 system, the following books are also provided. All PBS Pro books are provided in PDF. The *PBS Pro Release Overview, Installation Guide, and Administration Addendum for Cray XT3 Systems* is provided in PDF and HTML format.

<table>
<thead>
<tr>
<th>Book Title</th>
<th>Number</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAPI Programmer’s Reference</td>
<td>S–6514–307</td>
<td>No</td>
</tr>
<tr>
<td>PAPI Software Specification</td>
<td>S–6531–30</td>
<td>No</td>
</tr>
<tr>
<td>SuperLLI Users’ Guide</td>
<td>S–6532–10</td>
<td>No</td>
</tr>
<tr>
<td>FLEXlm End Users Guide</td>
<td>S–6508–95</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 7. PBS Pro Books Provided with This Release

<table>
<thead>
<tr>
<th>Book Title</th>
<th>Number</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBS Pro Release Overview, Installation Guide, and Administration Addendum for Cray XT3 Systems</td>
<td>S–2438–533xt</td>
<td>Yes</td>
</tr>
<tr>
<td>PBS Pro 5.3 User Guide, PBS-3B101</td>
<td>S–6500–53</td>
<td>No</td>
</tr>
<tr>
<td>PBS Pro 5.3 External Reference Specification, PBS-3BE01</td>
<td>S–6501–53</td>
<td>No</td>
</tr>
<tr>
<td>PBS Pro 5.3 Administrator Guide, PBS-3BA01</td>
<td>S–6502–53</td>
<td>No</td>
</tr>
<tr>
<td>PBS Pro 5.3 Quick Start Guide, PBS-3BQ01</td>
<td>S-6510–53</td>
<td>No</td>
</tr>
</tbody>
</table>

4.4 Man Pages Provided with This Release

- Application launch command: `yod(1)`
- System view commands: `xtshowcabs(1), xtshowmesh(1)`
- Cray-specific MPI man page: `intro_mpi(1)`
- Cray SHMEM man pages: `start with intro_shmem(1)`
- Single-system view (SSV) man pages: `xthostname(1), xtkill(1), xtps(1), xtwho(1)`
- UNICOS/lc man pages: `start with intro_xt3(1)`
- Cray Linux man pages
- Modules software package man pages: `module(1), modulefile(4)`
• Man pages are provided for the following third-party products:
  – PGI compiler commands: cc(1), cc(1), ftn(1), f77(1)
  – GNU compiler commands: gcc(1) and g77(1)
  – MPICH2
  – LAPACK
  – ScaLAPACK
  – BLACS
  – PAPI
  – SUSE LINUX
  – Lustre

If your site ordered CrayPat, man pages are provided: start with craypat(1).

If your site ordered Cray Apprentice\textsuperscript{2}, the app2(1) man page is provided.\textsuperscript{1}

If your site ordered PBS Pro, man pages are provided: start with pbs(1B).

### 4.5 Additional Documentation Resources

Table 8 lists the resources for obtaining documentation not included in this release or for documentation in addition to that included in the release.

<table>
<thead>
<tr>
<th>Product</th>
<th>Documentation Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNU compilers</td>
<td>Documentation for the GNU C and Fortran compilers is available at: <a href="http://gcc.gnu.org/onlinedocs/">http://gcc.gnu.org/onlinedocs/</a></td>
</tr>
<tr>
<td>MPICH2</td>
<td>Additional documentation is available in HTML and PDF formats from the Argonne National Laboratory website at <a href="http://www-unix.mcs.anl.gov/mpi/mpich2">http://www-unix.mcs.anl.gov/mpi/mpich2</a>. Additional information about the MPI-2 standard is available at <a href="http://www.mpi-forum.org/docs/docs.html">http://www.mpi-forum.org/docs/docs.html</a></td>
</tr>
<tr>
<td>ScaLAPACK</td>
<td>The ScaLAPACK Users’ Guide and ScaLAPACK tutorial are available in HTML format at <a href="http://www.netlib.org/scalapack/slug">http://www.netlib.org/scalapack/slug</a></td>
</tr>
</tbody>
</table>

\textsuperscript{1} In addition, the Cray Apprentice\textsuperscript{2} GUI provides online help.
<table>
<thead>
<tr>
<th>Product</th>
<th>Documentation Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SuperLU</td>
<td>Additional SuperLU documentation is available at <a href="http://crd.lbl.gov/~xiaoye/SuperLU/">http://crd.lbl.gov/~xiaoye/SuperLU/</a></td>
</tr>
<tr>
<td>Lustre</td>
<td>Additional Lustre documentation is available at <a href="http://www.lustre.org/documentation.html">http://www.lustre.org/documentation.html</a></td>
</tr>
<tr>
<td>PAPI</td>
<td>Additional PAPI documentation is available at <a href="http://icl.cs.utk.edu/papi/custom/index.html?lid=49&amp;slid=79">http://icl.cs.utk.edu/papi/custom/index.html?lid=49&amp;slid=79</a></td>
</tr>
<tr>
<td>MySQL</td>
<td>MySQL documentation is available at <a href="http://www.mysql.com/documentation">http://www.mysql.com/documentation</a></td>
</tr>
<tr>
<td>DHCP</td>
<td>DHCP documentation is available at <a href="http://www.ietf.org">http://www.ietf.org</a></td>
</tr>
<tr>
<td>FLEXlm</td>
<td>Additional FLEXlm documentation is available at <a href="http://www.macrovision.com/products/legacy_products/flexlm/index.shtml">http://www.macrovision.com/products/legacy_products/flexlm/index.shtml</a></td>
</tr>
<tr>
<td>glibc</td>
<td>glibc documentation is available at <a href="http://gcc.gnu.org/onlinedocs">http://gcc.gnu.org/onlinedocs</a></td>
</tr>
<tr>
<td>GNET</td>
<td>GNET documentation is available at <a href="http://www.gnetlibrary.org">http://www.gnetlibrary.org</a></td>
</tr>
<tr>
<td>GLIB</td>
<td>GLIB documentation is available at <a href="http://developer.gnome.org/doc/API/2.0/glib/index.html">http://developer.gnome.org/doc/API/2.0/glib/index.html</a></td>
</tr>
<tr>
<td>RPM</td>
<td>RPM documentation is available at <a href="http://www.rpm.org">http://www.rpm.org</a></td>
</tr>
</tbody>
</table>

### 4.6 TotalView Documentation from Etnus, LLC

TotalView books and man pages for Cray XT3 systems are available from Etnus, LLC. For information about TotalView publications, see http://www.etnus.com/Documentation/index.html.

### 4.7 Cray Glossary

A Cray Glossary of terms specific to the Cray XT3 system is included with CrayDoc. The entire Cray Glossary is available on the CrayDoc public website:

http://docs.cray.com
This chapter contains the following information about the Cray XT3 1.3 software releases:

- Hardware and software requirements (Section 5.1, page 29)
- Optional products supported (Section 5.2, page 29)
- TotalView from Etnus, LLC (Section 5.3, page 30)
- Contents of the release package (Section 5.4, page 30)
- Licensing (Section 5.5, page 31)
- Ordering software (Section 5.6, page 32)

### 5.1 Hardware and Software Requirements

The supported upgrade path is from the base Cray XT3 1.2 release or Cray XT3 1.2 updates to the Cray XT3 1.3 release.

The following products run on Cray XT3 systems:

- UNICOS/lc 1.3
- Cray XT3 Programming Environment 1.3
- System Management Workstation 1.3
- CRMS 1.3

### 5.2 Optional Products Supported

The Cray XT3 1.3 software releases support the following optional products offered directly from Cray Inc.:

- PBS Pro 5.3.3xt
- CrayPat 1.2
- Cray Apprentice² 2.5
5.3 TotalView from Etnus, LLC

You can order a special implementation of the TotalView 7.0 debugger for Cray XT3 systems from Etnus, LLC. You cannot order TotalView directly from Cray Inc.

TotalView provides source-level debugging of MPI applications. For information about ordering, installing, using, and maintaining TotalView, see http://www.etnus.com/TotalView/index.html.

5.4 Contents of the Release Package

The Cray XT3 systems 1.3 release package includes:

- System Management Workstation 1.3
- UNICOS/lc 1.3, which includes:
  - Linux kernel 2.4 and SUSE LINUX 8.2 beta
  - Catamount 1.3 microkernel
  - Lustre 1.3 file system
  - CRMS 1.3

Also included with the UNICOS/lc release package are these related products:

- GNet 2.0.5 network library
- Modules 3.1.6 user environment management utility
- RPM Package Manager 4.1.1
- MySQL 4.0 database manager
- FLEXlm 9.5 license manager
- Dynamic Host Configuration Protocol (DHCP) 3.0

- Programming Environment 1.3, which includes:
  - PGI 6.0 Fortran, C, and C++ compilers and tools
  - The GNU 3.2.3 C and Fortran 77 compilers

---

1 PGI 6.0-5 requires the FLEXlm license manager, which controls the number of simultaneous users.
- Cray MPICH2 1.0 library of MPI-2 routines
- Cray SHMEM 1.0 library of distributed-memory access routines
- ACML 2.7 library of BLAS, LAPACK, and FFT routines
- Cray XT3 LibSci 1.3 library of ScaLAPACK, BLACS, and SuperLU routines
- Performance API (PAPI) 3.1
- GNU glibc 2.4.2

- CrayDoc software suite and the documentation, described in Chapter 4, page 23
- A printed copy of this release overview
- A printed copy of the *Cray XT3 Software Installation and Configuration Guide*
- A printed copy of the *Cray XT3 Systems 1.3 Release Errata*
- CrayPat 1.2 (if ordered by your site)
- Cray Apprentice2 2.5 (if ordered by your site)
- PBS Pro batch subsystem 5.3.3xt release, which is based on PBS Pro version 5.3.1 from Altair Grid Technologies (if ordered by your site)

### 5.5 Licensing

Cray licenses the following as separate products for Cray XT3 systems under a Cray license agreement:

- Cray XT3 OS binary (which provides rights to UNICOS/lc and its components)

  **Note:** Source Code Option: The Cray XT3 OS license is binary by default. Certain U.S. customers may be eligible to obtain a Cray XT3 OS buildable source license for an additional fee. For more information regarding source code for the Cray XT3 OS, please contact your sales representative.

- Lustre Parallel File System (contractual rights to Lustre are included with the Cray XT3 OS license for some initial customers)
- Cray XT3 Programming Environment (licensed by number of simultaneous users)
- PBS Pro Batch Subsystem (optional product)
• CrayPat Performance Collector (optional product)
• Cray Apprentice² Performance Analyzer (optional product licensed by number of simultaneous users)

The PAPIlicnotices(7) and superlulicnotices(7) man pages list the license notices for the software that Cray supplies for the Cray XT3 Programming Environment in conjunction with the software and documentation copyright distribution requirements. The gnulicnotices(7) man page lists the public license notice for the GNU Free Documentation used in the UNICOS/1c release.

For more information about licensing and pricing, contact your Cray sales representative or send e-mail to crayinfo@cray.com.

Customers outside the United States and Canada must sign a Letter of Assurance before software can be shipped to them. For questions about whether you have signed this agreement, or questions about which software requires this letter, send e-mail to crayinfo@cray.com.

5.6 Ordering Software

This release package is distributed by order only to customers who have signed a license agreement for the Cray software that includes this product. The most current revision of the release package is supplied. To receive any upgrades to a given Cray product, the customer must also have a signed support agreement for this Cray software.

You can order the release package from the Cray Software Distribution Center in any of the following ways:

E-mail:
orderdsk@cray.com

CRInform (for subscribers):
crinform.cray.com

Click on the Order Cray Software link.

Telephone (inside U.S., Canada):
1–800–284–2729 (BUG CRAY), then 605–9100

Telephone (outside U.S., Canada):
+1–651–605–9100

Fax:
+1–651–605–9001
Mail:
Software Distribution Center
Cray Inc.
1340 Mendota Heights Road
Mendota Heights, MN 55120–1128
USA

Software will be shipped by ground service or 5-day international service.
This chapter describes the customer services that support this release.

6.1 Technical Assistance with Software Problems

If you experience problems with Cray software, contact your Cray service representative. Your service representative will work with you to resolve the problem. If you choose to have full- or part-time support on site, your on-site personnel are your primary contacts for service. If you have elected not to have on-site support, please call or send e-mail to the Cray Customer Support Center:

E-mail:
support@cray.com

Telephone (inside U.S., Canada):
1–800–950–2729 (CRAY)

Telephone (outside U.S., Canada):
+1–715–726–4993

Fax:
+1–651–605–9001

6.2 CRInform System

The CRInform system is the information and problem-reporting system for Cray customers who are CRInform subscribers.

You are a CRInform subscriber if your site has a software license agreement and software support agreement. Access CRInform at:

crinform.cray.com

Ask your system administrator for your password. Some of the things a subscriber to CRInform can do include:

• Report software problems (SPRs)
• Request technical assistance (RTAs)
• Communicate with other Cray system users
• Read about software problems reported at other sites
• Learn about solutions to various problems
• Order Cray software
• View Cray Service Bulletin

The CRInform program automatically logs events pertinent to your Cray system site as news items, so you do not have to search through the system for new information. The logged events include Software Problem Report (SPR) or Request for Technical Assistance (RTA) activity, new orderable software, new issues of the Cray Service Bulletin, new field notices (FNs), new software release documents, new software problem fix information, new marketing information, and new CRInform program information. You can also get automatic e-mail notification of any or all of the news items.

6.3 Training

To find out more about Cray training, contact your Cray representative or contact us in any of the following ways:

E-mail:
wwtng@cray.com

Web:
www.cray.com/training/

Fax:
+1–715–726–4991

Mail:
Technical Training
Cray Inc.
P.O. Box 6000
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USA

6.4 Cray Service Bulletin (CRSB)

The CRInform site provides access to the online Cray Service Bulletin, also called CRSB, which contains descriptions of software problems, information about service procedures or agreements, and announcements of product upgrades and future products for the private use of Cray customers.
6.5 Cray Public Website

The Cray public website offers information about a variety of topics and is located at:

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