



Red Hat Enterprise Linux

5

5.1 Release Notes

Release Notes for Red Hat Enterprise Linux 5.1
Edition 1.0

Red Hat Enterprise Linux
Documentation

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Red Hat Enterprise Linux 5 5.1 Release Notes

Release Notes for Red Hat Enterprise Linux 5.1 Edition 1.0

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Red Hat Enterprise Linux Documentation

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Abstract

The Release Notes provide high-level coverage of the improvements and additions that have been implemented in Red Hat Enterprise Linux 5.1. For detailed documentation on all changes to Red Hat Enterprise Linux for the 5.1 update, refer to the Technical Notes.

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1. Release Notes for x86

- ✦ When installing Red Hat Enterprise Linux 5 on a fully virtualized SMP guest, the installation may freeze. This can occur when the host (dom0) is running Red Hat Enterprise Linux 5.1.

To prevent this, set the guest to use a single processor using the install. You can do this by using the `--vcpus=1` option in `virt-install`. Once the installation is completed, you can set the guest to SMP by modifying the allocated `vcpus` in `virt-manager`.

- ✦ This release includes WBEMSMT, a suite of web-based applications that provides a user-friendly management interface for Samba and DNS. For more information about WBEMSMT, refer to <http://sblim.wiki.sourceforge.net/>.
- ✦ Upgrading `pm-utils` from a Red Hat Enterprise Linux 5.1 Beta version of `pm-utils` will fail, resulting in the following error:

```
error: unpacking of archive failed on file /etc/pm/sleep.d: cpio: rename
```

To prevent this from occurring, delete the `/etc/pm/sleep.d/` directory prior to upgrading. If `/etc/pm/sleep.d` contains any files, you can move those files to `/etc/pm/hooks/`.

- ✦ Hardware testing for the *Mellanox MT25204* has revealed that an internal error occurs under certain high-load conditions. When the `ib_mthca` driver reports a catastrophic error on this hardware, it is usually related to an insufficient completion queue depth relative to the number of outstanding work requests generated by the user application.

Although the driver will reset the hardware and recover from such an event, all existing connections are lost at the time of the error. This generally results in a segmentation fault in the user application. Further, if `opensm` is running at the time the error occurs, then it will have to be manually restarted in order to resume proper operation.

- ✦ Driver Update Disks now support Red Hat's Driver Update Program RPM-based packaging. If a driver disk uses the newer format, it is possible to include RPM packaged drivers that will be preserved across system updates.

Please note that driver RPMs are copied only for the default kernel variant that is in use on the installed system. For example, installing a driver RPM on a system running the virtualized kernel will install the driver *only* for the virtualized kernel. The driver RPM will not be installed for any other installed kernel variant in the system.

As such, on a system that has multiple kernel variants installed, you will need to boot the system on each kernel variant and install the driver RPM. For example, if your system has both bare-metal and virtualized kernels installed, boot your system using the bare-metal kernel and install the driver RPM. Then, reboot the system into the virtualized kernel and install the driver RPM again.

- ✦ During the lifetime of `dom0`, you cannot create guests (i.e. `xm create`) more than 32,750 times. For example, if you have guests rebooting in a loop, `dom0` will fail to boot any guest after rebooting guests a total of 32,750 times.

If this event occurs, restart `dom0`

- ✦ Using the `divider` command-line argument may not work properly in this architecture. This issue will be addressed in a future update of Red Hat Enterprise Linux 5.
- ✦ The Red Hat Enterprise Linux 5.1 NFS server now supports referral exports. These exports are based on extensions to the NFSv4 protocol. Any NFS clients that do not support these extensions (namely, Red Hat Enterprise Linux releases prior to 5.1) will not be able to access these exports.

As such, if an NFS client does not support these exports, any attempt to access these exports may fail with an I/O error. In some cases, depending on the client implementation, the failure may be more severe, including the possibility of a system crash.

It is important that you take precautions to ensure that NFS referral exports are not accessed by clients that do not support them.

- ✧ **GFS2** is an incremental advancement of GFS. This update applies several significant improvements that require a change to the on-disk file system format. GFS file systems can be converted to GFS2 using the utility **gfs2_convert**, which updates the metadata of a GFS file system accordingly.

While much improved since its introduction in Red Hat Enterprise Linux 5, GFS2 remains a Technology Preview. The release notes included in the distribution incorrectly states that GFS2 is fully supported. Nevertheless, benchmark tests indicate faster performance on the following:

- heavy usage in a single directory and faster directory scans (Postmark benchmark)
- synchronous I/O operations (**fstest** benchmark test indicates improved performance for messaging applications like TIBCO)
- cached reads, as there is no longer any locking overhead
- direct I/O to preallocated files
- NFS file handle lookups
- **df**, as allocation information is now cached

In addition, GFS2 also features the following changes:

- journals are now plain (though hidden) files instead of metadata. Journals can now be dynamically added as additional servers mount a file system.
 - quotas are now enabled and disabled by the mount option **quota=<on|off|account>**
 - **quiesce** is no longer needed on a cluster to replay journals for failure recovery
 - nanosecond timestamps are now supported
 - similar to ext3, GFS2 now supports the **data=ordered** mode
 - attribute settings **lsattr()** and **chattr()** are now supported via standard **ioctl()**
 - file system sizes above 16TB are now supported
 - GFS2 is a standard file system, and can be used in non-clustered configurations
- ✧ Installing Red Hat Enterprise Linux 5.1 on *HP BL860c* blade systems may hang during the IP information request stage. This issue manifests when you have to select **OK** twice on the **Configure TCP/IP** screen.

If this occurs, reboot and perform the installation with Ethernet autonegotiation disabled. To do this, use the parameter **ethtool="autoneg=off"** when booting from the installation media. Doing so does not affect the final installed system.

- ✧ The **nohide** export option is required on referral exports (i.e. exports that specify a referral server). This is because referral exports need to "cross over" a bound mount point. The **nohide** export option is required for such a "cross over" to be successful.

For more information on bound mounts, refer to **man exports 5**.

- ✦ This update includes the **lvm2** event monitoring daemon. If you are already using **lvm2** mirroring, perform the following steps to ensure that all monitoring functions are upgraded properly:
 - ✦ Deactivate all mirrored **lvm2** logical volumes before updating. To do this, use the command **lvchange -a n <volume group or mirrored volume>**.
 - ✦ Stop the old **lvm2** event daemon using **killall -HUP dmeventd**.
 - ✦ Perform the upgrade of all related RPM packages, namely **device-mapper** and **lvm2**.
 - ✦ Reactivate all mirrored volumes again using **lvchange -a y <volume group or mirrored volume>**.
- ✦ *Rapid Virtualization Indexing (RVI)* is now supported on 64-bit, 32-bit, and 32-bit PAE kernels. However, RVI can only translate 32-bit guest virtual addresses on the 32-bit PAE hypervisor.

As such, if a guest is running a PAE kernel with more than 3840MB of RAM, a wrong address translation error will occur. This can crash the guest.

It is recommended that you use the 64-bit kernel if you intend to run guests with more than 4GB of physical RAM under RVI.

- ✦ Running 16 cores or more using *AMD Rev F* processors may result in system resets when performing fully-virtualized guest installations.
- ✦ Installing the **systemtap-runtime** package will result in a transaction check error if the **systemtap** package is already installed. Further, upgrading Red Hat Enterprise Linux 5 to 5.1 will also fail if the **systemtap** package is already installed.

As such, remove the **systemtap** package using the command **rpm -e systemtap-0.5.12-1.e15** before installing **systemtap-runtime** or performing an upgrade.

- ✦ When setting up NFSROOT, **BOOTPROTO** must be set as **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0**.

If your environment requires a different setting for **BOOTPROTO**, then temporarily set **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0** before initially creating the **initrd**. You can reset the original value of **BOOTPROTO** after the **initrd** is created.

- ✦ Crash dumping through **kexec** and **kdump** may not function reliably with *HP Smart Array* controllers. Note that these controllers use the **cciss** driver.

A solution to this problem, which is likely to involve a firmware update to the controller, is being investigated.

- ✦ Creating a guest more than 1,000 times will cause **dom0** to reboot suddenly. It is recommended that you pre-empt this by rebooting **dom0** before the domain ID of any guest reaches 1,000.
- ✦ The *QLogic iSCSI Expansion Card* for the *IBM Bladecenter* provides both ethernet and iSCSI functions. Some parts on the card are shared by both functions. However, the current **qla3xxx** and **qla4xxx** drivers support ethernet and iSCSI functions individually. Both drivers do not support the use of ethernet and iSCSI functions simultaneously.

As such, using both ethernet and iSCSI functions simultaneously may hang the device. This could result in data loss and filesystem corruption on iSCSI devices, or network disruptions on other connected ethernet devices.

- ✦ When using **virt-manager** to add disks to an existing guest, duplicate entries may be created in the guest's **/etc/xen/<domain name>** configuration file. These duplicate entries will prevent the guest

from booting.

As such, you should remove these duplicate entries.

- Repeatedly migrating a guest between two hosts may cause one host to panic. If a host is rebooted after migrating a guest out of the system and before migrating the same guest back, the panic will not occur.
- **sysreport** is being deprecated in favor of **sos**. To install **sos**, run **yum install sos**. This command installs **sos** and removes **sysreport**. It is recommended that you update any existing kickstart files to reflect this.

After installing **sos**, use the command **sosreport** to invoke it. Using the command **sysreport** generates a warning that **sysreport** is now deprecated; continuing will invoke **sosreport**.

If you need to use the **sysreport** tool specifically, use the command **sysreport .legacy** to invoke it.

For more information about **sosreport**, refer to **man sosreport** and **sosreport --help**.

1.1. Installation-Related Notes

This section includes information specific to **Anaconda** and the installation of Red Hat Enterprise Linux 5.1.

To upgrade an already-installed Red Hat Enterprise Linux 5, you can use Red Hat Network to update those packages that have changed.

You may also use **Anaconda** to perform a fresh installation of Red Hat Enterprise Linux 5.1 or to perform an upgrade from *the latest updated version* of Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5.1.

Anaconda can also be used to upgrade an already-installed Red Hat Enterprise Linux 5.

- If you are copying the contents of the Red Hat Enterprise Linux 5 CD-ROMs (in preparation for a network-based installation, for example) be sure to copy the CD-ROMs for the operating system *only*. Do not copy the **Supplementary CD-ROM**, or any of the layered product CD-ROMs, as this will overwrite files necessary for **Anaconda**'s proper operation.

The contents of the **Supplementary CD-ROM** and other layered product CD-ROMs must be installed *after* Red Hat Enterprise Linux 5.1 has been installed.

- When installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, do *not* use the **kernel-xen** kernel. Using this kernel on fully virtualized guests can cause your system to hang.

If you are using an Installation Number when installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, be sure to deselect the **Virtualization** package group during the installation. The **Virtualization** package group option installs the **kernel-xen** kernel.

Note that paravirtualized guests are not affected by this issue. Paravirtualized guests always use the **kernel-xen** kernel.

- If you are using the Virtualized kernel when upgrading from Red Hat Enterprise Linux 5 to 5.1, you must reboot after completing the upgrade. You should then boot the system using the updated Virtualized kernel.

The hypervisors of Red Hat Enterprise Linux 5 and 5.1 are not ABI-compatible. If you do not boot the system after upgrading using the updated Virtualized kernel, the upgraded Virtualization RPMs will not match the running kernel.

1.1.1. Installation / Boot for iSCSI software initiator (open-iscsi)

iSCSI installation and boot was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview. This feature is now fully supported, with the restrictions described below.

This capability has three configurations depending on whether you are:

- using a hardware iSCSI initiator (such as the *QLogic qla4xxx*)
- using the **open-iscsi** initiator on a system with firmware boot support for iSCSI (such as iSCSI Boot Firmware, or a version of Open Firmware that features the iSCSI boot capability)
- using the **open-iscsi** initiator on a system with no firmware boot support for iSCSI

1.1.1.1. Using a Hardware iSCSI Initiator

If you are using a hardware iSCSI initiator, you can use the card's BIOS set-up utility to enter the IP address and other parameters required to obtain access to the remote storage. The logical units of the remote storage will be available in **Anaconda** as standard **sd** devices, with no additional set-up required.

If you need to determine the initiator's qualified name (IQN) in order to configure the remote storage server, follow these steps during installation:

1. Go to the installer page where you select which disk drives to use for the installation.
2. Click on **Advanced storage configuration**.
3. Click on **Add iSCSI target**.
4. The iSCSI IQN will be displayed on that screen.

1.1.1.2. Using open-iscsi On A System With Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with firmware boot support for iSCSI, use the firmware's setup utility to enter the IP address and other parameters needed to access the remote storage. Doing this configures the system to boot from the remote iSCSI storage.

Currently, Anaconda does not access the iSCSI information held by the firmware. Instead, you must manually enter the target IP address during installation. To do so, determine the IQN of the initiator using the procedure described above. Afterwards, on the same installer page where the initiator IQN is displayed, specify the IP address of the iSCSI target you wish to install to.

After manually specifying the IP address of the iSCSI target, the logical units on the iSCSI targets will be available for installation. The **initrd** created by **Anaconda** will now obtain the IQN and IP address of the iSCSI target.

If the IQN or IP address of the iSCSI target are changed in the future, enter the iBFT or Open Firmware set-up utility on each initiator and change the corresponding parameters. Afterwards, modify the **initrd** (stored in the iSCSI storage) for each initiator as follows:

1. Expand the **initrd** using **gunzip**.
2. Unpack it using **cpio -i**.
3. In the **init** file, search for the line containing the string **iscsistartup**. This line also contains the IQN and IP address of the iSCSI target; update this line with the new IQN and IP address.
4. Re-pack the **initrd** using **cpio -o**.
5. Re-compress the **initrd** using **gunzip**.

The ability of the operating system to obtain iSCSI information held by the Open Firmware / iBFT firmware is

planned for a future release. Such an enhancement will remove the need to modify the **initrd** (stored in the iSCSI storage) for each initiator whenever the IP address or IQN of the iSCSI target is changed.

1.1.1.3. Using open-iscsi On A System With No Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with no firmware boot support for iSCSI, use a network boot capability (such as PXE/tftp). In this case, follow the same procedure described earlier to determine the initiator IQN and specify the IP address of the iSCSI target. Once completed, copy the **initrd** to the network boot server and set up the system for network boot.

Similarly, if the IP address or IQN of the iSCSI target is changed, the **initrd** should be modified accordingly as well. To do so, use the same procedure described earlier to modify the **initrd** for each initiator.

1.2. Feature Updates

EXT3 Enhancement

The maximum capacity of the EXT3 is now 16TB (increased from 8TB). This enhancement was originally included in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this update.

yum-security

It is now possible to limit **yum** to install security updates *only*. To do so, simply install the **yum-security** plugin and run the following command:

```
yum update --security
```

Restarting a Resource Independently

It is now possible to restart a resource in a cluster without interrupting its parent service. This can be configured in **/etc/cluster/cluster.conf** on a running node using the **__independent_subtree="1"** attribute to tag a resource as independent.

For example:

```
<service name="example">
  <fs name="One" __independent_subtree="1" ...>
    <nfsexport ...>
      <nfsclient .../>
    </nfsexport>
  </fs>
  <fs name="Two" ...>
    <nfsexport ...>
      <nfsclient .../>
    </nfsexport>
    <script name="Database" .../>
  </fs>
  <ip/>
</service>
```

Here, two file system resources are used: **One** and **Two**. If **One** fails, it is restarted without interrupting **Two**. If **Two** fails, all components (**One**, children of **One** and children of **Two**) are restarted. At no given time are **Two** and its children dependent on any resource provided by **One**.

Note that *Samba* requires a specific service structure, and as such it cannot be used in a service with independent subtrees. This is also true for several other resources, so use the

`__independent_subtree="1"` attribute with caution.

Virtualization

The following Virtualization updates are also included in this release:

- The virtualized kernel can now use the **kdump** function.
- *AMD-V* is now supported in this release. This enables live domain migration for fully virtualized guests.
- The virtualized kernel can now support up to 16GB of RAM.
- The virtualized kernel can now support up to 256GB of RAM.
- The in-kernel socket API is now expanded. This was done to fix a bug that occurs when running **sctp** between guests.
- Virtual networking is now part of **libvirt**, the virtualization library. **libvirt** has a set of commands that sets up a virtual NAT/router and private network for all local guests on a machine. This is especially useful for guests that do not need to be routable from the outside. It is also useful for developers who use Virtualization on laptops.

Note that the virtual networking capability adds a dependency on **dnsmasq**, which handles **dhcp** for the virtual network.

For more information about **libvirt**, refer to <http://libvirt.org>.

- **libvirt** can now manage inactive virtual machines. **libvirt** does this by defining and undefining domains without stopping or starting them. This functionality is similar to the **virsh define** and **virsh undefine** commands.

This enhancement allows the Red Hat Virtual Machine Manager to display all available guests. This allows you to start these guests directly from the GUI.

- Installing the **kernel-xen** package no longer leads to the creation of incorrect / incomplete **elilo.conf** entries.
- Fully virtualized guests now support live migration.
- The **xm create** command now has a graphical equivalent in **virt-manager**.
- *Nested Paging* (NP) is now supported. This feature reduces the complexity of memory management in virtualized environments. In addition, NP also reduces CPU utilization in memory-intensive guests.

At present, NP is not enabled by default. If your system supports NP, it is recommended that you enable NP by booting the hypervisor with the parameter **hap=1**.

This update to the Virtualization feature also includes the capability to install and run paravirtualized 32-bit guests on 64-bit hosts. However, this capability is provided as a Technology Preview; as such, it is not supported for production use.

Shared Page Tables

Shared page tables are now supported for **hugetlb** memory. This enables page table entries to be shared among multiple processes.

Sharing page table entries among multiple processes consumes less cache space. This improves application cache hit ratio, resulting in better application performance.

divider

The **divider=<value>** option is a kernel command-line parameter that allows you to adjust the system clock rate while maintaining the same visible HZ timing value to user space applications.

Using the **divider=** option allows you to reduce CPU overhead and increase efficiency at the cost of lowering the accuracy of timing operations and profiling. This is useful in virtualized environments as well as for certain applications.

Useful **<values>** for the standard 1000Hz clock are:

- ✦ **2** = 500Hz
- ✦ **4** = 250Hz
- ✦ **10** = 100Hz (value used by previous releases of Red Hat Enterprise Linux)

Note that the virtualized kernel uses a 250HZ clock by default. As such, it does not need the **divider=** option either in **dom0** or in paravirtualized guests.

Installing to dm-multipath Devices

Anaconda now has the capability to detect, create, and install to *dm-multipath* devices. To enable this feature, add the parameter **mpath** to the kernel boot line.

This feature was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this release.

Note that **dm-multipath** also features inbox support for the *Dell MD3000*. However, multiple nodes that use **dm-multipath** to access the MD3000 cannot perform immediate failback.

Further, it is recommended that you use the **Custom Partitioning** interface in **Anaconda** if your system has both multipath and non-multipath devices. Using **Automatic Partitioning** in such cases may create both types of devices in the same logical volume groups.

At present, the following restrictions apply to this feature:

- ✦ If there is only one path to the boot Logical Unit Number (LUN), **Anaconda** installs to the SCSI device even if **mpath** is specified. Even after you enable multiple paths to the boot LUN and recreate the **initrd**, the operating system will boot from the SCSI device instead of the **dm-multipath** device.

However, if there are multiple paths to the boot LUN to begin with, **Anaconda** will correctly install to the corresponding **dm-multipath** device after **mpath** is specified in the kernel boot line.

- ✦ By default, **user_friendly_names** is set to **yes** in **multipath.conf**. This is a required setting in the support implementation of the **dm-multipath** root device. As such, setting **user_friendly_names** to **no** and recreating the **initrd** will result in a boot failure with the following error:

```
Checking filesystems
fsck.ext3: No such file or directory while trying to open
/dev/mapper/mpath0p1
```

Booting from Storage Area Network (SAN)

The ability to boot from a SAN disk device is now supported. In this case, SAN refers to a Fibre Channel or iSCSI interface. This capability also features support for system-to-storage connection through multiple paths using **dm-multipath**.

In configurations that use multiple host bus adapters (HBA), you may need to set the system BIOS to boot from another adapter if all paths through the current adapter fail.

Driver Update Program

The Driver Update Program (DUP) was designed to allow third-party vendors (such as OEMs) to add their own device drivers and other Linux Kernel Modules to Red Hat Enterprise Linux 5 systems using regular RPM packages as the distribution containers.

Red Hat Enterprise Linux 5.1 applies several updates to the DUP, most notably:

- install-time Driver Update RPMs through Driver Update Disks is now supported
- bootpath Driver Updates affecting the system bootpath are now supported
- support for third-party packaging of *Advanced Linux Sound Architecture* (ALSA) is now deprecated

Further, various updates were applied to the approved kernel ABI symbol whitelists. These whitelists are used by packaging drivers to determine which symbols and data structures provided by the kernel can be used in a third-party driver.

For more information, refer to <http://www.kerneldrivers.org/RedHatKernelModulePackages>.

1.3. Driver Updates

General Driver Updates

- **acpi**: updated **ibm_acpi** module to address several ACPI and docking station issues with Lenovo laptops.
- **ipmi**: Polling **ktthread** no longer runs when hardware interrupt is assigned to a Baseboard Management Controller.
- **sata**: **SATA/SAS** upgraded to version 2.6.22-rc3.
- **openib** and **openmpi**: upgraded to OFED (OpenFabrics Enterprise Distribution) version 1.2.
- **powernow-k8**: upgraded to version 2.0.0 to fully support *Greyhound*.
- **xinput**: added to enable full RSA support.
- **aic94xx**: upgraded to version 1.0.2-1, in line with an upgrade of the embedded sequencer firmware to v17. These updates apply the following changes:
 - fixed **ascb** race condition on platforms with expanders
 - added **REQ_TASK_ABORT** and **DEVICE_RESET** handlers
 - physical ports are now cleaned up properly after a discovery error
 - **phys** can now be enabled and disabled through **sysfs**
 - extended use of DDB lock to prevent race condition of DDB

Audio

ALSA updated to version 1.0.14. This update applies the following fixes:

- ✦ fixed noise problem on the IBM Taroko (M50)
- ✦ *Realtek ALC861* is now supported
- ✦ fixed a muting problem on xw8600 and xw6600
- ✦ *ADI 1884 Audio* is now supported
- ✦ fixed an audio configuration problem on xw4600

PCI

- ✦ added function calls to set maximum read request size for PCIX and PCI-Express
- ✦ *IBM System P* machines now support PCI-Express hotplugging
- ✦ added necessary drivers and PCI ID to support SB600 SMBus

Network

- ✦ **e1000** driver: updated to version 7.3.20-k2 to support I/OAT-enabled chipsets.
- ✦ **bnx2** driver: updated to version 1.5.11 to support 5709 hardware.
- ✦ **B44** ethernet driver: backported from upstream version 2.6.22-rc4 to apply the following changes:
 - several **endianness** fixes were made
 - **DMA_30BIT_MASK** constant is now used
 - **skb_copy_from_linear_data_offset()** is now used
 - **spin_lock_irqsave()** now features safer interrupt disabling
 - simple error checking is performed during resume
 - several fixes to multicast were applied
 - chip reset now takes longer than previously anticipated
- ✦ *Marvell sky2* driver: updated to version 1.14 to fix a bug that causes a kernel panic if the **ifup/ifdown** commands are executed repeatedly.
- ✦ **forcedeth-0.60** driver: now included in this release. This applies several critical bug fixes for customers using *NVIDIA's* MCP55 motherboard chipsets and corresponding onboard NIC.
- ✦ **ixgb** driver: updated to the latest upstream version (1.0.126).
- ✦ **netxen_nic** driver: version 3.4.2-2 added to enable support for *NetXen 10GbE* network cards.
- ✦ *Chelsio 10G Ethernet Network Controller* is now supported.
- ✦ added support for PCI error recovery to the **s2io** device.
- ✦ Broadcomm wireless ethernet driver now supports PCI ID for *nx6325* card.

- fixed a bug that caused an **ASSERTION FAILED** error when attempting to start a *BCM4306* via **ifup**.
- **ixgb** driver: updated to add EEH PCI error recovery support for the Intel 10-gigabit ethernet card. For more information, refer to **/usr/share/doc/kernel-doc-<kernel version>/Documentation/pci-error-recovery.txt**.
- **qla3xxx** driver: re-enabled and updated to version 2.03.00-k3 to provide networking support for *QLogic* iSCSI adapters without using iSCSI.
- *Intel PRO/Wireless 3945ABG* network driver: updated to version 1.2.0. This update resolves several issues, including a soft lockup bug that could occur under certain circumstances on some laptops.
- **qla2xxx**: driver upgraded to version 8.01.07-k6. This applies several changes, most notably:
 - iLDMA is now supported
 - the following Fibre Channel attributes are now supported:
 - symbolic nodename
 - system hostname
 - fabric name
 - host port state
 - trace-control async events are no longer logged
 - reset handling logic has been corrected
 - MSI-X is now supported
 - IRQ-0 assignments are now handled per system
 - NVRAM updates immediately go into effect

IPMI

This release includes an update of the **IPMI** driver set to include the upstream changes as of version 2.6.21.3, with some patches included from 2.6.22-rc-4. This update features the following changes (among others):

- fixed uninitialized data bug in **ipmi_si_intf**
- **kipmid** is no longer started if another driver supports interrupts
- users are now allowed to override the kernel daemon **enable** through **force_kipmid**
- per-channel command registration is now supported
- **MAX_IPMI_INTERFACES** is no longer used
- hot system interface removal is now supported
- added a Maintenance Mode to support firmware updates
- added **poweroff** support for the **pigeonpoint** IPMC
- BT subdriver can now survive long timeouts

- added **pci_remove** handling for proper cleanup on a hot remove

For information about new module parameters, refer to **/usr/share/doc/kernel-doc-*<kernel version>*/Documentation/IPMI.txt**.

SCSI

- ported SCSI blacklist from Red Hat Enterprise Linux 4 to this release.
- added PCI IDs for **aic79xx** driver.
- **aacraid** driver: updated to version 1.1.5-2437 to support *PRIMERGY RX800S2* and *RX800S3*.
- **megaraid_sas** driver: updated to version 3.10. This update defines the entry point for **bios_param**, adds an IOCTL memory pool, and applies several minor bug fixes.
- *Emulex lpfc* driver: updated to version 8.1.10.9. This update applies several changes, most notably:
 - fixed **host_lock** management in the **ioctl** paths
 - the *AMD* chipset is now automatically detected, and reduced the DMA length to 1024 bytes
 - nodes are no longer removed during **dev_loss_tmo** if discovery is active
 - 8GB link speeds are now enabled
- **qla4xxx** driver updated to apply the following changes:
 - added support for IPV6, QLE406x and **ioctl** module
 - fixed a **mutex_lock** bug that could cause lockups
 - resolved lockup issues of **qla4xxx** and **qla3xxx** when attempting to load/unload either interface
- **mpt fusion** drivers: updated to version 3.04.04. This update applies several changes, most notably:
 - fixed several error handling bugs
 - **mptsas** now serializes target resets
 - **mptsas** and **mptfc** now support LUNs and targets greater than 255
 - fixed an LSI **mptspi** driver regression that resulted in extremely slow DVD driver performance
 - when an LSI SCSI device returns a **BUSY** status, I/O attempts no longer fail after several retries
 - RAID arrays are no longer unavailable after auto-rebuild
- **arcmsr** driver: included to provide support for *Areca* RAID controllers.
- **3w-9xxx** module: updated to correctly support 3ware 9650SE.

1.4. Kernel-Related Updates

- The CIFS client has been updated to version 1.48aRH. This is based upon the 1.48a release, with patches that apply the following changes:
 - the mount option **sec=none** results in an anonymous mount
 - CIFS now honors the **umask** when POSIX extensions are enabled
 - fixed **sec=** mount options that request packet signing

Note that for users of the *EMC Celerra* product (NAS Code 5.5.26.x and below), the CIFS client hangs when accessing shares on EMC NAS. This issue is characterized by the following kernel messages:

```
kernel: CIFS VFS: server not responding
kernel: CIFS VFS: No response for cmd 162 mid 380
kernel: CIFS VFS: RFC1001 size 135 bigger than SMB for Mid=384
```

After a CIFS mount, it becomes impossible to read/write any file on it and any application that attempts an I/O on the mountpoint will hang. To resolve this issue, upgrade to NAS Code 5.5.27.5 or later (use EMC Primus case number emc165978).

- **MODULE_FIRMWARE** tags are now supported.
- *ICH9* controllers are now supported.
- *Greyhound* processors are now supported in **CPUID** calls.
- **Oprofile** now supports new *Greyhound* performance counter events.
- *Directed DIAG* is now supported to improve *z/VM* utilization.
- The *Intel* graphics chipset is now supported through the **DRM** kernel module. Further, the DRM API has been upgraded to version 1.3 to support direct rendering.
- Updates to **ACPI** power management have improved S3 suspend-to-RAM and S4 hibernate.

1.5. Other Updates

- **gaim** is now called **pidgin**.
- *Intel microcode* updated to version 1.17. This adds support for new *Intel* processors.
- Implicit active-active failover using **dm-multipath** on *EMC Clariion* storage is now supported.
- The Chinese font *Zysong* is no longer installed as part of the **fonts-chinese** package. *Zysong* is now packaged separately as **fonts-chinese-zysong**. The **fonts-chinese-zysong** package is located in the **Supplementary CD**.

Note that the **fonts-chinese-zysong** package is needed to support the Chinese National Standard GB18030.

- The Challenge Handshake Authentication Protocol (CHAP) username and password have a character limit of 256 each.
- **pump** is deprecated in this update. As such, configuring your network interface through **netconfig** may result in broken **ifcfg** scripts.

To properly configure your network interface, use **system-config-network** instead. Installing the updated **system-config-network** package removes **netconfig**.

- ✦ **rpm --aid** is no longer supported. It is recommended that you use **yum** when updating and installing packages.

1.6. Technology Previews

Technology Preview features are currently *not* supported under Red Hat Enterprise Linux 5.1 subscription services, may not be functionally complete, and are generally not suitable for production use. However, these features are included as a customer convenience and to provide the feature with wider exposure.

Customers may find these features useful in a non-production environment. Customers are also free to provide feedback and functionality suggestions for a Technology Preview feature before it becomes fully supported. Erratas will be provided for high-severity security issues.

During the development of a Technology Preview feature, additional components may become available to the public for testing. It is the intention of Red Hat to fully support Technology Preview features in a future release.

Stateless Linux

Stateless Linux is a new way of thinking about how a system should be run and managed, designed to simplify provisioning and management of large numbers of systems by making them easily replaceable. This is accomplished primarily by establishing prepared system images which get replicated and managed across a large number of stateless systems, running the operating system in a read-only manner (refer to `/etc/sysconfig/readonly-root` for more details).

In its current state of development, the Stateless features are subsets of the intended goals. As such, the capability remains as Technology Preview.

The following is a list of the initial capabilities included in Red Hat Enterprise Linux 5:

- ✦ running a stateless image over NFS
- ✦ running a stateless image via loopback over NFS
- ✦ running on iSCSI

It is highly recommended that those interested in testing stateless code read the HOWTO at <http://fedoraproject.org/wiki/StatelessLinuxHOWTO> and join stateless-list@redhat.com.

The enabling infrastructure pieces for Stateless Linux were originally introduced in Red Hat Enterprise Linux 5.

AIGLX

AIGLX is a Technology Preview feature of the otherwise fully supported X server. It aims to enable GL-accelerated effects on a standard desktop. The project consists of the following:

- ✦ a lightly modified X server
- ✦ an updated Mesa package that adds new protocol support

By installing these components, you can have GL-accelerated effects on your desktop with very few changes, as well as the ability to enable and disable them at will without replacing your X server. AIGLX also enables remote GLX applications to take advantage of hardware GLX acceleration.

devicescape (d80211)

The *devicescape* stack enables the **iw1wifi 4965GN** wireless driver. This stack allows certain wireless devices to connect to any Wi-Fi network.

This stack has a code base that is yet to be accepted upstream. In addition, the stability of this stack is yet to be conclusively verified through testing. As such, this stack is included in this release as a Technology Preview.

FS-Cache

FS-Cache is a local caching facility for remote file systems that allows users to cache NFS data on a locally mounted disk. To set up the FS-Cache facility, install the **cachefilesd** RPM and refer to the instructions in **/usr/share/doc/cachefilesd-<version>/README**.

Replace **<version>** with the corresponding version of the **cachefilesd** package installed.

Systemtap

Systemtap provides free software (GPL) infrastructure to simplify the gathering of information about the running Linux system. This assists the diagnosis of a performance or functional problem. With the help of **systemtap**, developers no longer need to go through the tedious and disruptive instrument, recompile, install, and reboot sequence that may be otherwise required to collect data.

iSCSI Target

The Linux target (tgt) framework allows a system to serve block-level SCSI storage to other systems that have a SCSI initiator. This capability is being initially deployed as a Linux iSCSI target, serving storage over a network to any iSCSI initiator.

To set up the iSCSI target, install the **scsi-target-utils** RPM and refer to the instructions in:

- ✦ **/usr/share/doc/scsi-target-utils-<version>/README**
- ✦ **/usr/share/doc/scsi-target-utils-<version>/README.iscsi**

Replace **<version>** with the corresponding version of the package installed.

For more information, refer to **man tgtadm**.

FireWire

The **firewire-sbp2** module is included in this update as a Technology Preview. This module enables connectivity with FireWire storage devices and scanners.

At present, FireWire does not support the following:

- ✦ IPv4
- ✦ *pcilynx* host controllers
- ✦ multi-LUN storage devices
- ✦ non-exclusive access to storage devices

In addition, the following issues still exist in this version of FireWire:

- ✦ a memory leak in the **SBP2** driver may cause the machine to become unresponsive.
- ✦ a code in this version does not work properly in big-endian machines. This could lead to unexpected behavior in PowerPC.

1.7. Resolved Issues

- ✦ A SATA bug that caused SATA-equipped systems to pause during the boot process and display an error before resuming is now fixed.
- ✦ In multi-boot systems, **parted** now preserves the starting sector of the first primary partition where Windows Vista™ is installed. As such, when setting up a multi-boot system with both Red Hat Enterprise Linux 5.1 and Windows Vista™, the latter is no longer rendered unbootable.
- ✦ **rmmod xennet** no longer causes **domU** to crash.
- ✦ 4-socket AMD *Sun Blade X8400 Server Module* systems that do not have memory configured in **node 0** no longer panic during boot.
- ✦ **conga** and **luci** can now be used to create and configure failover domains.
- ✦ When installing the **Cluster Storage** group through **yum**, the transaction no longer fails.
- ✦ During installation, incorrect SELinux contexts are no longer assigned to **/var/log/faillog** and **/var/log/tallylog**.
- ✦ On the dual-core AMD Platform, cpu-intensive activity on a single cpu no longer causes CPU cores to change frequencies.
- ✦ Installing Red Hat Enterprise Linux 5.1 using split installation media (for example, CD or NFSISO) no longer causes an error in the installation of **amanda-server**.
- ✦ During the installation process, **Anaconda** can now detect more than 4GB of RAM. This allows **Anaconda** to automatically determine whether it needs to install the kernel-PAE variant of the kernel or not.
- ✦ EDAC now reports the correct amount of memory on the latest k8 processors.
- ✦ Logging in remotely to a Gnome desktop via **gdm** no longer causes the login screen to hang.
- ✦ A bug in **autofs** that prevented multi-mounts from working properly is now fixed.
- ✦ Running **tvtime** and **xawtv** with the **bttv** kernel module no longer causes the system to freeze.
- ✦ Several patches to **utrace** apply the following fixes:
 - fixed a bug that causes a crash in race condition when using **ptrace**
 - fixed a regression that resulted in erroneous EIO returns from some **PTRACE_PEEKUSR** calls
 - fixed a regression that prevented some **wait4** calls from waking up when a child exited under certain circumstances
 - fixed a regression that sometimes prevented **SIGKILL** from terminating a process. This occurred if **ptrace** was performed on a process under certain circumstances.
- ✦ A RealTime Clock (RTC) bug that prevented alarms and periodic RTC interrupts from working properly is now fixed.

1.8. Known Issues

- ✦ The first time the **Release Notes** button is clicked in **Anaconda**, a delay occurs while the window renders the Release Notes. During this delay, a seemingly empty list appears in the window. The rendering normally completes quickly, so most users may not notice this.

This delay is mostly due to the fact that the package installation phase is the most CPU-intensive phase of installation.

- ✦ Some machines that use *NVIDIA* graphics cards may display corrupted graphics or fonts when using the graphical installer or during a graphical login. To work around this, switch to a virtual console and back to the original X host.
- ✦ Host bus adapters that use the MegaRAID driver must be set to operate in "Mass Storage" emulation mode, not in "I2O" emulation mode. To do this, perform the following steps:
 - ✦ Enter the MegaRAID **BIOS Set Up Utility**.
 - ✦ Enter the **Adapter settings menu**.
 - ✦ Under **Other Adapter Options**, select **Emulation** and set it to **Mass Storage**.

If the adapter is incorrectly set to "I2O" emulation, the system will attempt to load the i2o driver. This will fail, and prevent the proper driver from being loaded.

Previous Red Hat Enterprise Linux releases generally do not attempt to load the I2O driver before the MegaRAID driver. Regardless of this, the hardware should always be set to "Mass Storage" emulation mode when used with Linux.

- ✦ Laptops equipped with the *Cisco Aironet MPI-350* wireless may hang trying to get a DHCP address during any network-based installation using the wired ethernet port.

To work around this, use local media for your installation. Alternatively, you can disable the wireless card in the laptop BIOS prior to installation (you can re-enable the wireless card after completing the installation).

- ✦ Currently, **system-config-kickstart** does not support package selection and deselection. When using **system-config-kickstart**, the **Package Selection** option indicates that it is disabled. This is because **system-config-kickstart** uses **yum** to gather group information, but is unable to configure **yum** to connect to Red Hat Network.

At present, you need to update package sections in your kickstart files manually. When using **system-config-kickstart** to open a kickstart file, it will preserve all package information in it and write it back out when you save.

- ✦ Boot-time logging to **/var/log/boot.log** is not available in this update of Red Hat Enterprise Linux 5. An equivalent functionality will be added in a future update.
- ✦ When upgrading from Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5, the Deployment Guide is not automatically installed. You need to use **pirut** to manually install it after completing the upgrade.
- ✦ The system may not successfully reboot into a **kexec/kdump** kernel if X is running and using a driver other than *vesa*. This problem only exists with *ATI Rage XL* graphics chipsets.

If X is running on a system equipped with *ATI Rage XL*, ensure that it is using the *vesa* driver in order to successfully reboot into a **kexec/kdump** kernel.

- ✦ Installing the Virtualization feature may cause a **time went backwards** warning on HP systems with model numbers xw9300 and xw9400.

To work around this issue for xw9400 machines, configure the BIOS settings to enable the **HPET** timer. Note that this option is not available on xw9300 machines.

This will be resolved in an upcoming BIOS update by HP.

- ✦ When using Red Hat Enterprise Linux 5 on a machine with an *nVidia CK804* chipset installed, the following kernel messages may appear:

```
kernel: assign_interrupt_mode Found MSI capability
kernel: pcie_portdrv_probe->Dev[005d:10de] has invalid IRQ. Check vendor BIOS
```

These messages indicate that certain PCI-E ports are not requesting IRQs. Further, these messages do not, in any way, affect the operation of the machine.

- ✦ Removable storage devices (such as CDs and DVDs) do not automatically mount when you are logged in as root. As such, you will need to manually mount the device through the graphical file manager.

Alternatively, you can run the following command to mount a device to **/media**:

```
mount /dev/<device name> /media
```

- ✦ The *Calgary IOMMU* chip is not supported by default in this update. To enable support for this chip, use the kernel command line option **iommu=calgary**.
- ✦ The *IBM System z* does not provide a traditional Unix-style physical console. As such, Red Hat Enterprise Linux 5 for the *IBM System z* does not support the *firstboot* functionality during initial program load.

To properly initialize setup for Red Hat Enterprise Linux 5 on the *IBM System z*, run the following commands after installation:

- **/usr/bin/setup** — provided by the **setuptools** package.
- **/usr/bin/rhn_register** — provided by the **rhn-setup** package.
- ✦ When upgrading from Red Hat Enterprise Linux 5 to Red Hat Enterprise Linux 5.1 via Red Hat Network, **yum** may not prompt you to import the redhat-beta key. As such, it is advised that you import the redhat-beta key manually prior to upgrading. To do this, run the following command:

```
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
```

- ✦ When a LUN is deleted on a configured filer, the change is not reflected on the host. In such cases, **lvm** commands will hang indefinitely when **dm-multipath** is used, as the LUN has now become *stale*.

To work around this, delete all device and **mpath** link entries in **/etc/lvm/.cache** specific to the stale LUN.

To find out what these entries are, run the following command:

```
ls -l /dev/mpath | grep <stale LUN>
```

For example, if **<stale LUN>** is 3600d0230003414f30000203a7bc41a00, the following results may appear:

```
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00 -
> ../dm-4
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00p1
-> ../dm-5
```

This means that 3600d0230003414f30000203a7bc41a00 is mapped to two **mpath** links: **dm-4** and **dm-5**.

As such, the following lines should be deleted from `/etc/lvm/.cache`:

```
/dev/dm-4
/dev/dm-5
/dev/mapper/3600d0230003414f30000203a7bc41a00
/dev/mapper/3600d0230003414f30000203a7bc41a00p1
/dev/mpath/3600d0230003414f30000203a7bc41a00
/dev/mpath/3600d0230003414f30000203a7bc41a00p1
```

- ✦ When attempting to create a fully virtualized Windows™ guest from a CD or DVD, the second stage of the guest install might not continue upon reboot.

To work around this, edit `/etc/xen/<name of guest machine>` by properly appending an entry for the CD / DVD device.

If an installation to a simple file is used as a virtual device, the `disk` line of `/etc/xen/<name of guest machine>` will read like the following:

```
disk = [ 'file:/PATH-OF-SIMPLE-FILE,hda,w' ]
```

A DVD-ROM device located on the host as `/dev/dvd` can be made available to stage 2 of the installation as `hdc` by appending an entry like `'phy:/dev/dvd,hdc:cdrom,r'`. As such, the disk line should now read as follows:

```
disk = [ 'file:/opt/win2003-sp1-20061107,hda,w',
'phy:/dev/dvd,hdc:cdrom,r' ]
```

The precise device path to use may vary depending on your hardware.

- ✦ If the `sctp` module is not added to the kernel, running `netstat` with the `-A inet` or `-A inet6` option abnormally terminates with the following message:

```
netstat: no support for `AF_INET (sctp)' on this system.
```

To avoid this, install the `sctp` kernel module.

- ✦ Installing Red Hat Enterprise Linux 3.9 on a fully virtualized guest may be extremely slow. In addition, booting up the guest after installation may result in `hda: lost interrupt` errors.

To avoid this bootup error, configure the guest to use the SMP kernel.

- ✦ Current kernels do not assert *Data Terminal Ready* (DTR) signals before printing to serial ports during boot time. DTR assertion is required by some devices; as a result, kernel boot messages are not printed to serial consoles on such devices.
- ✦ Upgrading a host (`dom0`) system to Red Hat Enterprise Linux 5.1 may render existing Red Hat Enterprise Linux 4.5 SMP paravirtualized guests unbootable. This is more likely to occur when the host system has more than 4GB of RAM.

To work around this, boot each Red Hat Enterprise Linux 4.5 guest in single CPU mode and upgrade its kernel to the latest version (for Red Hat Enterprise Linux 4.5.z).

- ✦ The AMD 8132 and HP BroadCom HT100 used on some platforms (such as the HP dc7700) do not support `MMCONFIG` cycles. If your system uses either chipset, your PCI configuration should use the legacy `PortIO CF8/CFC` mechanism. To configure this, boot the system with the kernel parameter `-pci nommconf` during installation and add `pci=nommconf` to GRUB after rebooting.

Further, the *AMD 8132* chipset does not support Message Signaled Interrupts (MSI). If your system uses this chipset, you should also disable MSI. To do this, use the kernel parameter **-pci noms**i during installation and add **pci=noms**i to GRUB after rebooting.

However, if your specific platform is already blacklisted by the kernel, your system does not require the aforementioned **pci** kernel parameters. The following HP platforms are already blacklisted by the kernel:

- *DL585g2*
 - *dc7500*
 - *xw9300*
 - *xw9400*
- ✳ When running the bare-metal (non-Virtualized) kernel, the X server may not be able to retrieve **EDID** information from the monitor. When this occurs, the graphics driver will be unable to display resolutions higher than 800x600.

To work around this, add the following line to the **ServerLayout** section of **/etc/X11/xorg.conf**:

```
Option "Int10Backend" "x86emu"
```

- ✳ The **Virtual Machine Manager (virt-manager)** included in this release does not allow users to specify additional boot arguments to the paravirtualized guest installer. This is true even when such arguments are required to install certain types of paravirtualized guests on specific types of hardware.

This issue will be addressed in a future release of **virt-manager**. To specify arbitrary kernel arguments in installing paravirtualized guests from the command line, use **virt-install**.

- ✳ With the default **dm-multipath** configuration, *Netapp* devices may take several minutes to complete failback after a previously failed path is restored. To resolve this problem, add the following *Netapp* device configuration to the **devices** section of the **multipath.conf** file:

```
devices {
    device {
        vendor                "NETAPP"
        product                "LUN"
        getuid_callout        "/sbin/scsi_id -g -u -s
/block/%n"
        prio_callout          "/sbin/mpath_prio_netapp
/dev/%n"
        features              "1 queue_if_no_path"
        hardware_handler      "0"
        path_grouping_policy  group_by_prio
        failback              immediate
        rr_weight             uniform
        rr_min_io             128
        path_checker          directio
    }
}
```

2. Release Notes for x86_64

- ✦ This release includes WBEMSMT, a suite of web-based applications that provides a user-friendly management interface for Samba and DNS. For more information about WBEMSMT, refer to <http://sblim.wiki.sourceforge.net/>.
- ✦ Upgrading **pm-utils** from a Red Hat Enterprise Linux 5.1 Beta version of **pm-utils** will fail, resulting in the following error:

```
error: unpacking of archive failed on file /etc/pm/sleep.d: cpio: rename
```

To prevent this from occurring, delete the **/etc/pm/sleep.d/** directory prior to upgrading. If **/etc/pm/sleep.d** contains any files, you can move those files to **/etc/pm/hooks/**.

- ✦ Hardware testing for the *Mellanox MT25204* has revealed that an internal error occurs under certain high-load conditions. When the **ib_mthca** driver reports a catastrophic error on this hardware, it is usually related to an insufficient completion queue depth relative to the number of outstanding work requests generated by the user application.

Although the driver will reset the hardware and recover from such an event, all existing connections are lost at the time of the error. This generally results in a segmentation fault in the user application. Further, if **opensm** is running at the time the error occurs, then it will have to be manually restarted in order to resume proper operation.

- ✦ Driver Update Disks now support Red Hat's Driver Update Program RPM-based packaging. If a driver disk uses the newer format, it is possible to include RPM packaged drivers that will be preserved across system updates.

Please note that driver RPMs are copied only for the default kernel variant that is in use on the installed system. For example, installing a driver RPM on a system running the virtualized kernel will install the driver *only* for the virtualized kernel. The driver RPM will not be installed for any other installed kernel variant in the system.

As such, on a system that has multiple kernel variants installed, you will need to boot the system on each kernel variant and install the driver RPM. For example, if your system has both bare-metal and virtualized kernels installed, boot your system using the bare-metal kernel and install the driver RPM. Then, reboot the system into the virtualized kernel and install the driver RPM again.

- ✦ During the lifetime of **dom0**, you cannot create guests (i.e. **xm create**) more than 32,750 times. For example, if you have guests rebooting in a loop, **dom0** will fail to boot any guest after rebooting guests a total of 32,750 times.

If this event occurs, restart **dom0**

- ✦ Using the **divider** command-line argument may not work properly in this architecture. This issue will be addressed in a future update of Red Hat Enterprise Linux 5.
- ✦ The Red Hat Enterprise Linux 5.1 NFS server now supports referral exports. These exports are based on extensions to the NFSv4 protocol. Any NFS clients that do not support these extensions (namely, Red Hat Enterprise Linux releases prior to 5.1) will not be able to access these exports.

As such, if an NFS client does not support these exports, any attempt to access these exports may fail with an I/O error. In some cases, depending on the client implementation, the failure may be more severe, including the possibility of a system crash.

It is important that you take precautions to ensure that NFS referral exports are not accessed by clients that do not support them.

- ✦ **GFS2** is an incremental advancement of GFS. This update applies several significant improvements that require a change to the on-disk file system format. GFS file systems can be converted to GFS2 using the utility **gfs2_convert**, which updates the metadata of a GFS file system accordingly.

While much improved since its introduction in Red Hat Enterprise Linux 5, GFS2 remains a Technology Preview. The release notes included in the distribution incorrectly states that GFS2 is fully supported. Nevertheless, benchmark tests indicate faster performance on the following:

- heavy usage in a single directory and faster directory scans (Postmark benchmark)
- synchronous I/O operations (**fstest** benchmark test indicates improved performance for messaging applications like TIBCO)
- cached reads, as there is no longer any locking overhead
- direct I/O to preallocated files
- NFS file handle lookups
- **df**, as allocation information is now cached

In addition, GFS2 also features the following changes:

- journals are now plain (though hidden) files instead of metadata. Journals can now be dynamically added as additional servers mount a file system.
 - quotas are now enabled and disabled by the mount option **quota=<on|off|account>**
 - **quiesce** is no longer needed on a cluster to replay journals for failure recovery
 - nanosecond timestamps are now supported
 - similar to ext3, GFS2 now supports the **data=ordered** mode
 - attribute settings **lsattr()** and **chattr()** are now supported via standard **ioctl()**
 - file system sizes above 16TB are now supported
 - GFS2 is a standard file system, and can be used in non-clustered configurations
- ✦ Installing Red Hat Enterprise Linux 5.1 on *HP BL860c* blade systems may hang during the IP information request stage. This issue manifests when you have to select **OK** twice on the **Configure TCP/IP** screen.

If this occurs, reboot and perform the installation with Ethernet autonegotiation disabled. To do this, use the parameter **ethtool="autoneg=off"** when booting from the installation media. Doing so does not affect the final installed system.

- ✦ The **nohide** export option is required on referral exports (i.e. exports that specify a referral server). This is because referral exports need to "cross over" a bound mount point. The **nohide** export option is required for such a "cross over" to be successful.

For more information on bound mounts, refer to **man exports 5**.

- ✦ This update includes the **lvm2** event monitoring daemon. If you are already using **lvm2** mirroring, perform the following steps to ensure that all monitoring functions are upgraded properly:
 - ✦ Deactivate all mirrored **lvm2** logical volumes before updating. To do this, use the command **lvchange -a n <volume group or mirrored volume>**.
 - ✦ Stop the old **lvm2** event daemon using **killall -HUP dmeventd**.

- ✦ Perform the upgrade of all related RPM packages, namely **device-mapper** and **lvm2**.
- ✦ Reactivate all mirrored volumes again using **lvchange -a y <volume group or mirrored volume>**.
- ✦ *Rapid Virtualization Indexing (RVI)* is now supported on 64-bit, 32-bit, and 32-bit PAE kernels. However, RVI can only translate 32-bit guest virtual addresses on the 32-bit PAE hypervisor.

As such, if a guest is running a PAE kernel with more than 3840MB of RAM, a wrong address translation error will occur. This can crash the guest.

It is recommended that you use the 64-bit kernel if you intend to run guests with more than 4GB of physical RAM under RVI.

- ✦ Running 16 cores or more using *AMD Rev F* processors may result in system resets when performing fully-virtualized guest installations.
- ✦ Installing the **systemtap-runtime** package will result in a transaction check error if the **systemtap** package is already installed. Further, upgrading Red Hat Enterprise Linux 5 to 5.1 will also fail if the **systemtap** package is already installed.

As such, remove the **systemtap** package using the command **rpm -e systemtap-0.5.12-1.e15** before installing **systemtap-runtime** or performing an upgrade.

- ✦ When setting up NFSROOT, **BOOTPROTO** must be set as **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0**.

If your environment requires a different setting for **BOOTPROTO**, then temporarily set **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0** before initially creating the **initrd**. You can reset the original value of **BOOTPROTO** after the **initrd** is created.

- ✦ Crash dumping through **kexec** and **kdump** may not function reliably with *HP Smart Array* controllers. Note that these controllers use the **cciss** driver.

A solution to this problem, which is likely to involve a firmware update to the controller, is being investigated.

- ✦ Creating a guest more than 1,000 times will cause **dom0** to reboot suddenly. It is recommended that you pre-empt this by rebooting **dom0** before the domain ID of any guest reaches 1,000.
- ✦ The *QLogic iSCSI Expansion Card* for the *IBM Bladecenter* provides both ethernet and iSCSI functions. Some parts on the card are shared by both functions. However, the current **qla3xxx** and **qla4xxx** drivers support ethernet and iSCSI functions individually. Both drivers do not support the use of ethernet and iSCSI functions simultaneously.

As such, using both ethernet and iSCSI functions simultaneously may hang the device. This could result in data loss and filesystem corruption on iSCSI devices, or network disruptions on other connected ethernet devices.

- ✦ When using **virt-manager** to add disks to an existing guest, duplicate entries may be created in the guest's **/etc/xen/<domain name>** configuration file. These duplicate entries will prevent the guest from booting.

As such, you should remove these duplicate entries.

- ✦ Repeatedly migrating a guest between two hosts may cause one host to panic. If a host is rebooted after migrating a guest out of the system and before migrating the same guest back, the panic will not occur.

- ✦ **sysreport** is being deprecated in favor of **sos**. To install **sos**, run **yum install sos**. This command installs **sos** and removes **sysreport**. It is recommended that you update any existing kickstart files to reflect this.

After installing **sos**, use the command **sosreport** to invoke it. Using the command **sysreport** generates a warning that **sysreport** is now deprecated; continuing will invoke **sosreport**.

If you need to use the **sysreport** tool specifically, use the command **sysreport .legacy** to invoke it.

For more information about **sosreport**, refer to **man sosreport** and **sosreport --help**.

2.1. Installation-Related Notes

This section includes information specific to **Anaconda** and the installation of Red Hat Enterprise Linux 5.1.

To upgrade an already-installed Red Hat Enterprise Linux 5, you can use Red Hat Network to update those packages that have changed.

You may also use **Anaconda** to perform a fresh installation of Red Hat Enterprise Linux 5.1 or to perform an upgrade from *the latest updated version* of Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5.1.

Anaconda can also be used to upgrade an already-installed Red Hat Enterprise Linux 5.

- ✦ If you are copying the contents of the Red Hat Enterprise Linux 5 CD-ROMs (in preparation for a network-based installation, for example) be sure to copy the CD-ROMs for the operating system *only*. Do not copy the **Supplementary CD-ROM**, or any of the layered product CD-ROMs, as this will overwrite files necessary for **Anaconda**'s proper operation.

The contents of the **Supplementary CD-ROM** and other layered product CD-ROMs must be installed *after* Red Hat Enterprise Linux 5.1 has been installed.

- ✦ When installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, do *not* use the **kernel-xen** kernel. Using this kernel on fully virtualized guests can cause your system to hang.

If you are using an Installation Number when installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, be sure to deselect the **Virtualization** package group during the installation. The **Virtualization** package group option installs the **kernel-xen** kernel.

Note that paravirtualized guests are not affected by this issue. Paravirtualized guests always use the **kernel-xen** kernel.

- ✦ If you are using the Virtualized kernel when upgrading from Red Hat Enterprise Linux 5 to 5.1, you must reboot after completing the upgrade. You should then boot the system using the updated Virtualized kernel.

The hypervisors of Red Hat Enterprise Linux 5 and 5.1 are not ABI-compatible. If you do not boot the system after upgrading using the updated Virtualized kernel, the upgraded Virtualization RPMs will not match the running kernel.

2.1.1. Installation / Boot for iSCSI software initiator (open-iscsi)

iSCSI installation and boot was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview. This feature is now fully supported, with the restrictions described below.

This capability has three configurations depending on whether you are:

- ✦ using a hardware iSCSI initiator (such as the *QLogic qla4xxx*)

- ✦ using the **open-iscsi** initiator on a system with firmware boot support for iSCSI (such as iSCSI Boot Firmware, or a version of Open Firmware that features the iSCSI boot capability)
- ✦ using the **open-iscsi** initiator on a system with no firmware boot support for iSCSI

2.1.1.1. Using a Hardware iSCSI Initiator

If you are using a hardware iSCSI initiator, you can use the card's BIOS set-up utility to enter the IP address and other parameters required to obtain access to the remote storage. The logical units of the remote storage will be available in **Anaconda** as standard **sd** devices, with no additional set-up required.

If you need to determine the initiator's qualified name (IQN) in order to configure the remote storage server, follow these steps during installation:

1. Go to the installer page where you select which disk drives to use for the installation.
2. Click on **Advanced storage configuration**.
3. Click on **Add iSCSI target**.
4. The iSCSI IQN will be displayed on that screen.

2.1.1.2. Using open-iscsi On A System With Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with firmware boot support for iSCSI, use the firmware's setup utility to enter the IP address and other parameters needed to access the remote storage. Doing this configures the system to boot from the remote iSCSI storage.

Currently, Anaconda does not access the iSCSI information held by the firmware. Instead, you must manually enter the target IP address during installation. To do so, determine the IQN of the initiator using the procedure described above. Afterwards, on the same installer page where the initiator IQN is displayed, specify the IP address of the iSCSI target you wish to install to.

After manually specifying the IP address of the iSCSI target, the logical units on the iSCSI targets will be available for installation. The **initrd** created by **Anaconda** will now obtain the IQN and IP address of the iSCSI target.

If the IQN or IP address of the iSCSI target are changed in the future, enter the iBFT or Open Firmware set-up utility on each initiator and change the corresponding parameters. Afterwards, modify the **initrd** (stored in the iSCSI storage) for each initiator as follows:

1. Expand the **initrd** using **gunzip**.
2. Unpack it using **cpio -i**.
3. In the **init** file, search for the line containing the string **iscsistartup**. This line also contains the IQN and IP address of the iSCSI target; update this line with the new IQN and IP address.
4. Re-pack the **initrd** using **cpio -o**.
5. Re-compress the **initrd** using **gunzip**.

The ability of the operating system to obtain iSCSI information held by the Open Firmware / iBFT firmware is planned for a future release. Such an enhancement will remove the need to modify the **initrd** (stored in the iSCSI storage) for each initiator whenever the IP address or IQN of the iSCSI target is changed.

2.1.1.3. Using open-iscsi On A System With No Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with no firmware boot support for iSCSI, use a network boot capability (such as PXE/tftp). In this case, follow the same procedure described earlier to determine the initiator IQN and specify the IP address of the iSCSI target. Once completed, copy the **initrd** to the network boot server and set up the system for network boot.

Similarly, if the IP address or IQN of the iSCSI target is changed, the **initrd** should be modified accordingly as well. To do so, use the same procedure described earlier to modify the **initrd** for each initiator.

2.2. Feature Updates

EXT3 Enhancement

The maximum capacity of the EXT3 is now 16TB (increased from 8TB). This enhancement was originally included in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this update.

yum-security

It is now possible to limit **yum** to install security updates *only*. To do so, simply install the **yum-security** plugin and run the following command:

```
yum update --security
```

Restarting a Resource Independently

It is now possible to restart a resource in a cluster without interrupting its parent service. This can be configured in **/etc/cluster/cluster.conf** on a running node using the **__independent_subtree="1"** attribute to tag a resource as independent.

For example:

```
<service name="example">
  <fs name="One" __independent_subtree="1" ...>
    <nfsexport ...>
      <nfscclient .../>
    </nfsexport>
  </fs>
  <fs name="Two" ...>
    <nfsexport ...>
      <nfscclient .../>
    </nfsexport>
    <script name="Database" .../>
  </fs>
  <ip/>
</service>
```

Here, two file system resources are used: **One** and **Two**. If **One** fails, it is restarted without interrupting **Two**. If **Two** fails, all components (**One**, children of **One** and children of **Two**) are restarted. At no given time are **Two** and its children dependent on any resource provided by **One**.

Note that *Samba* requires a specific service structure, and as such it cannot be used in a service with independent subtrees. This is also true for several other resources, so use the **__independent_subtree="1"** attribute with caution.

Virtualization

The following Virtualization updates are also included in this release:

- ✦ The virtualized kernel can now use the **kdump** function.
- ✦ **AMD-V** is now supported in this release. This enables live domain migration for fully virtualized guests.
- ✦ The virtualized kernel can now support up to 256GB of RAM.
- ✦ The in-kernel socket API is now expanded. This was done to fix a bug that occurs when running **sctp** between guests.
- ✦ Virtual networking is now part of **libvirt**, the virtualization library. **libvirt** has a set of commands that sets up a virtual NAT/router and private network for all local guests on a machine. This is especially useful for guests that do not need to be routable from the outside. It is also useful for developers who use Virtualization on laptops.

Note that the virtual networking capability adds a dependency on **dnsmasq**, which handles **dhcp** for the virtual network.

For more information about **libvirt**, refer to <http://libvirt.org>.

- ✦ **libvirt** can now manage inactive virtual machines. **libvirt** does this by defining and undefining domains without stopping or starting them. This functionality is similar to the **virsh define** and **virsh undefine** commands.

This enhancement allows the Red Hat Virtual Machine Manager to display all available guests. This allows you to start these guests directly from the GUI.

- ✦ Installing the **kernel-xen** package no longer leads to the creation of incorrect / incomplete **elilo.conf** entries.
- ✦ Fully virtualized guests now support live migration.
- ✦ The **xm create** command now has a graphical equivalent in **virt-manager**.
- ✦ *Nested Paging* (NP) is now supported. This feature reduces the complexity of memory management in virtualized environments. In addition, NP also reduces CPU utilization in memory-intensive guests.

At present, NP is not enabled by default. If your system supports NP, it is recommended that you enable NP by booting the hypervisor with the parameter **hap=1**.

This update to the Virtualization feature also includes the capability to install and run paravirtualized 32-bit guests on 64-bit hosts. However, this capability is provided as a Technology Preview; as such, it is not supported for production use.

Shared Page Tables

Shared page tables are now supported for **hugetlb** memory. This enables page table entries to be shared among multiple processes.

Sharing page table entries among multiple processes consumes less cache space. This improves application cache hit ratio, resulting in better application performance.

divider

The **divider=<value>** option is a kernel command-line parameter that allows you to adjust the system clock rate while maintaining the same visible HZ timing value to user space applications.

Using the **divider=** option allows you to reduce CPU overhead and increase efficiency at the cost of lowering the accuracy of timing operations and profiling. This is useful in virtualized environments as well as for certain applications.

Useful **<values>** for the standard 1000Hz clock are:

- **2** = 500Hz
- **4** = 250Hz
- **10** = 100Hz (value used by previous releases of Red Hat Enterprise Linux)

Note that the virtualized kernel uses a 250HZ clock by default. As such, it does not need the **divider=** option either in **dom0** or in paravirtualized guests.

Installing to dm-multipath Devices

Anaconda now has the capability to detect, create, and install to *dm-multipath* devices. To enable this feature, add the parameter **mpath** to the kernel boot line.

This feature was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this release.

Note that **dm-multipath** also features inbox support for the *Dell MD3000*. However, multiple nodes that use **dm-multipath** to access the MD3000 cannot perform immediate failback.

Further, it is recommended that you use the **Custom Partitioning** interface in **Anaconda** if your system has both multipath and non-multipath devices. Using **Automatic Partitioning** in such cases may create both types of devices in the same logical volume groups.

At present, the following restrictions apply to this feature:

- If there is only one path to the boot Logical Unit Number (LUN), **Anaconda** installs to the SCSI device even if **mpath** is specified. Even after you enable multiple paths to the boot LUN and recreate the **initrd**, the operating system will boot from the SCSI device instead of the **dm-multipath** device.

However, if there are multiple paths to the boot LUN to begin with, **Anaconda** will correctly install to the corresponding **dm-multipath** device after **mpath** is specified in the kernel boot line.

- By default, **user_friendly_names** is set to **yes** in **multipath.conf**. This is a required setting in the support implementation of the **dm-multipath** root device. As such, setting **user_friendly_names** to **no** and recreating the **initrd** will result in a boot failure with the following error:

```
Checking filesystems
fsck.ext3: No such file or directory while trying to open
/dev/mapper/mpath0p1
```

Booting from Storage Area Network (SAN)

The ability to boot from a SAN disk device is now supported. In this case, SAN refers to a Fibre Channel or iSCSI interface. This capability also features support for system-to-storage connection through multiple paths using **dm-multipath**.

In configurations that use multiple host bus adapters (HBA), you may need to set the system BIOS to boot from another adapter if all paths through the current adapter fail.

Driver Update Program

The Driver Update Program (DUP) was designed to allow third-party vendors (such as OEMs) to add their own device drivers and other Linux Kernel Modules to Red Hat Enterprise Linux 5 systems using regular RPM packages as the distribution containers.

Red Hat Enterprise Linux 5.1 applies several updates to the DUP, most notably:

- ✦ install-time Driver Update RPMs through Driver Update Disks is now supported
- ✦ bootpath Driver Updates affecting the system bootpath are now supported
- ✦ support for third-party packaging of *Advanced Linux Sound Architecture* (ALSA) is now deprecated

Further, various updates were applied to the approved kernel ABI symbol whitelists. These whitelists are used by packaging drivers to determine which symbols and data structures provided by the kernel can be used in a third-party driver.

For more information, refer to <http://www.kerneldrivers.org/RedHatKernelModulePackages>.

2.3. Driver Updates

General Driver Updates

- ✦ **acpi**: updated **ibm_acpi** module to address several ACPI and docking station issues with Lenovo laptops.
- ✦ **ipmi**: Polling **kthread** no longer runs when hardware interrupt is assigned to a Baseboard Management Controller.
- ✦ **sata**: **SATA/SAS** upgraded to version 2.6.22-rc3.
- ✦ **openib** and **openmpi**: upgraded to OFED (OpenFabrics Enterprise Distribution) version 1.2.
- ✦ **powernow-k8**: upgraded to version 2.0.0 to fully support *Greyhound*.
- ✦ **xinput**: added to enable full RSA support.
- ✦ **aic94xx**: upgraded to version 1.0.2-1, in line with an upgrade of the embedded sequencer firmware to v17. These updates apply the following changes:
 - fixed **ascb** race condition on platforms with expanders
 - added **REQ_TASK_ABORT** and **DEVICE_RESET** handlers
 - physical ports are now cleaned up properly after a discovery error
 - **phys** can now be enabled and disabled through **sysfs**
 - extended use of DDB lock to prevent race condition of DDB

Audio

ALSA updated to version 1.0.14. This update applies the following fixes:

- ✦ fixed noise problem on the IBM Taroko (M50)
- ✦ *Realtek ALC861* is now supported

- ✦ fixed a muting problem on xw8600 and xw6600
- ✦ *ADI 1884 Audio* is now supported
- ✦ fixed an audio configuration problem on xw4600

PCI

- ✦ added function calls to set maximum read request size for PCIX and PCI-Express
- ✦ *IBM System P* machines now support PCI-Express hotplugging
- ✦ added necessary drivers and PCI ID to support SB600 SMBus

Network

- ✦ **e1000** driver: updated to version 7.3.20-k2 to support I/OAT-enabled chipsets.
- ✦ **bnx2** driver: updated to version 1.5.11 to support 5709 hardware.
- ✦ **B44** ethernet driver: backported from upstream version 2.6.22-rc4 to apply the following changes:
 - several **endianness** fixes were made
 - **DMA_30BIT_MASK** constant is now used
 - **skb_copy_from_linear_data_offset()** is now used
 - **spin_lock_irqsave()** now features safer interrupt disabling
 - simple error checking is performed during resume
 - several fixes to multicast were applied
 - chip reset now takes longer than previously anticipated
- ✦ *Marvell sky2* driver: updated to version 1.14 to fix a bug that causes a kernel panic if the **ifup/ifdown** commands are executed repeatedly.
- ✦ **forcedeth-0.60** driver: now included in this release. This applies several critical bug fixes for customers using *NVIDIA's* MCP55 motherboard chipsets and corresponding onboard NIC.
- ✦ **ixgb** driver: updated to the latest upstream version (1.0.126).
- ✦ **netxen_nic** driver: version 3.4.2-2 added to enable support for *NetXen 10GbE* network cards.
- ✦ *Chelsio 10G Ethernet Network Controller* is now supported.
- ✦ added support for PCI error recovery to the **s2io** device.
- ✦ Broadcom wireless ethernet driver now supports PCI ID for *nx6325* card.
- ✦ fixed a bug that caused an **ASSERTION FAILED** error when attempting to start a *BCM4306* via **ifup**.
- ✦ **ixgb** driver: updated to add EEH PCI error recovery support for the Intel 10-gigabit ethernet card. For more information, refer to `/usr/share/doc/kernel-doc-<kernel version>/Documentation/pci-error-recovery.txt`.

- ✦ **qla3xxx** driver: re-enabled and updated to version 2.03.00-k3 to provide networking support for *QLogic* iSCSI adapters without using iSCSI.
- ✦ *Intel PRO/Wireless 3945ABG* network driver: updated to version 1.2.0. This update resolves several issues, including a soft lockup bug that could occur under certain circumstances on some laptops.
- ✦ **qla2xxx**: driver upgraded to version 8.01.07-k6. This applies several changes, most notably:
 - iIDMA is now supported
 - the following Fibre Channel attributes are now supported:
 - symbolic nodename
 - system hostname
 - fabric name
 - host port state
 - trace-control async events are no longer logged
 - reset handling logic has been corrected
 - MSI-X is now supported
 - IRQ-0 assignments are now handled per system
 - NVRAM updates immediately go into effect

IPMI

This release includes an update of the **IPMI** driver set to include the upstream changes as of version 2.6.21.3, with some patches included from 2.6.22-rc-4. This update features the following changes (among others):

- ✦ fixed uninitialized data bug in **ipmi_si_intf**
- ✦ **kipmid** is no longer started if another driver supports interrupts
- ✦ users are now allowed to override the kernel daemon **enable** through **force_kipmid**
- ✦ per-channel command registration is now supported
- ✦ **MAX_IPMI_INTERFACES** is no longer used
- ✦ hot system interface removal is now supported
- ✦ added a Maintenance Mode to support firmware updates
- ✦ added **poweroff** support for the **pigeonpoint** IPMC
- ✦ BT subdriver can now survive long timeouts
- ✦ added **pci_remove** handling for proper cleanup on a hot remove

For information about new module parameters, refer to **/usr/share/doc/kernel-doc-*<kernel version>*/Documentation/IPMI.txt**.

SCSI

- ✦ ported SCSI blacklist from Red Hat Enterprise Linux 4 to this release.
- ✦ added PCI IDs for **aic79xx** driver.
- ✦ **aacraid** driver: updated to version 1.1.5-2437 to support *PRIMERGY RX800S2* and *RX800S3*.
- ✦ **megaraid_sas** driver: updated to version 3.10. This update defines the entry point for **bios_param**, adds an IOCTL memory pool, and applies several minor bug fixes.
- ✦ *Emulex lpfc* driver: updated to version 8.1.10.9. This update applies several changes, most notably:
 - fixed **host_lock** management in the **ioctl** paths
 - the *AMD* chipset is now automatically detected, and reduced the DMA length to 1024 bytes
 - nodes are no longer removed during **dev_loss_tmo** if discovery is active
 - 8GB link speeds are now enabled
- ✦ **qla4xxx** driver updated to apply the following changes:
 - added support for IPV6, QLE406x and **ioctl** module
 - fixed a **mutex_lock** bug that could cause lockups
 - resolved lockup issues of **qla4xxx** and **qla3xxx** when attempting to load/unload either interface
- ✦ **mpt fusion** drivers: updated to version 3.04.04. This update applies several changes, most notably:
 - fixed several error handling bugs
 - **mptsas** now serializes target resets
 - **mptsas** and **mptfc** now support LUNs and targets greater than 255
 - fixed an LSI **mptspi** driver regression that resulted in extremely slow DVD driver performance
 - when an LSI SCSI device returns a **BUSY** status, I/O attempts no longer fail after several retries
 - RAID arrays are no longer unavailable after auto-rebuild
- ✦ **arcmsr** driver: included to provide support for *Areca* RAID controllers.
- ✦ **3w-9xxx** module: updated to correctly support 3ware 9650SE.

2.4. Kernel-Related Updates

- ✦ The CIFS client has been updated to version 1.48aRH. This is based upon the 1.48a release, with patches that apply the following changes:
 - the mount option **sec=none** results in an anonymous mount
 - CIFS now honors the **umask** when POSIX extensions are enabled

- fixed **sec=** mount options that request packet signing

Note that for users of the *EMC Celerra* product (NAS Code 5.5.26.x and below), the CIFS client hangs when accessing shares on EMC NAS. This issue is characterized by the following kernel messages:

```
kernel: CIFS VFS: server not responding
kernel: CIFS VFS: No response for cmd 162 mid 380
kernel: CIFS VFS: RFC1001 size 135 bigger than SMB for Mid=384
```

After a CIFS mount, it becomes impossible to read/write any file on it and any application that attempts an I/O on the mountpoint will hang. To resolve this issue, upgrade to NAS Code 5.5.27.5 or later (use EMC Primus case number emc165978).

- ✦ **MODULE_FIRMWARE** tags are now supported.
- ✦ *ICH9* controllers are now supported.
- ✦ *Greyhound* processors are now supported in **CPUID** calls.
- ✦ **Oprofile** now supports new *Greyhound* performance counter events.
- ✦ *Directed DIAG* is now supported to improve *z/VM* utilization.
- ✦ The *Intel* graphics chipset is now supported through the **DRM** kernel module. Further, the DRM API has been upgraded to version 1.3 to support direct rendering.
- ✦ Updates to **ACPI** power management have improved S3 suspend-to-RAM and S4 hibernate.

2.5. Other Updates

- ✦ **gaim** is now called **pidgin**.
- ✦ *Intel microcode* updated to version 1.17. This adds support for new *Intel* processors.
- ✦ Implicit active-active failover using **dm-multipath** on *EMC Clariion* storage is now supported.
- ✦ The Chinese font *Zysong* is no longer installed as part of the **fonts-chinese** package. *Zysong* is now packaged separately as **fonts-chinese-zysong**. The **fonts-chinese-zysong** package is located in the **Supplementary CD**.

Note that the **fonts-chinese-zysong** package is needed to support the Chinese National Standard GB18030.

- ✦ The Challenge Handshake Authentication Protocol (CHAP) username and password have a character limit of 256 each.
- ✦ **pump** is deprecated in this update. As such, configuring your network interface through **netconfig** may result in broken **ifcfg** scripts.

To properly configure your network interface, use **system-config-network** instead. Installing the updated **system-config-network** package removes **netconfig**.

- ✦ **rpm --aid** is no longer supported. It is recommended that you use **yum** when updating and installing packages.

2.6. Technology Previews

Technology Preview features are currently *not* supported under Red Hat Enterprise Linux 5.1 subscription services, may not be functionally complete, and are generally not suitable for production use. However, these features are included as a customer convenience and to provide the feature with wider exposure.

Customers may find these features useful in a non-production environment. Customers are also free to provide feedback and functionality suggestions for a *Technology Preview* feature before it becomes fully supported. Erratas will be provided for high-severity security issues.

During the development of a *Technology Preview* feature, additional components may become available to the public for testing. It is the intention of Red Hat to fully support *Technology Preview* features in a future release.

Stateless Linux

Stateless Linux is a new way of thinking about how a system should be run and managed, designed to simplify provisioning and management of large numbers of systems by making them easily replaceable. This is accomplished primarily by establishing prepared system images which get replicated and managed across a large number of stateless systems, running the operating system in a read-only manner (refer to `/etc/sysconfig/readonly-root` for more details).

In its current state of development, the Stateless features are subsets of the intended goals. As such, the capability remains as *Technology Preview*.

The following is a list of the initial capabilities included in Red Hat Enterprise Linux 5:

- ✦ running a stateless image over NFS
- ✦ running a stateless image via loopback over NFS
- ✦ running on iSCSI

It is highly recommended that those interested in testing stateless code read the HOWTO at <http://fedoraproject.org/wiki/StatelessLinuxHOWTO> and join stateless-list@redhat.com.

The enabling infrastructure pieces for Stateless Linux were originally introduced in Red Hat Enterprise Linux 5.

AIGLX

AIGLX is a *Technology Preview* feature of the otherwise fully supported X server. It aims to enable GL-accelerated effects on a standard desktop. The project consists of the following:

- ✦ a lightly modified X server
- ✦ an updated Mesa package that adds new protocol support

By installing these components, you can have GL-accelerated effects on your desktop with very few changes, as well as the ability to enable and disable them at will without replacing your X server. *AIGLX* also enables remote GLX applications to take advantage of hardware GLX acceleration.

devicescape (d80211)

The *devicescape* stack enables the `iwlwifi 4965GN` wireless driver. This stack allows certain wireless devices to connect to any Wi-Fi network.

This stack has a code base that is yet to be accepted upstream. In addition, the stability of this stack is yet to be conclusively verified through testing. As such, this stack is included in this release as a *Technology Preview*.

FS-Cache

FS-Cache is a local caching facility for remote file systems that allows users to cache NFS data on a locally mounted disk. To set up the FS-Cache facility, install the **cachefilesd** RPM and refer to the instructions in `/usr/share/doc/cachefilesd-<version>/README`.

Replace `<version>` with the corresponding version of the **cachefilesd** package installed.

Systemtap

Systemtap provides free software (GPL) infrastructure to simplify the gathering of information about the running Linux system. This assists the diagnosis of a performance or functional problem. With the help of **systemtap**, developers no longer need to go through the tedious and disruptive instrument, recompile, install, and reboot sequence that may be otherwise required to collect data.

iSCSI Target

The Linux target (tgt) framework allows a system to serve block-level SCSI storage to other systems that have a SCSI initiator. This capability is being initially deployed as a Linux iSCSI target, serving storage over a network to any iSCSI initiator.

To set up the iSCSI target, install the **scsi-target-utils** RPM and refer to the instructions in:

- ✦ `/usr/share/doc/scsi-target-utils-<version>/README`
- ✦ `/usr/share/doc/scsi-target-utils-<version>/README.iscsi`

Replace `<version>` with the corresponding version of the package installed.

For more information, refer to `man tgtadm`.

FireWire

The **firewire-sbp2** module is included in this update as a Technology Preview. This module enables connectivity with FireWire storage devices and scanners.

At present, FireWire does not support the following:

- ✦ IPv4
- ✦ *pcilynx* host controllers
- ✦ multi-LUN storage devices
- ✦ non-exclusive access to storage devices

In addition, the following issues still exist in this version of FireWire:

- ✦ a memory leak in the **SBP2** driver may cause the machine to become unresponsive.
- ✦ a code in this version does not work properly in big-endian machines. This could lead to unexpected behavior in PowerPC.

2.7. Resolved Issues

- ✦ A SATA bug that caused SATA-equipped systems to pause during the boot process and display an error before resuming is now fixed.

- ✦ In multi-boot systems, **parted** now preserves the starting sector of the first primary partition where Windows Vista™ is installed. As such, when setting up a multi-boot system with both Red Hat Enterprise Linux 5.1 and Windows Vista™, the latter is no longer rendered unbootable.
- ✦ **rmmod xennet** no longer causes **domU** to crash.
- ✦ 4-socket AMD *Sun Blade X8400 Server Module* systems that do not have memory configured in **node 0** no longer panic during boot.
- ✦ **conga** and **luci** can now be used to create and configure failover domains.
- ✦ When installing the **Cluster Storage** group through **yum**, the transaction no longer fails.
- ✦ During installation, incorrect SELinux contexts are no longer assigned to **/var/log/faillog** and **/var/log/tallylog**.
- ✦ Installing Red Hat Enterprise Linux 5.1 using split installation media (for example, CD or NFSISO) no longer causes an error in the installation of **amanda-server**.
- ✦ EDAC now reports the correct amount of memory on the latest k8 processors.
- ✦ Logging in remotely to a Gnome desktop via **gdm** no longer causes the login screen to hang.
- ✦ A bug in **autofs** that prevented multi-mounts from working properly is now fixed.
- ✦ Running **tvtime** and **xawtv** with the **bttv** kernel module no longer causes the system to freeze.
- ✦ Several patches to **utrace** apply the following fixes:
 - fixed a bug that causes a crash in race condition when using **ptrace**
 - fixed a regression that resulted in erroneous EIO returns from some **PTRACE_PEEKUSR** calls
 - fixed a regression that prevented some **wait4** calls from waking up when a child exited under certain circumstances
 - fixed a regression that sometimes prevented **SIGKILL** from terminating a process. This occurred if **ptrace** was performed on a process under certain circumstances.
- ✦ A RealTime Clock (RTC) bug that prevented alarms and periodic RTC interrupts from working properly is now fixed.

2.8. Known Issues

- ✦ The first time the **Release Notes** button is clicked in **Anaconda**, a delay occurs while the window renders the Release Notes. During this delay, a seemingly empty list appears in the window. The rendering normally completes quickly, so most users may not notice this.

This delay is mostly due to the fact that the package installation phase is the most CPU-intensive phase of installation.

- ✦ Some machines that use **NVIDIA** graphics cards may display corrupted graphics or fonts when using the graphical installer or during a graphical login. To work around this, switch to a virtual console and back to the original X host.
- ✦ Host bus adapters that use the MegaRAID driver must be set to operate in "Mass Storage" emulation mode, not in "I2O" emulation mode. To do this, perform the following steps:

- ✦ Enter the MegaRAID **BIOS Set Up Utility**.

- ✦ Enter the **Adapter settings** menu.
- ✦ Under **Other Adapter Options**, select **Emulation** and set it to **Mass Storage**.

If the adapter is incorrectly set to "I2O" emulation, the system will attempt to load the i2o driver. This will fail, and prevent the proper driver from being loaded.

Previous Red Hat Enterprise Linux releases generally do not attempt to load the I2O driver before the MegaRAID driver. Regardless of this, the hardware should always be set to "Mass Storage" emulation mode when used with Linux.

- ✦ Laptops equipped with the *Cisco Aironet MPI-350* wireless may hang trying to get a DHCP address during any network-based installation using the wired ethernet port.

To work around this, use local media for your installation. Alternatively, you can disable the wireless card in the laptop BIOS prior to installation (you can re-enable the wireless card after completing the installation).

- ✦ Currently, **system-config-kickstart** does not support package selection and deselection. When using **system-config-kickstart**, the **Package Selection** option indicates that it is disabled. This is because **system-config-kickstart** uses **yum** to gather group information, but is unable to configure **yum** to connect to Red Hat Network.

At present, you need to update package sections in your kickstart files manually. When using **system-config-kickstart** to open a kickstart file, it will preserve all package information in it and write it back out when you save.

- ✦ Boot-time logging to `/var/log/boot.log` is not available in this update of Red Hat Enterprise Linux 5. An equivalent functionality will be added in a future update.
- ✦ When upgrading from Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5, the Deployment Guide is not automatically installed. You need to use **pirut** to manually install it after completing the upgrade.
- ✦ The system may not successfully reboot into a **kexec/kdump** kernel if X is running and using a driver other than *vesa*. This problem only exists with *ATI Rage XL* graphics chipsets.

If X is running on a system equipped with *ATI Rage XL*, ensure that it is using the *vesa* driver in order to successfully reboot into a **kexec/kdump** kernel.

- ✦ Installing the Virtualization feature may cause a **time went backwards** warning on HP systems with model numbers xw9300 and xw9400.

To work around this issue for xw9400 machines, configure the BIOS settings to enable the **HPET** timer. Note that this option is not available on xw9300 machines.

This will be resolved in an upcoming BIOS update by HP.

- ✦ When using Red Hat Enterprise Linux 5 on a machine with an *nVidia CK804* chipset installed, the following kernel messages may appear:

```
kernel: assign_interrupt_mode Found MSI capability
kernel: pcie_portdrv_probe->Dev[005d:10de] has invalid IRQ. Check vendor BIOS
```

These messages indicate that certain PCI-E ports are not requesting IRQs. Further, these messages do not, in any way, affect the operation of the machine.

- ✦ Removable storage devices (such as CDs and DVDs) do not automatically mount when you are logged in as root. As such, you will need to manually mount the device through the graphical file manager.

Alternatively, you can run the following command to mount a device to **/media**:

```
mount /dev/<device name> /media
```

- ✦ The *Calgary IOMMU* chip is not supported by default in this update. To enable support for this chip, use the kernel command line option **iommu=calgary**.
- ✦ The *IBM System z* does not provide a traditional Unix-style physical console. As such, Red Hat Enterprise Linux 5 for the *IBM System z* does not support the *firstboot* functionality during initial program load.

To properly initialize setup for Red Hat Enterprise Linux 5 on the *IBM System z*, run the following commands after installation:

- **/usr/bin/setup** — provided by the **setuptools** package.
- **/usr/bin/rhn_register** — provided by the **rhn-setup** package.
- ✦ When upgrading from Red Hat Enterprise Linux 5 to Red Hat Enterprise Linux 5.1 via Red Hat Network, **yum** may not prompt you to import the redhat-beta key. As such, it is advised that you import the redhat-beta key manually prior to upgrading. To do this, run the following command:

```
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
```

- ✦ When a LUN is deleted on a configured filer, the change is not reflected on the host. In such cases, **lvm** commands will hang indefinitely when **dm-multipath** is used, as the LUN has now become *stale*.

To work around this, delete all device and **mpath** link entries in **/etc/lvm/.cache** specific to the stale LUN.

To find out what these entries are, run the following command:

```
ls -l /dev/mpath | grep <stale LUN>
```

For example, if **<stale LUN>** is 3600d0230003414f30000203a7bc41a00, the following results may appear:

```
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00 -
> ../dm-4
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00p1
-> ../dm-5
```

This means that 3600d0230003414f30000203a7bc41a00 is mapped to two **mpath** links: **dm-4** and **dm-5**.

As such, the following lines should be deleted from **/etc/lvm/.cache**:

```
/dev/dm-4
/dev/dm-5
/dev/mapper/3600d0230003414f30000203a7bc41a00
/dev/mapper/3600d0230003414f30000203a7bc41a00p1
/dev/mpath/3600d0230003414f30000203a7bc41a00
/dev/mpath/3600d0230003414f30000203a7bc41a00p1
```

- ✦ When attempting to create a fully virtualized Windows™ guest from a CD or DVD, the second stage of the guest install might not continue upon reboot.

To work around this, edit `/etc/xen/<name of guest machine>` by properly appending an entry for the CD / DVD device.

If an installation to a simple file is used as a virtual device, the `disk` line of `/etc/xen/<name of guest machine>` will read like the following:

```
disk = [ 'file:/PATH-OF-SIMPLE-FILE,hda,w' ]
```

A DVD-ROM device located on the host as `/dev/dvd` can be made available to stage 2 of the installation as `hdc` by appending an entry like `'phy:/dev/dvd,hdc:cdrom,r'`. As such, the disk line should now read as follows:

```
disk = [ 'file:/opt/win2003-sp1-20061107,hda,w',
  'phy:/dev/dvd,hdc:cdrom,r' ]
```

The precise device path to use may vary depending on your hardware.

- ✦ If the `sctp` module is not added to the kernel, running `netstat` with the `-A inet` or `-A inet6` option abnormally terminates with the following message:

```
netstat: no support for `AF_INET (sctp)' on this system.
```

To avoid this, install the `sctp` kernel module.

- ✦ Installing Red Hat Enterprise Linux 3.9 on a fully virtualized guest may be extremely slow. In addition, booting up the guest after installation may result in `hda: lost interrupt` errors.

To avoid this bootup error, configure the guest to use the SMP kernel.

- ✦ Current kernels do not assert *Data Terminal Ready* (DTR) signals before printing to serial ports during boot time. DTR assertion is required by some devices; as a result, kernel boot messages are not printed to serial consoles on such devices.
- ✦ Upgrading a host (`dom0`) system to Red Hat Enterprise Linux 5.1 may render existing Red Hat Enterprise Linux 4.5 SMP paravirtualized guests unbootable. This is more likely to occur when the host system has more than 4GB of RAM.

To work around this, boot each Red Hat Enterprise Linux 4.5 guest in single CPU mode and upgrade its kernel to the latest version (for Red Hat Enterprise Linux 4.5.z).

- ✦ The *AMD 8132* and *HP BroadCom HT100* used on some platforms (such as the *HP dc7700*) do not support `MMCONFIG` cycles. If your system uses either chipset, your PCI configuration should use the legacy *PortIO CF8/CFC* mechanism. To configure this, boot the system with the kernel parameter `-pci nommconf` during installation and add `pci=nommconf` to GRUB after rebooting.

Further, the *AMD 8132* chipset does not support Message Signaled Interrupts (MSI). If your system uses this chipset, you should also disable MSI. To do this, use the kernel parameter `-pci noms` during installation and add `pci=noms` to GRUB after rebooting.

However, if your specific platform is already blacklisted by the kernel, your system does not require the aforementioned `pci` kernel parameters. The following HP platforms are already blacklisted by the kernel:

- *DL585g2*

- *dc7500*
- *xw9300*
- *xw9400*

- ✦ The **Virtual Machine Manager (virt-manager)** included in this release does not allow users to specify additional boot arguments to the paravirtualized guest installer. This is true even when such arguments are required to install certain types of paravirtualized guests on specific types of hardware.

This issue will be addressed in a future release of **virt-manager**. To specify arbitrary kernel arguments in installing paravirtualized guests from the command line, use **virt-install**.

- ✦ With the default **dm-multipath** configuration, *Netapp* devices may take several minutes to complete failback after a previously failed path is restored. To resolve this problem, add the following *Netapp* device configuration to the **devices** section of the **multipath.conf** file:

```

devices {
    device {
        vendor                "NETAPP"
        product                "LUN"
        getuid_callout        "/sbin/scsi_id -g -u -s
/block/%n"
        prio_callout          "/sbin/mpath_prio_netapp
/dev/%n"
        features              "1 queue_if_no_path"
        hardware_handler      "0"
        path_grouping_policy  group_by_prio
        failback              immediate
        rr_weight             uniform
        rr_min_io             128
        path_checker          directio
    }
}

```

3. Release Notes for ia64

- ✦ Virtualization does not work on architectures that use *Non-Uniform Memory Access* (NUMA). As such, installing the virtualized kernel on systems that use NUMA will result in a boot failure.

Some installation numbers install the virtualized kernel by default. If you have such an installation number and your system uses NUMA (or cannot disable NUMA), deselect the Virtualization option during installation.

- ✦ This release includes WBEMSMT, a suite of web-based applications that provides a user-friendly management interface for Samba and DNS. For more information about WBEMSMT, refer to <http://sblim.wiki.sourceforge.net/>.
- ✦ Upgrading **pm-utils** from a Red Hat Enterprise Linux 5.1 Beta version of **pm-utils** will fail, resulting in the following error:

```
error: unpacking of archive failed on file /etc/pm/sleep.d: cpio: rename
```

To prevent this from occurring, delete the **/etc/pm/sleep.d/** directory prior to upgrading. If **/etc/pm/sleep.d** contains any files, you can move those files to **/etc/pm/hooks/**.

- ✦ Using the **ipath** in this architecture may result in **openmpi** crashes. As such, the **ipath** driver is

currently released for this architecture as Technology Preview.

- Hardware testing for the *Mellanox MT25204* has revealed that an internal error occurs under certain high-load conditions. When the **ib_mthca** driver reports a catastrophic error on this hardware, it is usually related to an insufficient completion queue depth relative to the number of outstanding work requests generated by the user application.

Although the driver will reset the hardware and recover from such an event, all existing connections are lost at the time of the error. This generally results in a segmentation fault in the user application. Further, if **opensm** is running at the time the error occurs, then it will have to be manually restarted in order to resume proper operation.

- Driver Update Disks now support Red Hat's Driver Update Program RPM-based packaging. If a driver disk uses the newer format, it is possible to include RPM packaged drivers that will be preserved across system updates.

Please note that driver RPMs are copied only for the default kernel variant that is in use on the installed system. For example, installing a driver RPM on a system running the virtualized kernel will install the driver *only* for the virtualized kernel. The driver RPM will not be installed for any other installed kernel variant in the system.

As such, on a system that has multiple kernel variants installed, you will need to boot the system on each kernel variant and install the driver RPM. For example, if your system has both bare-metal and virtualized kernels installed, boot your system using the bare-metal kernel and install the driver RPM. Then, reboot the system into the virtualized kernel and install the driver RPM again.

- During the lifetime of **dom0**, you cannot create guests (i.e. **xm create**) more than 32,750 times. For example, if you have guests rebooting in a loop, **dom0** will fail to boot any guest after rebooting guests a total of 32,750 times.

If this event occurs, restart **dom0**

- Virtualization in this architecture can only support guests with a maximum RAM of 65,434 MB.
- The Red Hat Enterprise Linux 5.1 NFS server now supports referral exports. These exports are based on extensions to the NFSv4 protocol. Any NFS clients that do not support these extensions (namely, Red Hat Enterprise Linux releases prior to 5.1) will not be able to access these exports.

As such, if an NFS client does not support these exports, any attempt to access these exports may fail with an I/O error. In some cases, depending on the client implementation, the failure may be more severe, including the possibility of a system crash.

It is important that you take precautions to ensure that NFS referral exports are not accessed by clients that do not support them.

- **GFS2** is an incremental advancement of **GFS**. This update applies several significant improvements that require a change to the on-disk file system format. **GFS** file systems can be converted to **GFS2** using the utility **gfs2_convert**, which updates the metadata of a **GFS** file system accordingly.

While much improved since its introduction in Red Hat Enterprise Linux 5, **GFS2** remains a Technology Preview. The release notes included in the distribution incorrectly states that **GFS2** is fully supported. Nevertheless, benchmark tests indicate faster performance on the following:

- heavy usage in a single directory and faster directory scans (Postmark benchmark)
- synchronous I/O operations (**fstest** benchmark test indicates improved performance for messaging applications like TIBCO)
- cached reads, as there is no longer any locking overhead

- direct I/O to preallocated files
- NFS file handle lookups
- **df**, as allocation information is now cached

In addition, GFS2 also features the following changes:

- journals are now plain (though hidden) files instead of metadata. Journals can now be dynamically added as additional servers mount a file system.
 - quotas are now enabled and disabled by the mount option **quota=<on|off|account>**
 - **quiesce** is no longer needed on a cluster to replay journals for failure recovery
 - nanosecond timestamps are now supported
 - similar to ext3, GFS2 now supports the **data=ordered** mode
 - attribute settings **lsattr()** and **chattr()** are now supported via standard **ioctl()**
 - file system sizes above 16TB are now supported
 - GFS2 is a standard file system, and can be used in non-clustered configurations
- ✧ Installing Red Hat Enterprise Linux 5.1 on *HP BL860c* blade systems may hang during the IP information request stage. This issue manifests when you have to select **OK** twice on the **Configure TCP/IP** screen.

If this occurs, reboot and perform the installation with Ethernet autonegotiation disabled. To do this, use the parameter **ethtool="autoneg=off"** when booting from the installation media. Doing so does not affect the final installed system.

- ✧ The **nohide** export option is required on referral exports (i.e. exports that specify a referral server). This is because referral exports need to "cross over" a bound mount point. The **nohide** export option is required for such a "cross over" to be successful.

For more information on bound mounts, refer to **man exports 5**.

- ✧ This update includes the **lvm2** event monitoring daemon. If you are already using **lvm2** mirroring, perform the following steps to ensure that all monitoring functions are upgraded properly:
- ✧ Deactivate all mirrored **lvm2** logical volumes before updating. To do this, use the command **lvchange -a n <volume group or mirrored volume>**.
 - ✧ Stop the old **lvm2** event daemon using **killall -HUP dmeventd**.
 - ✧ Perform the upgrade of all related RPM packages, namely **device-mapper** and **lvm2**.
 - ✧ Reactivate all mirrored volumes again using **lvchange -a y <volume group or mirrored volume>**.
- ✧ *Rapid Virtualization Indexing (RVI)* is now supported on 64-bit, 32-bit, and 32-bit PAE kernels. However, RVI can only translate 32-bit guest virtual addresses on the 32-bit PAE hypervisor.

As such, if a guest is running a PAE kernel with more than 3840MB of RAM, a wrong address translation error will occur. This can crash the guest.

It is recommended that you use the 64-bit kernel if you intend to run guests with more than 4GB of physical RAM under RVI.

- ✦ Running 16 cores or more using *AMD Rev F* processors may result in system resets when performing fully-virtualized guest installations.
- ✦ If your system uses a *P600 SmartArray* controller, a machine check error may occur while running the virtualized kernel. When this occurs, **dom0** will reboot.

To prevent this, run the following shell script at the beginning of each boot:

```
#!/bin/bash
for x in $(lspci -d 103c:3220 | awk '{print $1}'); do
    val=$(setpci -s $x 40.b)
    val=$(( 0x$val | 1 ))
    setpci -s $x 40.b=$(printf '%x' $val)
done
```

- ✦ If you encounter a guest installation failure, it is recommended that you restart the **xend** daemon before attempting to install a new guest.
- ✦ Installing the **systemtap-runtime** package will result in a transaction check error if the **systemtap** package is already installed. Further, upgrading Red Hat Enterprise Linux 5 to 5.1 will also fail if the **systemtap** package is already installed.

As such, remove the **systemtap** package using the command **rpm -e systemtap-0.5.12-1.e15** before installing **systemtap-runtime** or performing an upgrade.

- ✦ Kernel modules such as **e1000** and **qla2xxx** cannot be unloaded if you are running the virtualized kernel.

As such, if you install any third-party drivers, it is recommended that you reboot the system.

- ✦ Paravirtualized guests cannot use the **parted** utility. To change disk partitioning on paravirtualized guests, use **parted** within **dom0** on the guest's disk; for example, **parted /var/lib/xen/images/pv_guest_disk_image.img**.
- ✦ When setting up NFSROOT, **BOOTPROTO** must be set as **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0**.

If your environment requires a different setting for **BOOTPROTO**, then temporarily set **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0** before initially creating the **initrd**. You can reset the original value of **BOOTPROTO** after the **initrd** is created.

- ✦ When attempting to create a fully-virtualized guest, the hypervisor may hang if you allocate too much of available RAM to the guest. In some cases, a kernel panic may occur.

Both events are caused by hypervisor memory shortage. To ensure that hypervisor overhead is accounted for each time you allocate memory to a guest, consider the following equation:

$$26\text{MB} + [(\text{number of virtual CPUs used by guest}) \times 17\text{MB}] = (\text{amount of memory to be left unallocated for each existent guest})$$

For example, if you have 2048MB of RAM on your system and you intend to use 4 virtual CPUs for only one guest, you should leave 94MB unallocated. If you intend to have two guests, both using 4 virtual CPUs, leave 188MB unallocated (and so on).

- ✦ Currently, live migration of fully virtualized guests is not supported on this architecture. The release notes included in the distribution incorrectly states that it is.

In addition, **kexec** and **kdump** is also not supported for virtualization in this architecture.

- ✦ Crash dumping through **kexec** and **kdump** may not function reliably with *HP Smart Array* controllers. Note that these controllers use the **cciss** driver.

A solution to this problem, which is likely to involve a firmware update to the controller, is being investigated.

- ✦ The *QLogic iSCSI Expansion Card* for the *IBM Bladecenter* provides both ethernet and iSCSI functions. Some parts on the card are shared by both functions. However, the current **qla3xxx** and **qla4xxx** drivers support ethernet and iSCSI functions individually. Both drivers do not support the use of ethernet and iSCSI functions simultaneously.

As such, using both ethernet and iSCSI functions simultaneously may hang the device. This could result in data loss and filesystem corruption on iSCSI devices, or network disruptions on other connected ethernet devices.

- ✦ When using **virt-manager** to add disks to an existing guest, duplicate entries may be created in the guest's `/etc/xen/<domain name>` configuration file. These duplicate entries will prevent the guest from booting.

As such, you should remove these duplicate entries.

- ✦ Repeatedly migrating a guest between two hosts may cause one host to panic. If a host is rebooted after migrating a guest out of the system and before migrating the same guest back, the panic will not occur.
- ✦ **sysreport** is being deprecated in favor of **sos**. To install **sos**, run **yum install sos**. This command installs **sos** and removes **sysreport**. It is recommended that you update any existing kickstart files to reflect this.

After installing **sos**, use the command **sosreport** to invoke it. Using the command **sysreport** generates a warning that **sysreport** is now deprecated; continuing will invoke **sosreport**.

If you need to use the **sysreport** tool specifically, use the command **sysreport .legacy** to invoke it.

For more information about **sosreport**, refer to **man sosreport** and **sosreport --help**.

3.1. Installation-Related Notes

This section includes information specific to **Anaconda** and the installation of Red Hat Enterprise Linux 5.1.

To upgrade an already-installed Red Hat Enterprise Linux 5, you can use Red Hat Network to update those packages that have changed.

You may also use **Anaconda** to perform a fresh installation of Red Hat Enterprise Linux 5.1 or to perform an upgrade from *the latest updated version* of Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5.1.

Anaconda can also be used to upgrade an already-installed Red Hat Enterprise Linux 5.

- ✦ Red Hat Enterprise Linux 5.1 for the 64-bit *Intel Itanium2* architecture includes runtime support for 32-bit applications through the use of Intel's IA-32 Execution Layer.

The IA-32 Execution Layer is provided on the **Supplementary CD** for the *Intel Itanium2* architecture. In addition, a set of 32-bit libraries and applications are provided on a separate 32-bit Compatibility Layer disc. The IA-32 Execution Layer and 32-bit compatibility packages together provide a runtime environment for 32-bit applications on the 64-bit native distribution.

To install the IA-32 Execution Layer and required 32-bit compatibility packages, follow these steps:

- ✦ Install Red Hat Enterprise Linux 5.1 for the *Intel Itanium2* Architecture.
- ✦ Insert the Red Hat Enterprise Linux 5.1 **Supplementary CD**, which contains the **ia32e1**

package.

- ✦ After the system has mounted the CD, change to the directory containing the **Supplementary** packages. For example:

```
cd /media/cdrom/Supplementary/
```

- ✦ Install the **ia32e1** package:

```
rpm -Uvh ia32e1-<version>.ia64.rpm
```

Replace *<version>* with the corresponding version of the **ia32e1** package to be installed.

- ✦ Eject the **Supplementary CD**:

```
eject /media/cdrom
```

- ✦ To verify the installation of the 32-bit compatibility layer and libraries after installation, check that the **/emul** directory has been created and that it contains files.

- ✦ To verify that the 32-bit compatibility mode is in effect, type the following in a shell prompt:

```
service ia32e1 status
```

- ✦ At this point you can install compatibility libraries by inserting the 32-bit **Compatibility Layer** disc. You may choose to install all of the packages available on the disc or choose the particular packages required in order to provide runtime support for your 32-bit applications.

- ✦ If you are copying the contents of the Red Hat Enterprise Linux 5 CD-ROMs (in preparation for a network-based installation, for example) be sure to copy the CD-ROMs for the operating system *only*. Do not copy the **Supplementary CD-ROM**, or any of the layered product CD-ROMs, as this will overwrite files necessary for **Anaconda**'s proper operation.

The contents of the **Supplementary CD-ROM** and other layered product CD-ROMs must be installed *after* Red Hat Enterprise Linux 5.1 has been installed.

- ✦ When installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, do *not* use the **kernel-xen** kernel. Using this kernel on fully virtualized guests can cause your system to hang.

If you are using an Installation Number when installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, be sure to deselect the **Virtualization** package group during the installation. The **Virtualization** package group option installs the **kernel-xen** kernel.

Note that paravirtualized guests are not affected by this issue. Paravirtualized guests always use the **kernel-xen** kernel.

- ✦ If you are using the Virtualized kernel when upgrading from Red Hat Enterprise Linux 5 to 5.1, you must reboot after completing the upgrade. You should then boot the system using the updated Virtualized kernel.

The hypervisors of Red Hat Enterprise Linux 5 and 5.1 are not ABI-compatible. If you do not boot the system after upgrading using the updated Virtualized kernel, the upgraded Virtualization RPMs will not match the running kernel.

3.1.1. Installation / Boot for iSCSI software initiator (open-iscsi)

iSCSI installation and boot was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview. This feature is now fully supported, with the restrictions described below.

This capability has three configurations depending on whether you are:

- ✦ using a hardware iSCSI initiator (such as the *QLogic qla4xxx*)
- ✦ using the **open-iscsi** initiator on a system with firmware boot support for iSCSI (such as iSCSI Boot Firmware, or a version of Open Firmware that features the iSCSI boot capability)
- ✦ using the **open-iscsi** initiator on a system with no firmware boot support for iSCSI

3.1.1.1. Using a Hardware iSCSI Initiator

If you are using a hardware iSCSI initiator, you can use the card's BIOS set-up utility to enter the IP address and other parameters required to obtain access to the remote storage. The logical units of the remote storage will be available in **Anaconda** as standard **sd** devices, with no additional set-up required.

If you need to determine the initiator's qualified name (IQN) in order to configure the remote storage server, follow these steps during installation:

1. Go to the installer page where you select which disk drives to use for the installation.
2. Click on **Advanced storage configuration**.
3. Click on **Add iSCSI target**.
4. The iSCSI IQN will be displayed on that screen.

3.1.1.2. Using open-iscsi On A System With Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with firmware boot support for iSCSI, use the firmware's setup utility to enter the IP address and other parameters needed to access the remote storage. Doing this configures the system to boot from the remote iSCSI storage.

Currently, Anaconda does not access the iSCSI information held by the firmware. Instead, you must manually enter the target IP address during installation. To do so, determine the IQN of the initiator using the procedure described above. Afterwards, on the same installer page where the initiator IQN is displayed, specify the IP address of the iSCSI target you wish to install to.

After manually specifying the IP address of the iSCSI target, the logical units on the iSCSI targets will be available for installation. The **initrd** created by **Anaconda** will now obtain the IQN and IP address of the iSCSI target.

If the IQN or IP address of the iSCSI target are changed in the future, enter the iBFT or Open Firmware set-up utility on each initiator and change the corresponding parameters. Afterwards, modify the **initrd** (stored in the iSCSI storage) for each initiator as follows:

1. Expand the **initrd** using **gunzip**.
2. Unpack it using **cpio -i**.
3. In the **init** file, search for the line containing the string **iscsistartup**. This line also contains the IQN and IP address of the iSCSI target; update this line with the new IQN and IP address.
4. Re-pack the **initrd** using **cpio -o**.
5. Re-compress the **initrd** using **gunzip**.

The ability of the operating system to obtain iSCSI information held by the Open Firmware / iBFT firmware is planned for a future release. Such an enhancement will remove the need to modify the **initrd** (stored in the iSCSI storage) for each initiator whenever the IP address or IQN of the iSCSI target is changed.

3.1.1.3. Using open-iscsi On A System With No Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with no firmware boot support for iSCSI, use a network boot capability (such as PXE/tftp). In this case, follow the same procedure described earlier to determine the initiator IQN and specify the IP address of the iSCSI target. Once completed, copy the **initrd** to the network boot server and set up the system for network boot.

Similarly, if the IP address or IQN of the iSCSI target is changed, the **initrd** should be modified accordingly as well. To do so, use the same procedure described earlier to modify the **initrd** for each initiator.

3.2. Feature Updates

EXT3 Enhancement

The maximum capacity of the EXT3 is now 16TB (increased from 8TB). This enhancement was originally included in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this update.

yum-security

It is now possible to limit **yum** to install security updates *only*. To do so, simply install the **yum-security** plugin and run the following command:

```
yum update --security
```

Restarting a Resource Independently

It is now possible to restart a resource in a cluster without interrupting its parent service. This can be configured in **/etc/cluster/cluster.conf** on a running node using the **__independent_subtree="1"** attribute to tag a resource as independent.

For example:

```
<service name="example">
  <fs name="One" __independent_subtree="1" ...>
    <nfsexport ...>
      <nfscclient .../>
    </nfsexport>
  </fs>
  <fs name="Two" ...>
    <nfsexport ...>
      <nfscclient .../>
    </nfsexport>
    <script name="Database" .../>
  </fs>
  <ip/>
</service>
```

Here, two file system resources are used: **One** and **Two**. If **One** fails, it is restarted without interrupting **Two**. If **Two** fails, all components (**One**, children of **One** and children of **Two**) are restarted. At no given time are **Two** and its children dependent on any resource provided by **One**.

Note that *Samba* requires a specific service structure, and as such it cannot be used in a service with independent subtrees. This is also true for several other resources, so use the **__independent_subtree="1"** attribute with caution.

Virtualization

The following Virtualization updates are also included in this release:

- ✦ *AMD-V* is now supported in this release. This enables live domain migration for fully virtualized guests.
- ✦ The in-kernel socket API is now expanded. This was done to fix a bug that occurs when running **sctp** between guests.
- ✦ Virtual networking is now part of **libvirt**, the virtualization library. **libvirt** has a set of commands that sets up a virtual NAT/router and private network for all local guests on a machine. This is especially useful for guests that do not need to be routable from the outside. It is also useful for developers who use Virtualization on laptops.

Note that the virtual networking capability adds a dependency on **dnsmasq**, which handles **dhcp** for the virtual network.

For more information about **libvirt**, refer to <http://libvirt.org>.

- ✦ **libvirt** can now manage inactive virtual machines. **libvirt** does this by defining and undefining domains without stopping or starting them. This functionality is similar to the **virsh define** and **virsh undefine** commands.

This enhancement allows the Red Hat Virtual Machine Manager to display all available guests. This allows you to start these guests directly from the GUI.

- ✦ Installing the **kernel-xen** package no longer leads to the creation of incorrect / incomplete **elilo.conf** entries.
- ✦ DomU no longer panics when you perform a save/restore numerous times after a kernel compilation.
- ✦ The **xm create** command now has a graphical equivalent in **virt-manager**.
- ✦ *Nested Paging* (NP) is now supported. This feature reduces the complexity of memory management in virtualized environments. In addition, NP also reduces CPU utilization in memory-intensive guests.

At present, NP is not enabled by default. If your system supports NP, it is recommended that you enable NP by booting the hypervisor with the parameter **hap=1**.

Virtualization is fully supported in this update. This feature was originally introduced as a Technology Preview in Red Hat Enterprise Linux 5.

Note, however, that installing Red Hat Enterprise Linux 5 *on a guest* will result in a guest freeze and host error, even if the host runs Red Hat Enterprise Linux 5.1. As such, Red Hat Enterprise Linux 5 remains unsupported as a guest in this architecture. Red Hat Enterprise Linux guests must be of version 5.1 or later.

Shared Page Tables

Shared page tables are now supported for **hugetlb** memory. This enables page table entries to be shared among multiple processes.

Sharing page table entries among multiple processes consumes less cache space. This improves application cache hit ratio, resulting in better application performance.

Installing to dm-multipath Devices

Anaconda now has the capability to detect, create, and install to *dm-multipath* devices. To enable this feature, add the parameter **mpath** to the kernel boot line.

This feature was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this release.

Note that **dm-multipath** also features inbox support for the *Dell MD3000*. However, multiple nodes that use **dm-multipath** to access the MD3000 cannot perform immediate failback.

Further, it is recommended that you use the **Custom Partitioning** interface in **Anaconda** if your system has both multipath and non-multipath devices. Using **Automatic Partitioning** in such cases may create both types of devices in the same logical volume groups.

At present, the following restrictions apply to this feature:

- ✦ If there is only one path to the boot Logical Unit Number (LUN), **Anaconda** installs to the SCSI device even if **mpath** is specified. Even after you enable multiple paths to the boot LUN and recreate the **initrd**, the operating system will boot from the SCSI device instead of the **dm-multipath** device.

However, if there are multiple paths to the boot LUN to begin with, **Anaconda** will correctly install to the corresponding **dm-multipath** device after **mpath** is specified in the kernel boot line.

- ✦ By default, **user_friendly_names** is set to **yes** in **multipath.conf**. This is a required setting in the support implementation of the **dm-multipath** root device. As such, setting **user_friendly_names** to **no** and recreating the **initrd** will result in a boot failure with the following error:

```
Checking filesystems
fsck.ext3: No such file or directory while trying to open
/dev/mapper/mpath0p1
```

Booting from Storage Area Network (SAN)

The ability to boot from a SAN disk device is now supported. In this case, SAN refers to a Fibre Channel or iSCSI interface. This capability also features support for system-to-storage connection through multiple paths using **dm-multipath**.

In configurations that use multiple host bus adapters (HBA), you may need to set the system BIOS to boot from another adapter if all paths through the current adapter fail.

Driver Update Program

The Driver Update Program (DUP) was designed to allow third-party vendors (such as OEMs) to add their own device drivers and other Linux Kernel Modules to Red Hat Enterprise Linux 5 systems using regular RPM packages as the distribution containers.

Red Hat Enterprise Linux 5.1 applies several updates to the DUP, most notably:

- ✦ install-time Driver Update RPMs through Driver Update Disks is now supported
- ✦ bootpath Driver Updates affecting the system bootpath are now supported
- ✦ support for third-party packaging of *Advanced Linux Sound Architecture* (ALSA) is now deprecated

Further, various updates were applied to the approved kernel ABI symbol whitelists. These whitelists are used by packaging drivers to determine which symbols and data structures provided

by the kernel can be used in a third-party driver.

For more information, refer to <http://www.kerneldrivers.org/RedHatKernelModulePackages>.

3.3. Driver Updates

General Driver Updates

- ✦ acpi: updated **ibm_acpi** module to address several ACPI and docking station issues with Lenovo laptops.
- ✦ ipmi: Polling **kthread** no longer runs when hardware interrupt is assigned to a Baseboard Management Controller.
- ✦ sata: **SATA/SAS** upgraded to version 2.6.22-rc3.
- ✦ **openib** and **openmpi**: upgraded to OFED (OpenFabrics Enterprise Distribution) version 1.2.
- ✦ **powernow-k8**: upgraded to version 2.0.0 to fully support *Greyhound*.
- ✦ **xinput**: added to enable full RSA support.
- ✦ **aic94xx**: upgraded to version 1.0.2-1, in line with an upgrade of the embedded sequencer firmware to v17. These updates apply the following changes:
 - fixed **ascb** race condition on platforms with expanders
 - added **REQ_TASK_ABORT** and **DEVICE_RESET** handlers
 - physical ports are now cleaned up properly after a discovery error
 - **phys** can now be enabled and disabled through **sysfs**
 - extended use of DDB lock to prevent race condition of DDB

Audio

ALSA updated to version 1.0.14. This update applies the following fixes:

- ✦ fixed noise problem on the IBM Taroko (M50)
- ✦ *Realtek ALC861* is now supported
- ✦ fixed a muting problem on xw8600 and xw6600
- ✦ *ADI 1884 Audio* is now supported
- ✦ fixed an audio configuration problem on xw4600

PCI

- ✦ added function calls to set maximum read request size for PCIX and PCI-Express
- ✦ *IBM System P* machines now support PCI-Express hotplugging
- ✦ added necessary drivers and PCI ID to support SB600 SMBus

Network

- ✦ **e1000** driver: updated to version 7.3.20-k2 to support I/OAT-enabled chipsets.

- **bnx2** driver: updated to version 1.5.11 to support 5709 hardware.
- **B44** ethernet driver: backported from upstream version 2.6.22-rc4 to apply the following changes:
 - several **endianness** fixes were made
 - **DMA_30BIT_MASK** constant is now used
 - **skb_copy_from_linear_data_offset()** is now used
 - **spin_lock_irqsave()** now features safer interrupt disabling
 - simple error checking is performed during resume
 - several fixes to multicast were applied
 - chip reset now takes longer than previously anticipated
- *Marvell* **sky2** driver: updated to version 1.14 to fix a bug that causes a kernel panic if the **ifup/ifdown** commands are executed repeatedly.
- **forcedeth-0.60** driver: now included in this release. This applies several critical bug fixes for customers using *NVIDIA's* MCP55 motherboard chipsets and corresponding onboard NIC.
- **ixgb** driver: updated to the latest upstream version (1.0.126).
- **netxen_nic** driver: version 3.4.2-2 added to enable support for *NetXen 10GbE* network cards.
- *Chelsio 10G* Ethernet Network Controller is now supported.
- added support for PCI error recovery to the **s2io** device.
- Broadcom wireless ethernet driver now supports PCI ID for *nx6325* card.
- fixed a bug that caused an **ASSERTION FAILED** error when attempting to start a *BCM4306* via **ifup**.
- **ixgb** driver: updated to add EEH PCI error recovery support for the Intel 10-gigabit ethernet card. For more information, refer to **/usr/share/doc/kernel-doc-<kernel version>/Documentation/pci-error-recovery.txt**.
- **qla3xxx** driver: re-enabled and updated to version 2.03.00-k3 to provide networking support for *QLogic* iSCSI adapters without using iSCSI.
- **qla2xxx**: driver upgraded to version 8.01.07-k6. This applies several changes, most notably:
 - iIDMA is now supported
 - the following Fibre Channel attributes are now supported:
 - symbolic nodename
 - system hostname
 - fabric name
 - host port state
 - trace-control async events are no longer logged

- reset handling logic has been corrected
- MSI-X is now supported
- IRQ-0 assignments are now handled per system
- NVRAM updates immediately go into effect

IPMI

This release includes an update of the **IPMI** driver set to include the upstream changes as of version 2.6.21.3, with some patches included from 2.6.22-rc-4. This update features the following changes (among others):

- fixed uninitialized data bug in **ipmi_si_intf**
- **kipmid** is no longer started if another driver supports interrupts
- users are now allowed to override the kernel daemon **enable** through **force_kipmid**
- per-channel command registration is now supported
- **MAX_IPMI_INTERFACES** is no longer used
- hot system interface removal is now supported
- added a Maintenance Mode to support firmware updates
- added **poweroff** support for the **pigeonpoint** IPMC
- BT subdriver can now survive long timeouts
- added **pci_remove** handling for proper cleanup on a hot remove

For information about new module parameters, refer to **/usr/share/doc/kernel-doc-*<kernel version>*/Documentation/IPMI.txt**.

SCSI

- ported SCSI blacklist from Red Hat Enterprise Linux 4 to this release.
- added PCI IDs for **aic79xx** driver.
- **aacraid** driver: updated to version 1.1.5-2437 to support *PRIMERGY RX800S2* and *RX800S3*.
- **megaraid_sas** driver: updated to version 3.10. This update defines the entry point for **bios_param**, adds an IOCTL memory pool, and applies several minor bug fixes.
- *Emulex lpfc* driver: updated to version 8.1.10.9. This update applies several changes, most notably:
 - fixed **host_lock** management in the **ioctl** paths
 - the *AMD* chipset is now automatically detected, and reduced the DMA length to 1024 bytes
 - nodes are no longer removed during **dev_loss_tmo** if discovery is active
 - 8GB link speeds are now enabled

- ✦ **qla4xxx** driver updated to apply the following changes:
 - added support for IPV6, QLE406x and **ioct1** module
 - fixed a **mutex_lock** bug that could cause lockups
 - resolved lockup issues of **qla4xxx** and **qla3xxx** when attempting to load/unload either interface
- ✦ **mpt fusion** drivers: updated to version 3.04.04. This update applies several changes, most notably:
 - fixed several error handling bugs
 - **mptsas** now serializes target resets
 - **mptsas** and **mptfc** now support LUNs and targets greater than 255
 - fixed an LSI **mptspi** driver regression that resulted in extremely slow DVD driver performance
 - when an LSI SCSI device returns a **BUSY** status, I/O attempts no longer fail after several retries
 - RAID arrays are no longer unavailable after auto-rebuild
- ✦ **arcmsr** driver: included to provide support for *Areca* RAID controllers.
- ✦ **3w-9xxx** module: updated to correctly support 3ware 9650SE.

3.4. Kernel-Related Updates

- ✦ The CIFS client has been updated to version 1.48aRH. This is based upon the 1.48a release, with patches that apply the following changes:
 - the mount option **sec=none** results in an anonymous mount
 - CIFS now honors the **umask** when POSIX extensions are enabled
 - fixed **sec=** mount options that request packet signing

Note that for users of the *EMC Celerra* product (NAS Code 5.5.26.x and below), the CIFS client hangs when accessing shares on EMC NAS. This issue is characterized by the following kernel messages:

```
kernel: CIFS VFS: server not responding
kernel: CIFS VFS: No response for cmd 162 mid 380
kernel: CIFS VFS: RFC1001 size 135 bigger than SMB for Mid=384
```

After a CIFS mount, it becomes impossible to read/write any file on it and any application that attempts an I/O on the mountpoint will hang. To resolve this issue, upgrade to NAS Code 5.5.27.5 or later (use EMC Primus case number emc165978).

- ✦ **MODULE_FIRMWARE** tags are now supported.
- ✦ *ICH9* controllers are now supported.
- ✦ *Greyhound* processors are now supported in **CPUID** calls.
- ✦ The **getcpu** system call is now supported.

- ✦ **Oprofile** now supports new *Greyhound* performance counter events.
- ✦ *Directed DIAG* is now supported to improve *z/VM* utilization.
- ✦ The *Intel* graphics chipset is now supported through the **DRM** kernel module. Further, the DRM API has been upgraded to version 1.3 to support direct rendering.
- ✦ Updates to **ACPI** power management have improved S3 suspend-to-RAM and S4 hibernate.

3.5. Other Updates

- ✦ **gaim** is now called **pidgin**.
- ✦ The certified memory limit for this architecture is now 1TB (increased from 256GB).
- ✦ Implicit active-active failover using **dm-multipath** on *EMC Clariion* storage is now supported.
- ✦ The Chinese font *Zysong* is no longer installed as part of the **fonts-chinese** package. *Zysong* is now packaged separately as **fonts-chinese-zysong**. The **fonts-chinese-zysong** package is located in the **Supplementary CD**.

Note that the **fonts-chinese-zysong** package is needed to support the Chinese National Standard GB18030.

- ✦ The Challenge Handshake Authentication Protocol (CHAP) username and password have a character limit of 256 each.
- ✦ **pump** is deprecated in this update. As such, configuring your network interface through **netconfig** may result in broken **ifcfg** scripts.

To properly configure your network interface, use **system-config-network** instead. Installing the updated **system-config-network** package removes **netconfig**.

- ✦ **rpm --aid** is no longer supported. It is recommended that you use **yum** when updating and installing packages.

3.6. Technology Previews

Technology Preview features are currently *not* supported under Red Hat Enterprise Linux 5.1 subscription services, may not be functionally complete, and are generally not suitable for production use. However, these features are included as a customer convenience and to provide the feature with wider exposure.

Customers may find these features useful in a non-production environment. Customers are also free to provide feedback and functionality suggestions for a Technology Preview feature before it becomes fully supported. Erratas will be provided for high-severity security issues.

During the development of a Technology Preview feature, additional components may become available to the public for testing. It is the intention of Red Hat to fully support Technology Preview features in a future release.

Stateless Linux

Stateless Linux is a new way of thinking about how a system should be run and managed, designed to simplify provisioning and management of large numbers of systems by making them easily replaceable. This is accomplished primarily by establishing prepared system images which get replicated and managed across a large number of stateless systems, running the operating system in a read-only manner (refer to **/etc/sysconfig/readonly-root** for more details).

In its current state of development, the Stateless features are subsets of the intended goals. As such, the capability remains as Technology Preview.

The following is a list of the initial capabilities included in Red Hat Enterprise Linux 5:

- running a stateless image over NFS
- running a stateless image via loopback over NFS
- running on iSCSI

It is highly recommended that those interested in testing stateless code read the HOWTO at <http://fedoraproject.org/wiki/StatelessLinuxHOWTO> and join stateless-list@redhat.com.

The enabling infrastructure pieces for Stateless Linux were originally introduced in Red Hat Enterprise Linux 5.

AIGLX

AIGLX is a Technology Preview feature of the otherwise fully supported X server. It aims to enable GL-accelerated effects on a standard desktop. The project consists of the following:

- a lightly modified X server
- an updated Mesa package that adds new protocol support

By installing these components, you can have GL-accelerated effects on your desktop with very few changes, as well as the ability to enable and disable them at will without replacing your X server. AIGLX also enables remote GLX applications to take advantage of hardware GLX acceleration.

FS-Cache

FS-Cache is a local caching facility for remote file systems that allows users to cache NFS data on a locally mounted disk. To set up the FS-Cache facility, install the **cachefilesd** RPM and refer to the instructions in `/usr/share/doc/cachefilesd-<version>/README`.

Replace `<version>` with the corresponding version of the **cachefilesd** package installed.

Systemtap

Systemtap provides free software (GPL) infrastructure to simplify the gathering of information about the running Linux system. This assists the diagnosis of a performance or functional problem. With the help of **systemtap**, developers no longer need to go through the tedious and disruptive instrument, recompile, install, and reboot sequence that may be otherwise required to collect data.

iSCSI Target

The Linux target (`tgt`) framework allows a system to serve block-level SCSI storage to other systems that have a SCSI initiator. This capability is being initially deployed as a Linux iSCSI target, serving storage over a network to any iSCSI initiator.

To set up the iSCSI target, install the **scsi-target-utils** RPM and refer to the instructions in:

- `/usr/share/doc/scsi-target-utils-<version>/README`
- `/usr/share/doc/scsi-target-utils-<version>/README.iscsi`

Replace `<version>` with the corresponding version of the package installed.

For more information, refer to `man tgtadm`.

FireWire

The **firewire-sbp2** module is included in this update as a Technology Preview. This module enables connectivity with FireWire storage devices and scanners.

At present, FireWire does not support the following:

- ✦ IPv4
- ✦ *pcilynx* host controllers
- ✦ multi-LUN storage devices
- ✦ non-exclusive access to storage devices

In addition, the following issues still exist in this version of FireWire:

- ✦ a memory leak in the **SBP2** driver may cause the machine to become unresponsive.
- ✦ a code in this version does not work properly in big-endian machines. This could lead to unexpected behavior in PowerPC.

3.7. Resolved Issues

- ✦ In multi-boot systems, **parted** now preserves the starting sector of the first primary partition where Windows Vista™ is installed. As such, when setting up a multi-boot system with both Red Hat Enterprise Linux 5.1 and Windows Vista™, the latter is no longer rendered unbootable.
- ✦ **rmmod xenet** no longer causes **domU** to crash.
- ✦ 4-socket AMD *Sun Blade X8400 Server Module* systems that do not have memory configured in **node 0** no longer panic during boot.
- ✦ **conga** and **luci** can now be used to create and configure failover domains.
- ✦ When installing the **Cluster Storage** group through **yum**, the transaction no longer fails.
- ✦ During installation, incorrect SELinux contexts are no longer assigned to **/var/log/faillog** and **/var/log/tallylog**.
- ✦ Installing Red Hat Enterprise Linux 5.1 using split installation media (for example, CD or NFSISO) no longer causes an error in the installation of **amanda-server**.
- ✦ EDAC now reports the correct amount of memory on the latest k8 processors.
- ✦ Logging in remotely to a Gnome desktop via **gdm** no longer causes the login screen to hang.
- ✦ A bug in **autofs** that prevented multi-mounts from working properly is now fixed.
- ✦ Several patches to **utrace** apply the following fixes:
 - fixed a bug that causes a crash in race condition when using **ptrace**
 - fixed a regression that prevented some **wait4** calls from waking up when a child exited under certain circumstances
 - fixed a regression that sometimes prevented **SIGKILL** from terminating a process. This occurred if **ptrace** was performed on a process under certain circumstances.
- ✦ A RealTime Clock (RTC) bug that prevented alarms and periodic RTC interrupts from working properly is

now fixed.

3.8. Known Issues

- ✦ The first time the **Release Notes** button is clicked in **Anaconda**, a delay occurs while the window renders the Release Notes. During this delay, a seemingly empty list appears in the window. The rendering normally completes quickly, so most users may not notice this.

This delay is mostly due to the fact that the package installation phase is the most CPU-intensive phase of installation.

- ✦ Host bus adapters that use the MegaRAID driver must be set to operate in "Mass Storage" emulation mode, not in "I2O" emulation mode. To do this, perform the following steps:
 - ✦ Enter the MegaRAID **BIOS Set Up Utility**.
 - ✦ Enter the **Adapter settings menu**.
 - ✦ Under **Other Adapter Options**, select **Emulation** and set it to **Mass Storage**.

If the adapter is incorrectly set to "I2O" emulation, the system will attempt to load the i2o driver. This will fail, and prevent the proper driver from being loaded.

Previous Red Hat Enterprise Linux releases generally do not attempt to load the I2O driver before the MegaRAID driver. Regardless of this, the hardware should always be set to "Mass Storage" emulation mode when used with Linux.

- ✦ Laptops equipped with the *Cisco Aironet MPI-350* wireless may hang trying to get a DHCP address during any network-based installation using the wired ethernet port.

To work around this, use local media for your installation. Alternatively, you can disable the wireless card in the laptop BIOS prior to installation (you can re-enable the wireless card after completing the installation).

- ✦ Currently, **system-config-kickstart** does not support package selection and deselection. When using **system-config-kickstart**, the **Package Selection** option indicates that it is disabled. This is because **system-config-kickstart** uses **yum** to gather group information, but is unable to configure **yum** to connect to Red Hat Network.

At present, you need to update package sections in your kickstart files manually. When using **system-config-kickstart** to open a kickstart file, it will preserve all package information in it and write it back out when you save.

- ✦ Boot-time logging to **/var/log/boot.log** is not available in this update of Red Hat Enterprise Linux 5. An equivalent functionality will be added in a future update.
- ✦ When upgrading from Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5, the Deployment Guide is not automatically installed. You need to use **pirut** to manually install it after completing the upgrade.
- ✦ The system may not successfully reboot into a **kexec/kdump** kernel if X is running and using a driver other than *vesa*. This problem only exists with *ATI Rage XL* graphics chipsets.

If X is running on a system equipped with *ATI Rage XL*, ensure that it is using the *vesa* driver in order to successfully reboot into a **kexec/kdump** kernel.

- ✦ When using Red Hat Enterprise Linux 5 on a machine with an *nVidia CK804* chipset installed, the following kernel messages may appear:

```
kernel: assign_interrupt_mode Found MSI capability
kernel: pcie_portdrv_probe->Dev[005d:10de] has invalid IRQ. Check vendor BIOS
```

These messages indicate that certain PCI-E ports are not requesting IRQs. Further, these messages do not, in any way, affect the operation of the machine.

- ✦ Using **yum** to install packages from the **32-bit Compatibility Layer** disc may fail. If it does, it is because the Red Hat package signing key was not imported into the RPM database. This happens if you have not yet connected to Red Hat Network and obtained updates. To import the key manually, run the following command as root:

```
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-release
```

Once the Red Hat GPG key is imported, you may now use **yum** to install packages from the **32-bit Compatibility Layer** disc.

Note that when installing from this disc, it is advisable to use **yum** instead of **rpm** to ensure that base OS dependencies are addressed during installation.

- ✦ Removable storage devices (such as CDs and DVDs) do not automatically mount when you are logged in as root. As such, you will need to manually mount the device through the graphical file manager.

Alternatively, you can run the following command to mount a device to **/media**:

```
mount /dev/<device name> /media
```

- ✦ The *IBM System z* does not provide a traditional Unix-style physical console. As such, Red Hat Enterprise Linux 5 for the *IBM System z* does not support the *firstboot* functionality during initial program load.

To properly initialize setup for Red Hat Enterprise Linux 5 on the *IBM System z*, run the following commands after installation:

- **/usr/bin/setup** — provided by the **setuptools** package.
- **/usr/bin/rhn_register** — provided by the **rhn-setup** package.
- ✦ When upgrading from Red Hat Enterprise Linux 5 to Red Hat Enterprise Linux 5.1 via Red Hat Network, **yum** may not prompt you to import the redhat-beta key. As such, it is advised that you import the redhat-beta key manually prior to upgrading. To do this, run the following command:

```
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
```

- ✦ When a LUN is deleted on a configured filer, the change is not reflected on the host. In such cases, **lvm** commands will hang indefinitely when **dm-multipath** is used, as the LUN has now become *stale*.

To work around this, delete all device and **mpath** link entries in **/etc/lvm/.cache** specific to the stale LUN.

To find out what these entries are, run the following command:

```
ls -l /dev/mpath | grep <stale LUN>
```

For example, if **<stale LUN>** is 3600d0230003414f30000203a7bc41a00, the following results may appear:

```
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00 -
> ../dm-4
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00p1
-> ../dm-5
```

This means that 3600d0230003414f30000203a7bc41a00 is mapped to two **mpath** links: **dm-4** and **dm-5**.

As such, the following lines should be deleted from **/etc/lvm/.cache**:

```
/dev/dm-4
/dev/dm-5
/dev/mapper/3600d0230003414f30000203a7bc41a00
/dev/mapper/3600d0230003414f30000203a7bc41a00p1
/dev/mpath/3600d0230003414f30000203a7bc41a00
/dev/mpath/3600d0230003414f30000203a7bc41a00p1
```

- ✱ When attempting to create a fully virtualized Windows™ guest from a CD or DVD, the second stage of the guest install might not continue upon reboot.

To work around this, edit **/etc/xen/<name of guest machine>** by properly appending an entry for the CD / DVD device.

If an installation to a simple file is used as a virtual device, the **disk** line of **/etc/xen/<name of guest machine>** will read like the following:

```
disk = [ 'file:/PATH-OF-SIMPLE-FILE,hda,w' ]
```

A DVD-ROM device located on the host as **/dev/dvd** can be made available to stage 2 of the installation as **hdc** by appending an entry like **'phy:/dev/dvd,hdc:cdrom,r'**. As such, the disk line should now read as follows:

```
disk = [ 'file:/opt/win2003-sp1-20061107,hda,w',
'phy:/dev/dvd,hdc:cdrom,r' ]
```

The precise device path to use may vary depending on your hardware.

- ✱ If the **sctp** module is not added to the kernel, running **netstat** with the **-A inet** or **-A inet6** option abnormally terminates with the following message:

```
netstat: no support for `AF_INET (sctp)' on this system.
```

To avoid this, install the **sctp** kernel module.

- ✱ Current kernels do not assert *Data Terminal Ready* (DTR) signals before printing to serial ports during boot time. DTR assertion is required by some devices; as a result, kernel boot messages are not printed to serial consoles on such devices.
- ✱ The *AMD 8132* and *HP BroadCom HT100* used on some platforms (such as the *HP dc7700*) do not support **MMCONFIG** cycles. If your system uses either chipset, your PCI configuration should use the legacy *PortIO CF8/CFC* mechanism. To configure this, boot the system with the kernel parameter **-pci nommconf** during installation and add **pci=nommconf** to GRUB after rebooting.

Further, the *AMD 8132* chipset does not support Message Signaled Interrupts (MSI). If your system uses this chipset, you should also disable MSI. To do this, use the kernel parameter **-pci noms** during installation and add **pci=noms** to GRUB after rebooting.

However, if your specific platform is already blacklisted by the kernel, your system does not require the aforementioned **pci** kernel parameters. The following HP platforms are already blacklisted by the kernel:

- *DL585g2*
 - *dc7500*
 - *xw9300*
 - *xw9400*
- ✦ The **Virtual Machine Manager (virt-manager)** included in this release does not allow users to specify additional boot arguments to the paravirtualized guest installer. This is true even when such arguments are required to install certain types of paravirtualized guests on specific types of hardware.

This issue will be addressed in a future release of **virt-manager**. To specify arbitrary kernel arguments in installing paravirtualized guests from the command line, use **virt-install**.

- ✦ By default, the *Itanium dom0* virtualized kernel boots up with 512MB RAM and one CPU. You can override this on the hypervisor command line using the **dom0_mem** and **dom0_max_vcpus** parameters. For example, you can set **dom0** to boot with 4GB of RAM and 8 CPUs using the parameters **dom0_mem=4G dom0_max_vcpus=8**.

For Red Hat Enterprise Linux 5, the maximum supported value for **dom0_mem** is 256G. The maximum supported value for **dom0_max_vcpus** is 32.

However, setting **dom0** to boot with the actual amount of RAM the system has may result in a kernel panic. This is because there is likely to be slightly less than the full RAM actually available for **dom0** to use. At present, the hypervisor is unable to handle this situation gracefully.

As such, if the system has *x* amount of RAM, it is not advisable to use **dom0_mem=x**.

- ✦ On some *Itanium* systems configured for console output to VGA, the **dom0** virtualized kernel may fail to boot. This is because the virtualized kernel failed to properly detect the default console device from the *Extensible Firmware Interface* (EFI) settings.

When this occurs, you can work around this by adding the boot parameter **console=tty** to the kernel boot options in **/boot/efi/elilo.conf**.

- ✦ On some *Itanium* systems, X may fail to start on the VGA console. This is because the system memory layout does not prevent X from attempting to utilize memory regions incompatible to its needs. This can cause a *Machine Check Abort* (MCA), while in some cases X will simply fail with an X log entry of **xf86MapDomainMem(): mmap() failure**.

It is recommended that you boot affected systems in runlevel 3, and any necessary X applications should be run within a VNC X server or over X11-forwarding on a remote host. Both bare-metal and virtualized kernels are affected by this issue.

This issue will be resolved in an upcoming minor update of Red Hat Enterprise Linux 5. Testing results confirm that the issue should only manifest on *Itanium* systems with more than 128 PCI devices. This behavior is consistent with X on Red Hat Enterprise Linux 5.

- ✦ With the default **dm-multipath** configuration, *Netapp* devices may take several minutes to complete failback after a previously failed path is restored. To resolve this problem, add the following *Netapp* device configuration to the **devices** section of the **multipath.conf** file:

```
devices {
    device {
```

```

        vendor                "NETAPP"
        product                "LUN"
        getuid_callout         "/sbin/scsi_id -g -u -s
/block/%n"
        prio_callout          "/sbin/mpath_prio_netapp
/dev/%n"
        features               "1 queue_if_no_path"
        hardware_handler       "0"
        path_grouping_policy   group_by_prio
        failback               immediate
        rr_weight              uniform
        rr_min_io              128
        path_checker           directio
    }

```

4. Release Notes for ppc

- ✦ This release includes WBEMSMT, a suite of web-based applications that provides a user-friendly management interface for Samba and DNS. For more information about WBEMSMT, refer to <http://sblim.wiki.sourceforge.net/>.
- ✦ Upgrading **pm-utils** from a Red Hat Enterprise Linux 5.1 Beta version of **pm-utils** will fail, resulting in the following error:

```
error: unpacking of archive failed on file /etc/pm/sleep.d: cpio: rename
```

To prevent this from occurring, delete the **/etc/pm/sleep.d/** directory prior to upgrading. If **/etc/pm/sleep.d** contains any files, you can move those files to **/etc/pm/hooks/**.

- ✦ Hardware testing for the *Mellanox MT25204* has revealed that an internal error occurs under certain high-load conditions. When the **ib_mthca** driver reports a catastrophic error on this hardware, it is usually related to an insufficient completion queue depth relative to the number of outstanding work requests generated by the user application.

Although the driver will reset the hardware and recover from such an event, all existing connections are lost at the time of the error. This generally results in a segmentation fault in the user application. Further, if **opensm** is running at the time the error occurs, then it will have to be manually restarted in order to resume proper operation.

- ✦ Driver Update Disks now support Red Hat's Driver Update Program RPM-based packaging. If a driver disk uses the newer format, it is possible to include RPM packaged drivers that will be preserved across system updates.

Please note that driver RPMs are copied only for the default kernel variant that is in use on the installed system. For example, installing a driver RPM on a system running the virtualized kernel will install the driver *only* for the virtualized kernel. The driver RPM will not be installed for any other installed kernel variant in the system.

As such, on a system that has multiple kernel variants installed, you will need to boot the system on each kernel variant and install the driver RPM. For example, if your system has both bare-metal and virtualized kernels installed, boot your system using the bare-metal kernel and install the driver RPM. Then, reboot the system into the virtualized kernel and install the driver RPM again.

- ✦ During the lifetime of **dom0**, you cannot create guests (i.e. **xm create**) more than 32,750 times. For example, if you have guests rebooting in a loop, **dom0** will fail to boot any guest after rebooting guests a total of 32,750 times.

If this event occurs, restart **dom0**

- ✦ The Red Hat Enterprise Linux 5.1 NFS server now supports referral exports. These exports are based on extensions to the NFSv4 protocol. Any NFS clients that do not support these extensions (namely, Red Hat Enterprise Linux releases prior to 5.1) will not be able to access these exports.

As such, if an NFS client does not support these exports, any attempt to access these exports may fail with an I/O error. In some cases, depending on the client implementation, the failure may be more severe, including the possibility of a system crash.

It is important that you take precautions to ensure that NFS referral exports are not accessed by clients that do not support them.

- ✦ *GFS2* is an incremental advancement of GFS. This update applies several significant improvements that require a change to the on-disk file system format. GFS file systems can be converted to GFS2 using the utility **gfs2_convert**, which updates the metadata of a GFS file system accordingly.

While much improved since its introduction in Red Hat Enterprise Linux 5, GFS2 remains a Technology Preview. The release notes included in the distribution incorrectly states that GFS2 is fully supported. Nevertheless, benchmark tests indicate faster performance on the following:

- heavy usage in a single directory and faster directory scans (Postmark benchmark)
- synchronous I/O operations (**fstest** benchmark test indicates improved performance for messaging applications like TIBCO)
- cached reads, as there is no longer any locking overhead
- direct I/O to preallocated files
- NFS file handle lookups
- **df**, as allocation information is now cached

In addition, GFS2 also features the following changes:

- journals are now plain (though hidden) files instead of metadata. Journals can now be dynamically added as additional servers mount a file system.
 - quotas are now enabled and disabled by the mount option **quota=<on|off|account>**
 - **quiesce** is no longer needed on a cluster to replay journals for failure recovery
 - nanosecond timestamps are now supported
 - similar to ext3, GFS2 now supports the **data=ordered** mode
 - attribute settings **lsattr()** and **chattr()** are now supported via standard **ioctl()**
 - file system sizes above 16TB are now supported
 - GFS2 is a standard file system, and can be used in non-clustered configurations
- ✦ Installing Red Hat Enterprise Linux 5.1 on *HP BL860c* blade systems may hang during the IP information request stage. This issue manifests when you have to select **OK** twice on the **Configure TCP/IP** screen.

If this occurs, reboot and perform the installation with Ethernet autonegotiation disabled. To do this, use the parameter **ethtool="autoneg=off"** when booting from the installation media. Doing so does not affect the final installed system.

- ✦ The **nohide** export option is required on referral exports (i.e. exports that specify a referral server). This is because referral exports need to "cross over" a bound mount point. The **nohide** export option is required for such a "cross over" to be successful.

For more information on bound mounts, refer to **man exports 5**.

- ✦ This update includes the **lvm2** event monitoring daemon. If you are already using **lvm2** mirroring, perform the following steps to ensure that all monitoring functions are upgraded properly:
 - ✦ Deactivate all mirrored **lvm2** logical volumes before updating. To do this, use the command **lvchange -a n <volume group or mirrored volume>**.
 - ✦ Stop the old **lvm2** event daemon using **killall -HUP dmeventd**.
 - ✦ Perform the upgrade of all related RPM packages, namely **device-mapper** and **lvm2**.
 - ✦ Reactivate all mirrored volumes again using **lvchange -a y <volume group or mirrored volume>**.
- ✦ *Rapid Virtualization Indexing (RVI)* is now supported on 64-bit, 32-bit, and 32-bit PAE kernels. However, RVI can only translate 32-bit guest virtual addresses on the 32-bit PAE hypervisor.

As such, if a guest is running a PAE kernel with more than 3840MB of RAM, a wrong address translation error will occur. This can crash the guest.

It is recommended that you use the 64-bit kernel if you intend to run guests with more than 4GB of physical RAM under RVI.

- ✦ Running 16 cores or more using *AMD Rev F* processors may result in system resets when performing fully-virtualized guest installations.
- ✦ Installing the **systemtap-runtime** package will result in a transaction check error if the **systemtap** package is already installed. Further, upgrading Red Hat Enterprise Linux 5 to 5.1 will also fail if the **systemtap** package is already installed.

As such, remove the **systemtap** package using the command **rpm -e systemtap-0.5.12-1.e15** before installing **systemtap-runtime** or performing an upgrade.

- ✦ When setting up NFSROOT, **BOOTPROTO** must be set as **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0**.

If your environment requires a different setting for **BOOTPROTO**, then temporarily set **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0** before initially creating the **initrd**. You can reset the original value of **BOOTPROTO** after the **initrd** is created.

- ✦ **nfsroot** is fully supported in this update. This allows users to run Red Hat Enterprise Linux 5.1 with its root file system (/) mounted via NFS.

nfsroot was originally introduced in Red Hat Enterprise Linux 5 as a subset of the Technology Preview feature *Stateless Linux*. The full implementation of Stateless Linux remains a Technology Preview.

At present, **nfsroot** has the following restrictions:

- Each client must have its own separate root file system over the NFS server. This restriction applies even when read-only root is in use.
- SWAP is not supported over NFS.

- SELinux cannot be enabled on **nfsroot** clients. In general, Red Hat does not recommend disabling SELinux. As such, customers must carefully consider the security implications of this action.

The release notes included in the distribution of Red Hat Enterprise Linux 5.1 contains outdated instructions on how to set up **nfsroot**. Refer to the following procedure on how to set up **nfsroot**. As always, this procedure assumes that your network device is **eth0** and the associated network driver is **tg3**. You may need to adjust according to your system configuration:

- ✧ Create the **initrd** in your home directory using the following command:

```
mkinitrd --with=tg3 --rootfs=nfs --net-dev=eth0 --rootdev=<nfs server ip>:/<path to nfsroot> ~/initrd-<kernel-version>.img <kernel-version>
```

This **initrd** must be created using the Red Hat Enterprise Linux 5.1 kernel.

- ✧ Next, create a **zImage.initrd** image from the **initrd** generated earlier. **zImage.initrd** is a compressed kernel and initrd in one image. Use the following command:

```
mkzimage /boot/vmlinuz-<kernel-version> /boot/config-<kernel-version> /boot/System.map-<kernel-version> ~/initrd-<kernel-version>.img /usr/share/ppc64-utils/zImage.stub ~/zImage.initrd-<kernel-version>
```

- ✧ Copy the created **zImage.initrd-<kernel-version>** to an exportable location on your **tftp** server.
- ✧ Ensure that the exported **nfsroot** file system on the **nfs** server contains the necessary binaries and modules. These binaries and modules must correspond to the version of the kernel used to create the **initrd** in the first step.
- ✧ Configure the DHCP server to point the client to the target **zImage.initrd-<kernel-version>**.

To do this, add the following entries to the **/etc/dhcpd.conf** file of the DHCP server:

```
next-server <tftp hostname/IP address>;
filename "<tftp-path>/zImage.initrd";
```

Note that **<tftp-path>** should specify the path to the **zImage.initrd** from within the **tftp**-exported directory. For example, if the absolute path to the **zImage.initrd** is **/tftpboot/mykernels/zImage.initrd** and **/tftpboot/** is the **tftp**-exported directory, then **<tftp-path>** should be **mykernels/zImage.initrd**.

- ✧ Finally, set your system's boot configuration parameters to make it boot first from the network device (in this example, the network device is **eth0**).

For more information about setting up a Red Hat Enterprise Linux 5.1 network installation for the *BladeCenter QS21*, refer to http://www-01.ibm.com/chips/techlib/techlib.nsf/products/Cell_Broadband_Engine.

- ✧ The *QLogic iSCSI Expansion Card* for the *IBM BladeCenter* provides both ethernet and iSCSI functions. Some parts on the card are shared by both functions. However, the current **qla3xxx** and **qla4xxx** drivers support ethernet and iSCSI functions individually. Both drivers do not support the use of ethernet and iSCSI functions simultaneously.

As such, using both ethernet and iSCSI functions simultaneously may hang the device. This could result in data loss and filesystem corruption on iSCSI devices, or network disruptions on other connected ethernet devices.

- ✦ When using **virt-manager** to add disks to an existing guest, duplicate entries may be created in the guest's `/etc/xen/<domain name>` configuration file. These duplicate entries will prevent the guest from booting.

As such, you should remove these duplicate entries.

- ✦ Repeatedly migrating a guest between two hosts may cause one host to panic. If a host is rebooted after migrating a guest out of the system and before migrating the same guest back, the panic will not occur.
- ✦ **sysreport** is being deprecated in favor of **sos**. To install **sos**, run **yum install sos**. This command installs **sos** and removes **sysreport**. It is recommended that you update any existing kickstart files to reflect this.

After installing **sos**, use the command **sosreport** to invoke it. Using the command **sysreport** generates a warning that **sysreport** is now deprecated; continuing will invoke **sosreport**.

If you need to use the **sysreport** tool specifically, use the command **sysreport .legacy** to invoke it.

For more information about **sosreport**, refer to **man sosreport** and **sosreport --help**.

4.1. Installation-Related Notes

This section includes information specific to **Anaconda** and the installation of Red Hat Enterprise Linux 5.1.

To upgrade an already-installed Red Hat Enterprise Linux 5, you can use Red Hat Network to update those packages that have changed.

You may also use **Anaconda** to perform a fresh installation of Red Hat Enterprise Linux 5.1 or to perform an upgrade from *the latest updated version* of Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5.1.

Anaconda can also be used to upgrade an already-installed Red Hat Enterprise Linux 5.

- ✦ The minimum RAM required to install Red Hat Enterprise Linux 5.1 is now 1GB; the recommended RAM is 2GB. If a machine has less than 1GB RAM, the installation process may hang.

Further, PPC machines that have 1GB of RAM experience significant performance issues under certain RAM-intensive workloads. For a Red Hat Enterprise Linux 5.1 system to perform RAM-intensive processes optimally, it is recommended that 4GB of RAM be equipped on the machine. This ensures that the system has the same number of physical pages as that on PPC machines (using 512MB of RAM) running Red Hat Enterprise Linux 4.5 or earlier.

- ✦ If you are copying the contents of the Red Hat Enterprise Linux 5 CD-ROMs (in preparation for a network-based installation, for example) be sure to copy the CD-ROMs for the operating system *only*. Do not copy the **Supplementary CD-ROM**, or any of the layered product CD-ROMs, as this will overwrite files necessary for **Anaconda**'s proper operation.

The contents of the **Supplementary CD-ROM** and other layered product CD-ROMs must be installed *after* Red Hat Enterprise Linux 5.1 has been installed.

- ✦ When installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, do *not* use the **kernel-xen** kernel. Using this kernel on fully virtualized guests can cause your system to hang.

If you are using an Installation Number when installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, be sure to deselect the **Virtualization** package group during the installation. The **Virtualization** package group option installs the **kernel-xen** kernel.

Note that paravirtualized guests are not affected by this issue. Paravirtualized guests always use the **kernel-xen** kernel.

- If you are using the Virtualized kernel when upgrading from Red Hat Enterprise Linux 5 to 5.1, you must reboot after completing the upgrade. You should then boot the system using the updated Virtualized kernel.

The hypervisors of Red Hat Enterprise Linux 5 and 5.1 are not ABI-compatible. If you do not boot the system after upgrading using the updated Virtualized kernel, the upgraded Virtualization RPMs will not match the running kernel.

4.1.1. Installation / Boot for iSCSI software initiator (open-iscsi)

iSCSI installation and boot was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview. This feature is now fully supported, with the restrictions described below.

This capability has three configurations depending on whether you are:

- using a hardware iSCSI initiator (such as the *QLogic qla4xxx*)
- using the **open-iscsi** initiator on a system with firmware boot support for iSCSI (such as iSCSI Boot Firmware, or a version of Open Firmware that features the iSCSI boot capability)
- using the **open-iscsi** initiator on a system with no firmware boot support for iSCSI

4.1.1.1. Using a Hardware iSCSI Initiator

If you are using a hardware iSCSI initiator, you can use the card's BIOS set-up utility to enter the IP address and other parameters required to obtain access to the remote storage. The logical units of the remote storage will be available in **Anaconda** as standard **sd** devices, with no additional set-up required.

If you need to determine the initiator's qualified name (IQN) in order to configure the remote storage server, follow these steps during installation:

1. Go to the installer page where you select which disk drives to use for the installation.
2. Click on **Advanced storage configuration**.
3. Click on **Add iSCSI target**.
4. The iSCSI IQN will be displayed on that screen.

4.1.1.2. Using open-iscsi On A System With Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with firmware boot support for iSCSI, use the firmware's setup utility to enter the IP address and other parameters needed to access the remote storage. Doing this configures the system to boot from the remote iSCSI storage.

Currently, Anaconda does not access the iSCSI information held by the firmware. Instead, you must manually enter the target IP address during installation. To do so, determine the IQN of the initiator using the procedure described above. Afterwards, on the same installer page where the initiator IQN is displayed, specify the IP address of the iSCSI target you wish to install to.

After manually specifying the IP address of the iSCSI target, the logical units on the iSCSI targets will be available for installation. The **initrd** created by **Anaconda** will now obtain the IQN and IP address of the iSCSI target.

If the IQN or IP address of the iSCSI target are changed in the future, enter the iBFT or Open Firmware set-up utility on each initiator and change the corresponding parameters. Afterwards, modify the **initrd** (stored in the iSCSI storage) for each initiator as follows:

1. Expand the **initrd** using **gunzip**.

2. Unpack it using **cpio -i**.
3. In the **init** file, search for the line containing the string **iscsistartup**. This line also contains the IQN and IP address of the iSCSI target; update this line with the new IQN and IP address.
4. Re-pack the **initrd** using **cpio -o**.
5. Re-compress the **initrd** using **gunzip**.

The ability of the operating system to obtain iSCSI information held by the Open Firmware / iBFT firmware is planned for a future release. Such an enhancement will remove the need to modify the **initrd** (stored in the iSCSI storage) for each initiator whenever the IP address or IQN of the iSCSI target is changed.

4.1.1.3. Using open-iscsi On A System With No Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with no firmware boot support for iSCSI, use a network boot capability (such as PXE/tftp). In this case, follow the same procedure described earlier to determine the initiator IQN and specify the IP address of the iSCSI target. Once completed, copy the **initrd** to the network boot server and set up the system for network boot.

Similarly, if the IP address or IQN of the iSCSI target is changed, the **initrd** should be modified accordingly as well. To do so, use the same procedure described earlier to modify the **initrd** for each initiator.

4.2. Feature Updates

EXT3 Enhancement

The maximum capacity of the EXT3 is now 16TB (increased from 8TB). This enhancement was originally included in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this update.

yum-security

It is now possible to limit **yum** to install security updates *only*. To do so, simply install the **yum-security** plugin and run the following command:

```
yum update --security
```

Restarting a Resource Independently

It is now possible to restart a resource in a cluster without interrupting its parent service. This can be configured in **/etc/cluster/cluster.conf** on a running node using the **__independent_subtree="1"** attribute to tag a resource as independent.

For example:

```
<service name="example">
  <fs name="One" __independent_subtree="1" ...>
    <nfsexport ...>
      <nfsclient .../>
    </nfsexport>
  </fs>
  <fs name="Two" ...>
    <nfsexport ...>
      <nfsclient .../>
    </nfsexport>
```



```

        <script name="Database" .../>
    </fs>
    <ip/>
</service>

```

Here, two file system resources are used: **One** and **Two**. If **One** fails, it is restarted without interrupting **Two**. If **Two** fails, all components (**One**, children of **One** and children of **Two**) are restarted. At no given time are **Two** and its children dependent on any resource provided by **One**.

Note that *Samba* requires a specific service structure, and as such it cannot be used in a service with independent subtrees. This is also true for several other resources, so use the `__independent_subtree="1"` attribute with caution.

Virtualization

The following Virtualization updates are also included in this release:

- ✦ *AMD-V* is now supported in this release. This enables live domain migration for fully virtualized guests.
- ✦ The in-kernel socket API is now expanded. This was done to fix a bug that occurs when running **sctp** between guests.
- ✦ Virtual networking is now part of **libvirt**, the virtualization library. **libvirt** has a set of commands that sets up a virtual NAT/router and private network for all local guests on a machine. This is especially useful for guests that do not need to be routable from the outside. It is also useful for developers who use Virtualization on laptops.

Note that the virtual networking capability adds a dependency on **dnsmasq**, which handles **dhcp** for the virtual network.

For more information about **libvirt**, refer to <http://libvirt.org>.

- ✦ **libvirt** can now manage inactive virtual machines. **libvirt** does this by defining and undefining domains without stopping or starting them. This functionality is similar to the **virsh define** and **virsh undefine** commands.

This enhancement allows the Red Hat Virtual Machine Manager to display all available guests. This allows you to start these guests directly from the GUI.

- ✦ Installing the **kernel-xen** package no longer leads to the creation of incorrect / incomplete **elilo.conf** entries.
- ✦ The **xm create** command now has a graphical equivalent in **virt-manager**.
- ✦ *Nested Paging* (NP) is now supported. This feature reduces the complexity of memory management in virtualized environments. In addition, NP also reduces CPU utilization in memory-intensive guests.

At present, NP is not enabled by default. If your system supports NP, it is recommended that you enable NP by booting the hypervisor with the parameter **hap=1**.

Shared Page Tables

Shared page tables are now supported for **hugetlb** memory. This enables page table entries to be shared among multiple processes.

Sharing page table entries among multiple processes consumes less cache space. This improves application cache hit ratio, resulting in better application performance.

Installing to dm-multipath Devices

Anaconda now has the capability to detect, create, and install to *dm-multipath* devices. To enable this feature, add the parameter **mpath** to the kernel boot line.

This feature was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this release.

Note that **dm-multipath** also features inbox support for the *Dell MD3000*. However, multiple nodes that use **dm-multipath** to access the MD3000 cannot perform immediate failback.

Further, it is recommended that you use the **Custom Partitioning** interface in **Anaconda** if your system has both multipath and non-multipath devices. Using **Automatic Partitioning** in such cases may create both types of devices in the same logical volume groups.

At present, the following restrictions apply to this feature:

- ✦ If there is only one path to the boot Logical Unit Number (LUN), **Anaconda** installs to the SCSI device even if **mpath** is specified. Even after you enable multiple paths to the boot LUN and recreate the **initrd**, the operating system will boot from the SCSI device instead of the **dm-multipath** device.

However, if there are multiple paths to the boot LUN to begin with, **Anaconda** will correctly install to the corresponding **dm-multipath** device after **mpath** is specified in the kernel boot line.

- ✦ By default, **user_friendly_names** is set to **yes** in **multipath.conf**. This is a required setting in the support implementation of the **dm-multipath** root device. As such, setting **user_friendly_names** to **no** and recreating the **initrd** will result in a boot failure with the following error:

```
Checking filesystems
fsck.ext3: No such file or directory while trying to open
/dev/mapper/mpath0p1
```

Booting from Storage Area Network (SAN)

The ability to boot from a SAN disk device is now supported. In this case, SAN refers to a Fibre Channel or iSCSI interface. This capability also features support for system-to-storage connection through multiple paths using **dm-multipath**.

In configurations that use multiple host bus adapters (HBA), you may need to set the system BIOS to boot from another adapter if all paths through the current adapter fail.

Driver Update Program

The Driver Update Program (DUP) was designed to allow third-party vendors (such as OEMs) to add their own device drivers and other Linux Kernel Modules to Red Hat Enterprise Linux 5 systems using regular RPM packages as the distribution containers.

Red Hat Enterprise Linux 5.1 applies several updates to the DUP, most notably:

- ✦ install-time Driver Update RPMs through Driver Update Disks is now supported
- ✦ bootpath Driver Updates affecting the system bootpath are now supported
- ✦ support for third-party packaging of *Advanced Linux Sound Architecture* (ALSA) is now deprecated

Further, various updates were applied to the approved kernel ABI symbol whitelists. These whitelists are used by packaging drivers to determine which symbols and data structures provided by the kernel can be used in a third-party driver.

For more information, refer to <http://www.kerneldrivers.org/RedHatKernelModulePackages>.

4.3. Driver Updates

General Driver Updates

- ✦ acpi: updated **ibm_acpi** module to address several ACPI and docking station issues with Lenovo laptops.
- ✦ ipmi: Polling **ktthread** no longer runs when hardware interrupt is assigned to a Baseboard Management Controller.
- ✦ sata: **SATA/SAS** upgraded to version 2.6.22-rc3.
- ✦ **openib** and **openmpi**: upgraded to OFED (OpenFabrics Enterprise Distribution) version 1.2.
- ✦ **powernow-k8**: upgraded to version 2.0.0 to fully support *Greyhound*.
- ✦ **xinput**: added to enable full RSA support.
- ✦ **aic94xx**: upgraded to version 1.0.2-1, in line with an upgrade of the embedded sequencer firmware to v17. These updates apply the following changes:
 - fixed **ascb** race condition on platforms with expanders
 - added **REQ_TASK_ABORT** and **DEVICE_RESET** handlers
 - physical ports are now cleaned up properly after a discovery error
 - **phys** can now be enabled and disabled through **sysfs**
 - extended use of DDB lock to prevent race condition of DDB

Audio

ALSA updated to version 1.0.14. This update applies the following fixes:

- ✦ fixed noise problem on the IBM Taroko (M50)
- ✦ *Realtek ALC861* is now supported
- ✦ fixed a muting problem on xw8600 and xw6600
- ✦ *ADI 1884 Audio* is now supported
- ✦ fixed an audio configuration problem on xw4600

PCI

- ✦ added function calls to set maximum read request size for PCIX and PCI-Express
- ✦ *IBM System P* machines now support PCI-Express hotplugging
- ✦ added necessary drivers and PCI ID to support SB600 SMBus

Network

- **e1000** driver: updated to version 7.3.20-k2 to support I/OAT-enabled chipsets.
- **bnx2** driver: updated to version 1.5.11 to support 5709 hardware.
- **B44** ethernet driver: backported from upstream version 2.6.22-rc4 to apply the following changes:
 - several **endianness** fixes were made
 - **DMA_30BIT_MASK** constant is now used
 - **skb_copy_from_linear_data_offset()** is now used
 - **spin_lock_irqsave()** now features safer interrupt disabling
 - simple error checking is performed during resume
 - several fixes to multicast were applied
 - chip reset now takes longer than previously anticipated
- *Marvell* **sky2** driver: updated to version 1.14 to fix a bug that causes a kernel panic if the **ifup/ifdown** commands are executed repeatedly.
- **forcedeth-0.60** driver: now included in this release. This applies several critical bug fixes for customers using *NVIDIA's* MCP55 motherboard chipsets and corresponding onboard NIC.
- **ixgb** driver: updated to the latest upstream version (1.0.126).
- **netxen_nic** driver: version 3.4.2-2 added to enable support for *NetXen 10GbE* network cards.
- *Chelsio 10G* Ethernet Network Controller is now supported.
- added support for PCI error recovery to the **s2io** device.
- Broadcom wireless ethernet driver now supports PCI ID for *nx6325* card.
- fixed a bug that caused an **ASSERTION FAILED** error when attempting to start a *BCM4306* via **ifup**.
- **ixgb** driver: updated to add EEH PCI error recovery support for the Intel 10-gigabit ethernet card. For more information, refer to `/usr/share/doc/kernel-<kernel version>/Documentation/pci-error-recovery.txt`.
- **qla3xxx** driver: re-enabled and updated to version 2.03.00-k3 to provide networking support for *QLogic* iSCSI adapters without using iSCSI.
- **spidernet** network driver: updated to support *QS21*. This update also features several bug fixes, most notably:
 - fixed a bug that causes the kernel to crash when **ifdown eth0** calls on a non-idle interface
 - fixed a bug that causes the driver to hang when the kernel is under extreme pressure, preventing it from handling interrupts in a timely fashion
 - fixed misconfigured TX interrupts that resulted in sub-par performance for small packets

- **eHEA** driver and **ibmebus**: updated to fully support Dynamic Logical Partitioning (DLPAR) add/remove functions for logical adapters and logical ports. In addition, several fixes were also applied to enhance error recovery in the **eHEA** driver.
- **qla2xxx**: driver upgraded to version 8.01.07-k6. This applies several changes, most notably:
 - iIDMA is now supported
 - the following Fibre Channel attributes are now supported:
 - symbolic nodename
 - system hostname
 - fabric name
 - host port state
 - trace-control async events are no longer logged
 - reset handling logic has been corrected
 - MSI-X is now supported
 - IRQ-0 assignments are now handled per system
 - NVRAM updates immediately go into effect

IPMI

This release includes an update of the **IPMI** driver set to include the upstream changes as of version 2.6.21.3, with some patches included from 2.6.22-rc-4. This update features the following changes (among others):

- fixed uninitialized data bug in **ipmi_si_intf**
- **kipmid** is no longer started if another driver supports interrupts
- users are now allowed to override the kernel daemon **enable** through **force_kipmid**
- per-channel command registration is now supported
- **MAX_IPMI_INTERFACES** is no longer used
- hot system interface removal is now supported
- added a Maintenance Mode to support firmware updates
- added **poweroff** support for the **pigeonpoint** IPMC
- BT subdriver can now survive long timeouts
- added **pci_remove** handling for proper cleanup on a hot remove

For information about new module parameters, refer to **/usr/share/doc/kernel-doc-*<kernel version>*/Documentation/IPMI.txt**.

SCSI

- ported SCSI blacklist from Red Hat Enterprise Linux 4 to this release.

- added PCI IDs for **aic79xx** driver.
- **aacraid** driver: updated to version 1.1.5-2437 to support *PRIMERGY RX800S2* and *RX800S3*.
- **megaraid_sas** driver: updated to version 3.10. This update defines the entry point for **bios_param**, adds an IOCTL memory pool, and applies several minor bug fixes.
- *Emulex lpfc* driver: updated to version 8.1.10.9. This update applies several changes, most notably:
 - fixed **host_lock** management in the **ioctl** paths
 - the *AMD* chipset is now automatically detected, and reduced the DMA length to 1024 bytes
 - nodes are no longer removed during **dev_loss_tmo** if discovery is active
 - 8GB link speeds are now enabled
- **qla4xxx** driver updated to apply the following changes:
 - added support for IPV6, QLE406x and **ioctl** module
 - fixed a **mutex_lock** bug that could cause lockups
 - resolved lockup issues of **qla4xxx** and **qla3xxx** when attempting to load/unload either interface
- **mpt fusion** drivers: updated to version 3.04.04. This update applies several changes, most notably:
 - fixed several error handling bugs
 - **mptsas** now serializes target resets
 - **mptsas** and **mptfc** now support LUNs and targets greater than 255
 - fixed an LSI **mptspi** driver regression that resulted in extremely slow DVD driver performance
 - when an LSI SCSI device returns a **BUSY** status, I/O attempts no longer fail after several retries
 - RAID arrays are no longer unavailable after auto-rebuild
- **arcmsr** driver: included to provide support for *Areca* RAID controllers.
- **3w-9xxx** module: updated to correctly support 3ware 9650SE.

4.4. Kernel-Related Updates

- The CIFS client has been updated to version 1.48aRH. This is based upon the 1.48a release, with patches that apply the following changes:
 - the mount option **sec=none** results in an anonymous mount
 - CIFS now honors the **umask** when POSIX extensions are enabled
 - fixed **sec=** mount options that request packet signing

Note that for users of the *EMC Celerra* product (NAS Code 5.5.26.x and below), the CIFS client hangs when accessing shares on EMC NAS. This issue is characterized by the following kernel messages:

```
kernel: CIFS VFS: server not responding
kernel: CIFS VFS: No response for cmd 162 mid 380
kernel: CIFS VFS: RFC1001 size 135 bigger than SMB for Mid=384
```

After a CIFS mount, it becomes impossible to read/write any file on it and any application that attempts an I/O on the mountpoint will hang. To resolve this issue, upgrade to NAS Code 5.5.27.5 or later (use EMC Primus case number emc165978).

- ✦ **MODULE_FIRMWARE** tags are now supported.
- ✦ *ICH9* controllers are now supported.
- ✦ *Greyhound* processors are now supported in **CPUID** calls.
- ✦ Supported applications and libraries now use code optimized for the *Power6 raw* mode.
- ✦ The *QS21* is now supported in the latest *IBM Cell Broadband Engine* platform update. This update also applies several bug fixes and features the following changes (among others):
 - *Cell/B.E.* SDK 3.0 is now supported
 - improved kernel support
 - SPE Runtime Management Library (**LibSPE**) is now included
 - added a new function for SPU management (**SPUfs**)
- ✦ Message Signaled Interrupts (MSI) now support PCI-E slots on new *Power* platforms, JS21 and future hardware models.
- ✦ LPAR systems now restart according to user preferences, even on power failure.
- ✦ **Oprofile** now supports new *Greyhound* performance counter events.
- ✦ *Directed DIAG* is now supported to improve *z/VM* utilization.
- ✦ The *Intel* graphics chipset is now supported through the **DRM** kernel module. Further, the DRM API has been upgraded to version 1.3 to support direct rendering.
- ✦ Updates to **ACPI** power management have improved S3 suspend-to-RAM and S4 hibernate.
- ✦ *IBM Power5* now supports IDE device hotplugging and DLPAR. As such, the device node for CD/DVD drives is now **/dev/scdx** (originally **/dev/hdx**) on *IBM Power5* machines.

4.5. Other Updates

- ✦ **gaim** is now called **pidgin**.
- ✦ Implicit active-active failover using **dm-multipath** on *EMC Clariion* storage is now supported.
- ✦ The Chinese font *Zysong* is no longer installed as part of the **fonts-chinese** package. *Zysong* is now packaged separately as **fonts-chinese-zysong**. The **fonts-chinese-zysong** package is located in the **Supplementary CD**.

Note that the **fonts-chinese-zysong** package is needed to support the Chinese National Standard GB18030.

- ✦ The Challenge Handshake Authentication Protocol (CHAP) username and password have a character limit of 256 each.
- ✦ **pump** is deprecated in this update. As such, configuring your network interface through **netconfig** may result in broken **ifcfg** scripts.

To properly configure your network interface, use **system-config-network** instead. Installing the updated **system-config-network** package removes **netconfig**.

- ✦ **rpm --aid** is no longer supported. It is recommended that you use **yum** when updating and installing packages.

4.6. Technology Previews

Technology Preview features are currently *not* supported under Red Hat Enterprise Linux 5.1 subscription services, may not be functionally complete, and are generally not suitable for production use. However, these features are included as a customer convenience and to provide the feature with wider exposure.

Customers may find these features useful in a non-production environment. Customers are also free to provide feedback and functionality suggestions for a Technology Preview feature before it becomes fully supported. Erratas will be provided for high-severity security issues.

During the development of a Technology Preview feature, additional components may become available to the public for testing. It is the intention of Red Hat to fully support Technology Preview features in a future release.

Stateless Linux

Stateless Linux is a new way of thinking about how a system should be run and managed, designed to simplify provisioning and management of large numbers of systems by making them easily replaceable. This is accomplished primarily by establishing prepared system images which get replicated and managed across a large number of stateless systems, running the operating system in a read-only manner (refer to **/etc/sysconfig/readonly-root** for more details).

In its current state of development, the Stateless features are subsets of the intended goals. As such, the capability remains as Technology Preview.

The following is a list of the initial capabilities included in Red Hat Enterprise Linux 5:

- ✦ running a stateless image over NFS
- ✦ running a stateless image via loopback over NFS
- ✦ running on iSCSI

It is highly recommended that those interested in testing stateless code read the HOWTO at <http://fedoraproject.org/wiki/StatelessLinuxHOWTO> and join stateless-list@redhat.com.

The enabling infrastructure pieces for Stateless Linux were originally introduced in Red Hat Enterprise Linux 5.

AIGLX

AIGLX is a Technology Preview feature of the otherwise fully supported X server. It aims to enable GL-accelerated effects on a standard desktop. The project consists of the following:

- ✦ a lightly modified X server
- ✦ an updated Mesa package that adds new protocol support

By installing these components, you can have GL-accelerated effects on your desktop with very few changes, as well as the ability to enable and disable them at will without replacing your X server. AIGLX also enables remote GLX applications to take advantage of hardware GLX acceleration.

FS-Cache

FS-Cache is a local caching facility for remote file systems that allows users to cache NFS data on a locally mounted disk. To set up the FS-Cache facility, install the **cachefilesd** RPM and refer to the instructions in `/usr/share/doc/cachefilesd-<version>/README`.

Replace `<version>` with the corresponding version of the **cachefilesd** package installed.

Systemtap

Systemtap provides free software (GPL) infrastructure to simplify the gathering of information about the running Linux system. This assists the diagnosis of a performance or functional problem. With the help of **systemtap**, developers no longer need to go through the tedious and disruptive instrument, recompile, install, and reboot sequence that may be otherwise required to collect data.

iSCSI Target

The Linux target (tgt) framework allows a system to serve block-level SCSI storage to other systems that have a SCSI initiator. This capability is being initially deployed as a Linux iSCSI target, serving storage over a network to any iSCSI initiator.

To set up the iSCSI target, install the **scsi-target-utils** RPM and refer to the instructions in:

- ✦ `/usr/share/doc/scsi-target-utils-<version>/README`
- ✦ `/usr/share/doc/scsi-target-utils-<version>/README.iscsi`

Replace `<version>` with the corresponding version of the package installed.

For more information, refer to `man tgtadm`.

FireWire

The **firewire-sbp2** module is included in this update as a Technology Preview. This module enables connectivity with FireWire storage devices and scanners.

At present, FireWire does not support the following:

- ✦ IPv4
- ✦ *pcilynx* host controllers
- ✦ multi-LUN storage devices
- ✦ non-exclusive access to storage devices

In addition, the following issues still exist in this version of FireWire:

- ✦ a memory leak in the **SBP2** driver may cause the machine to become unresponsive.
- ✦ a code in this version does not work properly in big-endian machines. This could lead to unexpected behavior in PowerPC.

4.7. Resolved Issues

- ✦ In multi-boot systems, **parted** now preserves the starting sector of the first primary partition where Windows Vista™ is installed. As such, when setting up a multi-boot system with both Red Hat Enterprise Linux 5.1 and Windows Vista™, the latter is no longer rendered unbootable.
- ✦ **rmmod xennet** no longer causes **domU** to crash.
- ✦ 4-socket AMD *Sun Blade X8400 Server Module* systems that do not have memory configured in **node 0** no longer panic during boot.
- ✦ **conga** and **luci** can now be used to create and configure failover domains.
- ✦ When installing the **Cluster Storage** group through **yum**, the transaction no longer fails.
- ✦ During installation, incorrect SELinux contexts are no longer assigned to **/var/log/faillog** and **/var/log/tallylog**.
- ✦ Installing Red Hat Enterprise Linux 5.1 using split installation media (for example, CD or NFSISO) no longer causes an error in the installation of **amanda-server**.
- ✦ EDAC now reports the correct amount of memory on the latest k8 processors.
- ✦ Logging in remotely to a Gnome desktop via **gdm** no longer causes the login screen to hang.
- ✦ A bug in **autofs** that prevented multi-mounts from working properly is now fixed.
- ✦ Several patches to **utrace** apply the following fixes:
 - fixed a bug that causes a crash in race condition when using **ptrace**
 - fixed a regression that prevented some **wait4** calls from waking up when a child exited under certain circumstances
 - fixed a regression that sometimes prevented **SIGKILL** from terminating a process. This occurred if **ptrace** was performed on a process under certain circumstances.
- ✦ A RealTime Clock (RTC) bug that prevented alarms and periodic RTC interrupts from working properly is now fixed.

4.8. Known Issues

- ✦ The first time the **Release Notes** button is clicked in **Anaconda**, a delay occurs while the window renders the Release Notes. During this delay, a seemingly empty list appears in the window. The rendering normally completes quickly, so most users may not notice this.

This delay is mostly due to the fact that the package installation phase is the most CPU-intensive phase of installation.

- ✦ Host bus adapters that use the MegaRAID driver must be set to operate in "Mass Storage" emulation mode, not in "I2O" emulation mode. To do this, perform the following steps:
 - ✦ Enter the MegaRAID **BIOS Set Up Utility**.
 - ✦ Enter the **Adapter settings** menu.
 - ✦ Under **Other Adapter Options**, select **Emulation** and set it to **Mass Storage**.

If the adapter is incorrectly set to "I2O" emulation, the system will attempt to load the i2o driver. This will fail, and prevent the proper driver from being loaded.

Previous Red Hat Enterprise Linux releases generally do not attempt to load the I2O driver before the MegaRAID driver. Regardless of this, the hardware should always be set to "Mass Storage" emulation mode when used with Linux.

- ✦ Laptops equipped with the *Cisco Aironet MPI-350* wireless may hang trying to get a DHCP address during any network-based installation using the wired ethernet port.

To work around this, use local media for your installation. Alternatively, you can disable the wireless card in the laptop BIOS prior to installation (you can re-enable the wireless card after completing the installation).

- ✦ Currently, **system-config-kickstart** does not support package selection and deselection. When using **system-config-kickstart**, the **Package Selection** option indicates that it is disabled. This is because **system-config-kickstart** uses **yum** to gather group information, but is unable to configure **yum** to connect to Red Hat Network.

At present, you need to update package sections in your kickstart files manually. When using **system-config-kickstart** to open a kickstart file, it will preserve all package information in it and write it back out when you save.

- ✦ When using **Alt-SysRq-W** to debug, the following warning message will appear:

```
Badness in smp_call_function at arch/powerpc/kernel/smp.c:223
```

Afterwards, the system will also warn that it will hang. This message should be ignored as it will not cause the system to hang.

- ✦ Boot-time logging to **/var/log/boot.log** is not available in this update of Red Hat Enterprise Linux 5. An equivalent functionality will be added in a future update.
- ✦ When upgrading from Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5, the Deployment Guide is not automatically installed. You need to use **pirut** to manually install it after completing the upgrade.
- ✦ The system may not successfully reboot into a **kexec/kdump** kernel if X is running and using a driver other than *vesa*. This problem only exists with *ATI Rage XL* graphics chipsets.

If X is running on a system equipped with *ATI Rage XL*, ensure that it is using the *vesa* driver in order to successfully reboot into a **kexec/kdump** kernel.

- ✦ When using Red Hat Enterprise Linux 5 on a machine with an *nVidia CK804* chipset installed, the following kernel messages may appear:

```
kernel: assign_interrupt_mode Found MSI capability
kernel: pcie_portdrv_probe->Dev[005d:10de] has invalid IRQ. Check vendor BIOS
```

These messages indicate that certain PCI-E ports are not requesting IRQs. Further, these messages do not, in any way, affect the operation of the machine.

- ✦ Removable storage devices (such as CDs and DVDs) do not automatically mount when you are logged in as root. As such, you will need to manually mount the device through the graphical file manager.

Alternatively, you can run the following command to mount a device to **/media**:

```
mount /dev/<device name> /media
```

- ✦ The *IBM System z* does not provide a traditional Unix-style physical console. As such, Red Hat Enterprise Linux 5 for the *IBM System z* does not support the *firstboot* functionality during initial program load.

To properly initialize setup for Red Hat Enterprise Linux 5 on the *IBM System z*, run the following commands after installation:

- **/usr/bin/setup** — provided by the **setuptools** package.
 - **/usr/bin/rhn_register** — provided by the **rhn-setup** package.
- ✦ When upgrading from Red Hat Enterprise Linux 5 to Red Hat Enterprise Linux 5.1 via Red Hat Network, **yum** may not prompt you to import the redhat-beta key. As such, it is advised that you import the redhat-beta key manually prior to upgrading. To do this, run the following command:

```
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
```

- ✦ When a LUN is deleted on a configured filer, the change is not reflected on the host. In such cases, **lvm** commands will hang indefinitely when **dm-multipath** is used, as the LUN has now become *stale*.

To work around this, delete all device and **mpath** link entries in **/etc/lvm/.cache** specific to the stale LUN.

To find out what these entries are, run the following command:

```
ls -l /dev/mpath | grep <stale LUN>
```

For example, if **<stale LUN>** is 3600d0230003414f30000203a7bc41a00, the following results may appear:

```
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00 -
> ../dm-4
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00p1
-> ../dm-5
```

This means that 3600d0230003414f30000203a7bc41a00 is mapped to two **mpath** links: **dm-4** and **dm-5**.

As such, the following lines should be deleted from **/etc/lvm/.cache**:

```
/dev/dm-4
/dev/dm-5
/dev/mapper/3600d0230003414f30000203a7bc41a00
/dev/mapper/3600d0230003414f30000203a7bc41a00p1
/dev/mpath/3600d0230003414f30000203a7bc41a00
/dev/mpath/3600d0230003414f30000203a7bc41a00p1
```

- ✦ When attempting to create a fully virtualized Windows™ guest from a CD or DVD, the second stage of the guest install might not continue upon reboot.

To work around this, edit **/etc/xen/<name of guest machine>** by properly appending an entry for the CD / DVD device.

If an installation to a simple file is used as a virtual device, the **disk** line of **/etc/xen/<name of guest machine>** will read like the following:

```
disk = [ 'file:/PATH-OF-SIMPLE-FILE,hda,w' ]
```

A DVD-ROM device located on the host as `/dev/dvd` can be made available to stage 2 of the installation as `hdc` by appending an entry like `'phy:/dev/dvd,hdc:cdrom,r'`. As such, the disk line should now read as follows:

```
disk = [ 'file:/opt/win2003-sp1-20061107,hda,w',
        'phy:/dev/dvd,hdc:cdrom,r' ]
```

The precise device path to use may vary depending on your hardware.

- ✦ If the `sctp` module is not added to the kernel, running `netstat` with the `-A inet` or `-A inet6` option abnormally terminates with the following message:

```
netstat: no support for `AF_INET (sctp)' on this system.
```

To avoid this, install the `sctp` kernel module.

- ✦ Current kernels do not assert *Data Terminal Ready* (DTR) signals before printing to serial ports during boot time. DTR assertion is required by some devices; as a result, kernel boot messages are not printed to serial consoles on such devices.
- ✦ The *AMD 8132* and *HP BroadCom HT100* used on some platforms (such as the *HP dc7700*) do not support `MMCONFIG` cycles. If your system uses either chipset, your PCI configuration should use the legacy *PortIO CF8/CFC* mechanism. To configure this, boot the system with the kernel parameter `-pci nommconfig` during installation and add `pci=nommconf` to GRUB after rebooting.

Further, the *AMD 8132* chipset does not support Message Signaled Interrupts (MSI). If your system uses this chipset, you should also disable MSI. To do this, use the kernel parameter `-pci nomsi` during installation and add `pci=nomsi` to GRUB after rebooting.

However, if your specific platform is already blacklisted by the kernel, your system does not require the aforementioned `pci` kernel parameters. The following HP platforms are already blacklisted by the kernel:

- *DL585g2*
 - *dc7500*
 - *xw9300*
 - *xw9400*
- ✦ The **Virtual Machine Manager** (`virt-manager`) included in this release does not allow users to specify additional boot arguments to the paravirtualized guest installer. This is true even when such arguments are required to install certain types of paravirtualized guests on specific types of hardware.

This issue will be addressed in a future release of `virt-manager`. To specify arbitrary kernel arguments in installing paravirtualized guests from the command line, use `virt-install`.

- ✦ With the default `dm-multipath` configuration, *Netapp* devices may take several minutes to complete failback after a previously failed path is restored. To resolve this problem, add the following *Netapp* device configuration to the `devices` section of the `multipath.conf` file:

```
devices {
    device {
        vendor                "NETAPP"
```

```

        product                "LUN"
        getuid_callout          "/sbin/scsi_id -g -u -s
/block/%n"
        prio_callout           "/sbin/mpath_prio_netapp
/dev/%n"
        features                "1 queue_if_no_path"
        hardware_handler        "0"
        path_grouping_policy    group_by_prio
        failback                immediate
        rr_weight               uniform
        rr_min_io               128
        path_checker            directio
    }

```

5. Release Notes for s390x

- ✦ This release includes WBEMSMT, a suite of web-based applications that provides a user-friendly management interface for Samba and DNS. For more information about WBEMSMT, refer to <http://sblim.wiki.sourceforge.net/>.
- ✦ Upgrading **pm-utils** from a Red Hat Enterprise Linux 5.1 Beta version of **pm-utils** will fail, resulting in the following error:

```
error: unpacking of archive failed on file /etc/pm/sleep.d: cpio: rename
```

To prevent this from occurring, delete the `/etc/pm/sleep.d/` directory prior to upgrading. If `/etc/pm/sleep.d` contains any files, you can move those files to `/etc/pm/hooks/`.

- ✦ Hardware testing for the *Mellanox MT25204* has revealed that an internal error occurs under certain high-load conditions. When the **ib_mthca** driver reports a catastrophic error on this hardware, it is usually related to an insufficient completion queue depth relative to the number of outstanding work requests generated by the user application.

Although the driver will reset the hardware and recover from such an event, all existing connections are lost at the time of the error. This generally results in a segmentation fault in the user application. Further, if **opensm** is running at the time the error occurs, then it will have to be manually restarted in order to resume proper operation.

- ✦ Driver Update Disks now support Red Hat's Driver Update Program RPM-based packaging. If a driver disk uses the newer format, it is possible to include RPM packaged drivers that will be preserved across system updates.

Please note that driver RPMs are copied only for the default kernel variant that is in use on the installed system. For example, installing a driver RPM on a system running the virtualized kernel will install the driver *only* for the virtualized kernel. The driver RPM will not be installed for any other installed kernel variant in the system.

As such, on a system that has multiple kernel variants installed, you will need to boot the system on each kernel variant and install the driver RPM. For example, if your system has both bare-metal and virtualized kernels installed, boot your system using the bare-metal kernel and install the driver RPM. Then, reboot the system into the virtualized kernel and install the driver RPM again.

- ✦ During the lifetime of **dom0**, you cannot create guests (i.e. **xm create**) more than 32,750 times. For example, if you have guests rebooting in a loop, **dom0** will fail to boot any guest after rebooting guests a total of 32,750 times.

If this event occurs, restart **dom0**

- ✦ The Red Hat Enterprise Linux 5.1 NFS server now supports referral exports. These exports are based on extensions to the NFSv4 protocol. Any NFS clients that do not support these extensions (namely, Red Hat Enterprise Linux releases prior to 5.1) will not be able to access these exports.

As such, if an NFS client does not support these exports, any attempt to access these exports may fail with an I/O error. In some cases, depending on the client implementation, the failure may be more severe, including the possibility of a system crash.

It is important that you take precautions to ensure that NFS referral exports are not accessed by clients that do not support them.

- ✦ *GFS2* is an incremental advancement of GFS. This update applies several significant improvements that require a change to the on-disk file system format. GFS file systems can be converted to GFS2 using the utility **gfs2_convert**, which updates the metadata of a GFS file system accordingly.

While much improved since its introduction in Red Hat Enterprise Linux 5, GFS2 remains a Technology Preview. The release notes included in the distribution incorrectly states that GFS2 is fully supported. Nevertheless, benchmark tests indicate faster performance on the following:

- heavy usage in a single directory and faster directory scans (Postmark benchmark)
- synchronous I/O operations (**fstest** benchmark test indicates improved performance for messaging applications like TIBCO)
- cached reads, as there is no longer any locking overhead
- direct I/O to preallocated files
- NFS file handle lookups
- **df**, as allocation information is now cached

In addition, GFS2 also features the following changes:

- journals are now plain (though hidden) files instead of metadata. Journals can now be dynamically added as additional servers mount a file system.
 - quotas are now enabled and disabled by the mount option **quota=<on|off|account>**
 - **quiesce** is no longer needed on a cluster to replay journals for failure recovery
 - nanosecond timestamps are now supported
 - similar to ext3, GFS2 now supports the **data=ordered** mode
 - attribute settings **lsattr()** and **chattr()** are now supported via standard **ioctl()**
 - file system sizes above 16TB are now supported
 - GFS2 is a standard file system, and can be used in non-clustered configurations
- ✦ Installing Red Hat Enterprise Linux 5.1 on *HP BL860c* blade systems may hang during the IP information request stage. This issue manifests when you have to select **OK** twice on the **Configure TCP/IP** screen.

If this occurs, reboot and perform the installation with Ethernet autonegotiation disabled. To do this, use the parameter **ethtool="autoneg=off"** when booting from the installation media. Doing so does not affect the final installed system.

- ✦ The **nohide** export option is required on referral exports (i.e. exports that specify a referral server). This is because referral exports need to "cross over" a bound mount point. The **nohide** export option is required for such a "cross over" to be successful.

For more information on bound mounts, refer to **man exports 5**.

- ✦ This update includes the **lvm2** event monitoring daemon. If you are already using **lvm2** mirroring, perform the following steps to ensure that all monitoring functions are upgraded properly:
 - ✦ Deactivate all mirrored **lvm2** logical volumes before updating. To do this, use the command **lvchange -a n <volume group or mirrored volume>**.
 - ✦ Stop the old **lvm2** event daemon using **killall -HUP dmeventd**.
 - ✦ Perform the upgrade of all related RPM packages, namely **device-mapper** and **lvm2**.
 - ✦ Reactivate all mirrored volumes again using **lvchange -a y <volume group or mirrored volume>**.
- ✦ *Rapid Virtualization Indexing (RVI)* is now supported on 64-bit, 32-bit, and 32-bit PAE kernels. However, RVI can only translate 32-bit guest virtual addresses on the 32-bit PAE hypervisor.

As such, if a guest is running a PAE kernel with more than 3840MB of RAM, a wrong address translation error will occur. This can crash the guest.

It is recommended that you use the 64-bit kernel if you intend to run guests with more than 4GB of physical RAM under RVI.

- ✦ Running 16 cores or more using *AMD Rev F* processors may result in system resets when performing fully-virtualized guest installations.
- ✦ Installing the **systemtap-runtime** package will result in a transaction check error if the **systemtap** package is already installed. Further, upgrading Red Hat Enterprise Linux 5 to 5.1 will also fail if the **systemtap** package is already installed.

As such, remove the **systemtap** package using the command **rpm -e systemtap-0.5.12-1.e15** before installing **systemtap-runtime** or performing an upgrade.

- ✦ When setting up NFSROOT, **BOOTPROTO** must be set as **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0**.

If your environment requires a different setting for **BOOTPROTO**, then temporarily set **BOOTPROTO=dhcp** in **/etc/sysconfig/network-scripts/ifcfg-eth0** before initially creating the **initrd**. You can reset the original value of **BOOTPROTO** after the **initrd** is created.

- ✦ The *QLogic iSCSI Expansion Card* for the *IBM Bladecenter* provides both ethernet and iSCSI functions. Some parts on the card are shared by both functions. However, the current **qla3xxx** and **qla4xxx** drivers support ethernet and iSCSI functions individually. Both drivers do not support the use of ethernet and iSCSI functions simultaneously.

As such, using both ethernet and iSCSI functions simultaneously may hang the device. This could result in data loss and filesystem corruption on iSCSI devices, or network disruptions on other connected ethernet devices.

- ✦ When using **virt-manager** to add disks to an existing guest, duplicate entries may be created in the guest's **/etc/xen/<domain name>** configuration file. These duplicate entries will prevent the guest from booting.

As such, you should remove these duplicate entries.

- Repeatedly migrating a guest between two hosts may cause one host to panic. If a host is rebooted after migrating a guest out of the system and before migrating the same guest back, the panic will not occur.
- **sysreport** is being deprecated in favor of **sos**. To install **sos**, run **yum install sos**. This command installs **sos** and removes **sysreport**. It is recommended that you update any existing kickstart files to reflect this.

After installing **sos**, use the command **sosreport** to invoke it. Using the command **sysreport** generates a warning that **sysreport** is now deprecated; continuing will invoke **sosreport**.

If you need to use the **sysreport** tool specifically, use the command **sysreport .legacy** to invoke it.

For more information about **sosreport**, refer to **man sosreport** and **sosreport --help**.

5.1. Installation-Related Notes

This section includes information specific to **Anaconda** and the installation of Red Hat Enterprise Linux 5.1.

To upgrade an already-installed Red Hat Enterprise Linux 5, you can use Red Hat Network to update those packages that have changed.

You may also use **Anaconda** to perform a fresh installation of Red Hat Enterprise Linux 5.1 or to perform an upgrade from *the latest updated version* of Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5.1.

Anaconda can also be used to upgrade an already-installed Red Hat Enterprise Linux 5.

- If you are copying the contents of the Red Hat Enterprise Linux 5 CD-ROMs (in preparation for a network-based installation, for example) be sure to copy the CD-ROMs for the operating system *only*. Do not copy the **Supplementary CD-ROM**, or any of the layered product CD-ROMs, as this will overwrite files necessary for **Anaconda**'s proper operation.

The contents of the **Supplementary CD-ROM** and other layered product CD-ROMs must be installed *after* Red Hat Enterprise Linux 5.1 has been installed.

- When installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, do *not* use the **kernel-xen** kernel. Using this kernel on fully virtualized guests can cause your system to hang.

If you are using an Installation Number when installing Red Hat Enterprise Linux 5.1 on a fully virtualized guest, be sure to deselect the **Virtualization** package group during the installation. The **Virtualization** package group option installs the **kernel-xen** kernel.

Note that paravirtualized guests are not affected by this issue. Paravirtualized guests always use the **kernel-xen** kernel.

- If you are using the Virtualized kernel when upgrading from Red Hat Enterprise Linux 5 to 5.1, you must reboot after completing the upgrade. You should then boot the system using the updated Virtualized kernel.

The hypervisors of Red Hat Enterprise Linux 5 and 5.1 are not ABI-compatible. If you do not boot the system after upgrading using the updated Virtualized kernel, the upgraded Virtualization RPMs will not match the running kernel.

5.1.1. Installation / Boot for iSCSI software initiator (open-iscsi)

iSCSI installation and boot was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview. This feature is now fully supported, with the restrictions described below.

This capability has three configurations depending on whether you are:

- ✦ using a hardware iSCSI initiator (such as the *QLogic qla4xxx*)
- ✦ using the **open-iscsi** initiator on a system with firmware boot support for iSCSI (such as iSCSI Boot Firmware, or a version of Open Firmware that features the iSCSI boot capability)
- ✦ using the **open-iscsi** initiator on a system with no firmware boot support for iSCSI

5.1.1.1. Using a Hardware iSCSI Initiator

If you are using a hardware iSCSI initiator, you can use the card's BIOS set-up utility to enter the IP address and other parameters required to obtain access to the remote storage. The logical units of the remote storage will be available in **Anaconda** as standard **sd** devices, with no additional set-up required.

If you need to determine the initiator's qualified name (IQN) in order to configure the remote storage server, follow these steps during installation:

1. Go to the installer page where you select which disk drives to use for the installation.
2. Click on **Advanced storage configuration**.
3. Click on **Add iSCSI target**.
4. The iSCSI IQN will be displayed on that screen.

5.1.1.2. Using open-iscsi On A System With Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with firmware boot support for iSCSI, use the firmware's setup utility to enter the IP address and other parameters needed to access the remote storage. Doing this configures the system to boot from the remote iSCSI storage.

Currently, Anaconda does not access the iSCSI information held by the firmware. Instead, you must manually enter the target IP address during installation. To do so, determine the IQN of the initiator using the procedure described above. Afterwards, on the same installer page where the initiator IQN is displayed, specify the IP address of the iSCSI target you wish to install to.

After manually specifying the IP address of the iSCSI target, the logical units on the iSCSI targets will be available for installation. The **initrd** created by **Anaconda** will now obtain the IQN and IP address of the iSCSI target.

If the IQN or IP address of the iSCSI target are changed in the future, enter the iBFT or Open Firmware set-up utility on each initiator and change the corresponding parameters. Afterwards, modify the **initrd** (stored in the iSCSI storage) for each initiator as follows:

1. Expand the **initrd** using **gunzip**.
2. Unpack it using **cpio -i**.
3. In the **init** file, search for the line containing the string **iscsistartup**. This line also contains the IQN and IP address of the iSCSI target; update this line with the new IQN and IP address.
4. Re-pack the **initrd** using **cpio -o**.
5. Re-compress the **initrd** using **gunzip**.

The ability of the operating system to obtain iSCSI information held by the Open Firmware / iBFT firmware is planned for a future release. Such an enhancement will remove the need to modify the **initrd** (stored in the iSCSI storage) for each initiator whenever the IP address or IQN of the iSCSI target is changed.

5.1.1.3. Using open-iscsi On A System With No Firmware Boot Support for iSCSI

If you are using the **open-iscsi** software initiator on a system with no firmware boot support for iSCSI, use a network boot capability (such as PXE/tftp). In this case, follow the same procedure described earlier to determine the initiator IQN and specify the IP address of the iSCSI target. Once completed, copy the **initrd** to the network boot server and set up the system for network boot.

Similarly, if the IP address or IQN of the iSCSI target is changed, the **initrd** should be modified accordingly as well. To do so, use the same procedure described earlier to modify the **initrd** for each initiator.

5.2. Feature Updates

EXT3 Enhancement

The maximum capacity of the EXT3 is now 16TB (increased from 8TB). This enhancement was originally included in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this update.

yum-security

It is now possible to limit **yum** to install security updates *only*. To do so, simply install the **yum-security** plugin and run the following command:

```
yum update --security
```

Anaconda layer 2 Mode Enhancement

Anaconda now supports connections to a *VSWITCH*, *GuestLAN*, or *OSA* in **layer 2** mode. The installer now prompts for the mode in the initial stage of the installation. The value provided for the mode also affects the resulting network interface startup script after installation.

For **layer 2** installations, the value **OPTIONS="layer2=1"** is written to **ifcfg-eth0**; for **layer 3**, the value **ARP=no** is written.

Note that when installing on a *System z* guest, you can make the mode persistent. To do so, add either **LAYER2=0** or **LAYER2=1** to the CMS configuration file. Use **LAYER2=0** when the OSA is in **layer 3** mode, and **LAYER2=1** when the OSA is in **layer 2** mode.

When specifying **LAYER2=1**, you can also specify **VSWITCH=1** when connecting to a VSWITCH, or **VSWITCH=0** when connecting directly to the OSA. If a VSWITCH is not in use, specify the MAC address in the CMS configuration file using the parameter **MACADDR=<MAC address>**.

Restarting a Resource Independently

It is now possible to restart a resource in a cluster without interrupting its parent service. This can be configured in **/etc/cluster/cluster.conf** on a running node using the **__independent_subtree="1"** attribute to tag a resource as independent.

For example:

```
<service name="example">
  <fs name="One" __independent_subtree="1" ...>
    <nfsexport ...>
      <nfscclient .../>
    </nfsexport>
  </fs>
  <fs name="Two" ...>
    <nfsexport ...>
      <nfscclient .../>
  </fs>
```

```

        </nfsexport>
        <script name="Database" .../>
    </fs>
    <ip/>
</service>

```

Here, two file system resources are used: **One** and **Two**. If **One** fails, it is restarted without interrupting **Two**. If **Two** fails, all components (**One**, children of **One** and children of **Two**) are restarted. At no given time are **Two** and its children dependent on any resource provided by **One**.

Note that *Samba* requires a specific service structure, and as such it cannot be used in a service with independent subtrees. This is also true for several other resources, so use the `__independent_subtree="1"` attribute with caution.

Virtualization

The following Virtualization updates are also included in this release:

- *AMD-V* is now supported in this release. This enables live domain migration for fully virtualized guests.
- The in-kernel socket API is now expanded. This was done to fix a bug that occurs when running `sctp` between guests.
- Virtual networking is now part of **libvirt**, the virtualization library. **libvirt** has a set of commands that sets up a virtual NAT/router and private network for all local guests on a machine. This is especially useful for guests that do not need to be routable from the outside. It is also useful for developers who use Virtualization on laptops.

Note that the virtual networking capability adds a dependency on **dnsmasq**, which handles **dhcp** for the virtual network.

For more information about **libvirt**, refer to <http://libvirt.org>.

- **libvirt** can now manage inactive virtual machines. **libvirt** does this by defining and undefining domains without stopping or starting them. This functionality is similar to the `virsh define` and `virsh undefine` commands.

This enhancement allows the Red Hat Virtual Machine Manager to display all available guests. This allows you to start these guests directly from the GUI.

- Installing the **kernel-xen** package no longer leads to the creation of incorrect / incomplete `elilo.conf` entries.
- The `xm create` command now has a graphical equivalent in **virt-manager**.
- *Nested Paging* (NP) is now supported. This feature reduces the complexity of memory management in virtualized environments. In addition, NP also reduces CPU utilization in memory-intensive guests.

At present, NP is not enabled by default. If your system supports NP, it is recommended that you enable NP by booting the hypervisor with the parameter `hap=1`.

Shared Page Tables

Shared page tables are now supported for **hugetlb** memory. This enables page table entries to be shared among multiple processes.

Sharing page table entries among multiple processes consumes less cache space. This improves

application cache hit ratio, resulting in better application performance.

Installing to dm-multipath Devices

Anaconda now has the capability to detect, create, and install to *dm-multipath* devices. To enable this feature, add the parameter **mpath** to the kernel boot line.

This feature was originally introduced in Red Hat Enterprise Linux 5 as a Technology Preview, and is now fully supported in this release.

Note that **dm-multipath** also features inbox support for the *Dell MD3000*. However, multiple nodes that use **dm-multipath** to access the MD3000 cannot perform immediate failback.

Further, it is recommended that you use the **Custom Partitioning** interface in **Anaconda** if your system has both multipath and non-multipath devices. Using **Automatic Partitioning** in such cases may create both types of devices in the same logical volume groups.

At present, the following restrictions apply to this feature:

- ✦ If there is only one path to the boot Logical Unit Number (LUN), **Anaconda** installs to the SCSI device even if **mpath** is specified. Even after you enable multiple paths to the boot LUN and recreate the **initrd**, the operating system will boot from the SCSI device instead of the **dm-multipath** device.

However, if there are multiple paths to the boot LUN to begin with, **Anaconda** will correctly install to the corresponding **dm-multipath** device after **mpath** is specified in the kernel boot line.

- ✦ By default, **user_friendly_names** is set to **yes** in **multipath.conf**. This is a required setting in the support implementation of the **dm-multipath** root device. As such, setting **user_friendly_names** to **no** and recreating the **initrd** will result in a boot failure with the following error:

```
Checking filesystems
fsck.ext3: No such file or directory while trying to open
/dev/mapper/mpath0p1
```

Booting from Storage Area Network (SAN)

The ability to boot from a SAN disk device is now supported. In this case, SAN refers to a Fibre Channel or iSCSI interface. This capability also features support for system-to-storage connection through multiple paths using **dm-multipath**.

In configurations that use multiple host bus adapters (HBA), you may need to set the system BIOS to boot from another adapter if all paths through the current adapter fail.

Driver Update Program

The Driver Update Program (DUP) was designed to allow third-party vendors (such as OEMs) to add their own device drivers and other Linux Kernel Modules to Red Hat Enterprise Linux 5 systems using regular RPM packages as the distribution containers.

Red Hat Enterprise Linux 5.1 applies several updates to the DUP, most notably:

- ✦ install-time Driver Update RPMs through Driver Update Disks is now supported
- ✦ bootpath Driver Updates affecting the system bootpath are now supported

- support for third-party packaging of *Advanced Linux Sound Architecture* (ALSA) is now deprecated

Further, various updates were applied to the approved kernel ABI symbol whitelists. These whitelists are used by packaging drivers to determine which symbols and data structures provided by the kernel can be used in a third-party driver.

For more information, refer to <http://www.kerneldrivers.org/RedHatKernelModulePackages>.

5.3. Driver Updates

General Driver Updates

- acpi: updated **ibm_acpi** module to address several ACPI and docking station issues with Lenovo laptops.
- ipmi: Polling **kthread** no longer runs when hardware interrupt is assigned to a Baseboard Management Controller.
- sata: **SATA/SAS** upgraded to version 2.6.22-rc3.
- **openib** and **openmpi**: upgraded to OFED (OpenFabrics Enterprise Distribution) version 1.2.
- **crypto**: added support for 3592 tape encryption and *secure key* feature of *IBM System z* machines .
- **powernow-k8**: upgraded to version 2.0.0 to fully support *Greyhound*.
- **xinput**: added to enable full RSA support.
- **aic94xx**: upgraded to version 1.0.2-1, in line with an upgrade of the embedded sequencer firmware to v17. These updates apply the following changes:
 - fixed **ascb** race condition on platforms with expanders
 - added **REQ_TASK_ABORT** and **DEVICE_RESET** handlers
 - physical ports are now cleaned up properly after a discovery error
 - **phys** can now be enabled and disabled through **sysfs**
 - extended use of DDB lock to prevent race condition of DDB

Audio

ALSA updated to version 1.0.14. This update applies the following fixes:

- fixed noise problem on the IBM Taroko (M50)
- *Realtek ALC861* is now supported
- fixed a muting problem on xw8600 and xw6600
- *ADI 1884 Audio* is now supported
- fixed an audio configuration problem on xw4600

PCI

- added function calls to set maximum read request size for PCIX and PCI-Express

- *IBM System P* machines now support PCI-Express hotplugging
- added necessary drivers and PCI ID to support SB600 SMBus

Network

- **e1000** driver: updated to version 7.3.20-k2 to support I/OAT-enabled chipsets.
- **bnx2** driver: updated to version 1.5.11 to support 5709 hardware.
- **B44** ethernet driver: backported from upstream version 2.6.22-rc4 to apply the following changes:
 - several **endianness** fixes were made
 - **DMA_30BIT_MASK** constant is now used
 - **skb_copy_from_linear_data_offset()** is now used
 - **spin_lock_irqsave()** now features safer interrupt disabling
 - simple error checking is performed during resume
 - several fixes to multicast were applied
 - chip reset now takes longer than previously anticipated
- *Marvell sky2* driver: updated to version 1.14 to fix a bug that causes a kernel panic if the **ifup/ifdown** commands are executed repeatedly.
- **forcedeth-0.60** driver: now included in this release. This applies several critical bug fixes for customers using *NVIDIA's* MCP55 motherboard chipsets and corresponding onboard NIC.
- **ixgb** driver: updated to the latest upstream version (1.0.126).
- **netxen_nic** driver: version 3.4.2-2 added to enable support for *NetXen 10GbE* network cards.
- *Chelsio 10G Ethernet Network Controller* is now supported.
- added support for PCI error recovery to the **s2io** device.
- Broadcom wireless ethernet driver now supports PCI ID for *nx6325* card.
- fixed a bug that caused an **ASSERTION FAILED** error when attempting to start a *BCM4306* via **ifup**.
- **ixgb** driver: updated to add EEH PCI error recovery support for the Intel 10-gigabit ethernet card. For more information, refer to `/usr/share/doc/kernel-doc-<kernel version>/Documentation/pci-error-recovery.txt`.
- **qla3xxx** driver: re-enabled and updated to version 2.03.00-k3 to provide networking support for *QLogic* iSCSI adapters without using iSCSI.
- **qla2xxx**: driver upgraded to version 8.01.07-k6. This applies several changes, most notably:
 - iIDMA is now supported
 - the following Fibre Channel attributes are now supported:

- symbolic nodename
- system hostname
- fabric name
- host port state
- trace-control async events are no longer logged
- reset handling logic has been corrected
- MSI-X is now supported
- IRQ-0 assignments are now handled per system
- NVRAM updates immediately go into effect

IPMI

This release includes an update of the **IPMI** driver set to include the upstream changes as of version 2.6.21.3, with some patches included from 2.6.22-rc-4. This update features the following changes (among others):

- fixed uninitialized data bug in **ipmi_si_intf**
- **kipmid** is no longer started if another driver supports interrupts
- users are now allowed to override the kernel daemon **enable** through **force_kipmid**
- per-channel command registration is now supported
- **MAX_IPMI_INTERFACES** is no longer used
- hot system interface removal is now supported
- added a Maintenance Mode to support firmware updates
- added **poweroff** support for the **pigeonpoint** IPMC
- BT subdriver can now survive long timeouts
- added **pci_remove** handling for proper cleanup on a hot remove

For information about new module parameters, refer to **/usr/share/doc/kernel-doc-*<kernel version>*/Documentation/IPMI.txt**.

SCSI

- ported SCSI blacklist from Red Hat Enterprise Linux 4 to this release.
- added PCI IDs for **aic79xx** driver.
- **aacraid** driver: updated to version 1.1.5-2437 to support *PRIMERGY RX800S2* and *RX800S3*.
- **megaraid_sas** driver: updated to version 3.10. This update defines the entry point for **bios_param**, adds an IOCTL memory pool, and applies several minor bug fixes.
- *Emulex lpfc* driver: updated to version 8.1.10.9. This update applies several changes, most notably:

- fixed **host_lock** management in the **ioct1** paths
- the *AMD* chipset is now automatically detected, and reduced the DMA length to 1024 bytes
- nodes are no longer removed during **dev_loss_tmo** if discovery is active
- 8GB link speeds are now enabled
- ✦ **qla4xxx** driver updated to apply the following changes:
 - added support for IPV6, QLE406x and **ioct1** module
 - fixed a **mutex_lock** bug that could cause lockups
 - resolved lockup issues of **qla4xxx** and **qla3xxx** when attempting to load/unload either interface
- ✦ **mpt fusion** drivers: updated to version 3.04.04. This update applies several changes, most notably:
 - fixed several error handling bugs
 - **mptsas** now serializes target resets
 - **mptsas** and **mptfc** now support LUNs and targets greater than 255
 - fixed an LSI **mptspi** driver regression that resulted in extremely slow DVD driver performance
 - when an LSI SCSI device returns a **BUSY** status, I/O attempts no longer fail after several retries
 - RAID arrays are no longer unavailable after auto-rebuild
- ✦ **arcmsr** driver: included to provide support for *Areca* RAID controllers.
- ✦ **3w-9xxx** module: updated to correctly support 3ware 9650SE.

5.4. Kernel-Related Updates

- ✦ The CIFS client has been updated to version 1.48aRH. This is based upon the 1.48a release, with patches that apply the following changes:
 - the mount option **sec=none** results in an anonymous mount
 - CIFS now honors the **umask** when POSIX extensions are enabled
 - fixed **sec=** mount options that request packet signing

Note that for users of the *EMC Celerra* product (NAS Code 5.5.26.x and below), the CIFS client hangs when accessing shares on EMC NAS. This issue is characterized by the following kernel messages:

```
kernel: CIFS VFS: server not responding
kernel: CIFS VFS: No response for cmd 162 mid 380
kernel: CIFS VFS: RFC1001 size 135 bigger than SMB for Mid=384
```

After a CIFS mount, it becomes impossible to read/write any file on it and any application that attempts an I/O on the mountpoint will hang. To resolve this issue, upgrade to NAS Code 5.5.27.5 or later (use EMC Primus case number emc165978).

- ✦ **MODULE_FIRMWARE** tags are now supported.
- ✦ Automatic reboot/dump in case of kernel panic is now supported.
- ✦ *ICH9* controllers are now supported.
- ✦ *Greyhound* processors are now supported in **CPUID** calls.
- ✦ **Oprofile** now supports new *Greyhound* performance counter events.
- ✦ *Directed DIAG* is now supported to improve *z/VM* utilization.
- ✦ The *Intel* graphics chipset is now supported through the **DRM** kernel module. Further, the DRM API has been upgraded to version 1.3 to support direct rendering.
- ✦ Updates to **ACPI** power management have improved S3 suspend-to-RAM and S4 hibernate.

5.5. Other Updates

- ✦ **gaim** is now called **pidgin**.
- ✦ Implicit active-active failover using **dm-multipath** on *EMC Clariion* storage is now supported.
- ✦ The Chinese font *Zysong* is no longer installed as part of the **fonts-chinese** package. *Zysong* is now packaged separately as **fonts-chinese-zysong**. The **fonts-chinese-zysong** package is located in the **Supplementary CD**.

Note that the **fonts-chinese-zysong** package is needed to support the Chinese National Standard GB18030.

- ✦ The Challenge Handshake Authentication Protocol (CHAP) username and password have a character limit of 256 each.
- ✦ **pump** is deprecated in this update. As such, configuring your network interface through **netconfig** may result in broken **ifcfg** scripts.

To properly configure your network interface, use **system-config-network** instead. Installing the updated **system-config-network** package removes **netconfig**.

- ✦ **rpm --aid** is no longer supported. It is recommended that you use **yum** when updating and installing packages.

5.6. Technology Previews

Technology Preview features are currently *not* supported under Red Hat Enterprise Linux 5.1 subscription services, may not be functionally complete, and are generally not suitable for production use. However, these features are included as a customer convenience and to provide the feature with wider exposure.

Customers may find these features useful in a non-production environment. Customers are also free to provide feedback and functionality suggestions for a *Technology Preview* feature before it becomes fully supported. Erratas will be provided for high-severity security issues.

During the development of a *Technology Preview* feature, additional components may become available to the public for testing. It is the intention of Red Hat to fully support *Technology Preview* features in a future release.

Stateless Linux

Stateless Linux is a new way of thinking about how a system should be run and managed, designed to simplify provisioning and management of large numbers of systems by making them easily replaceable. This is accomplished primarily by establishing prepared system images which get replicated and managed across a large number of stateless systems, running the operating system in a read-only manner (refer to `/etc/sysconfig/readonly-root` for more details).

In its current state of development, the Stateless features are subsets of the intended goals. As such, the capability remains as Technology Preview.

The following is a list of the initial capabilities included in Red Hat Enterprise Linux 5:

- running a stateless image over NFS
- running a stateless image via loopback over NFS
- running on iSCSI

It is highly recommended that those interested in testing stateless code read the HOWTO at <http://fedoraproject.org/wiki/StatelessLinuxHOWTO> and join stateless-list@redhat.com.

The enabling infrastructure pieces for Stateless Linux were originally introduced in Red Hat Enterprise Linux 5.

AIGLX

AIGLX is a Technology Preview feature of the otherwise fully supported X server. It aims to enable GL-accelerated effects on a standard desktop. The project consists of the following:

- a lightly modified X server
- an updated Mesa package that adds new protocol support

By installing these components, you can have GL-accelerated effects on your desktop with very few changes, as well as the ability to enable and disable them at will without replacing your X server. AIGLX also enables remote GLX applications to take advantage of hardware GLX acceleration.

FS-Cache

FS-Cache is a local caching facility for remote file systems that allows users to cache NFS data on a locally mounted disk. To set up the FS-Cache facility, install the **cachefilesd** RPM and refer to the instructions in `/usr/share/doc/cachefilesd-<version>/README`.

Replace `<version>` with the corresponding version of the **cachefilesd** package installed.

Systemtap

Systemtap provides free software (GPL) infrastructure to simplify the gathering of information about the running Linux system. This assists the diagnosis of a performance or functional problem. With the help of **systemtap**, developers no longer need to go through the tedious and disruptive instrument, recompile, install, and reboot sequence that may be otherwise required to collect data.

iSCSI Target

The Linux target (`tgt`) framework allows a system to serve block-level SCSI storage to other systems that have a SCSI initiator. This capability is being initially deployed as a Linux iSCSI target, serving storage over a network to any iSCSI initiator.

To set up the iSCSI target, install the **scsi-target-utils** RPM and refer to the instructions in:

- ✦ `/usr/share/doc/scsi-target-utils-<version>/README`
- ✦ `/usr/share/doc/scsi-target-utils-<version>/README.iscsi`

Replace `<version>` with the corresponding version of the package installed.

For more information, refer to `man tgtadm`.

FireWire

The `firewire-sbp2` module is included in this update as a Technology Preview. This module enables connectivity with FireWire storage devices and scanners.

At present, FireWire does not support the following:

- ✦ IPv4
- ✦ `pcilynx` host controllers
- ✦ multi-LUN storage devices
- ✦ non-exclusive access to storage devices

In addition, the following issues still exist in this version of FireWire:

- ✦ a memory leak in the `SBP2` driver may cause the machine to become unresponsive.
- ✦ a code in this version does not work properly in big-endian machines. This could lead to unexpected behavior in PowerPC.

5.7. Resolved Issues

- ✦ In multi-boot systems, `parted` now preserves the starting sector of the first primary partition where Windows Vista™ is installed. As such, when setting up a multi-boot system with both Red Hat Enterprise Linux 5.1 and Windows Vista™, the latter is no longer rendered unbootable.
- ✦ `rmmod xennet` no longer causes `domU` to crash.
- ✦ 4-socket AMD *Sun Blade X8400 Server Module* systems that do not have memory configured in `node 0` no longer panic during boot.
- ✦ `conga` and `luci` can now be used to create and configure failover domains.
- ✦ When installing the `Cluster Storage` group through `yum`, the transaction no longer fails.
- ✦ During installation, incorrect SELinux contexts are no longer assigned to `/var/log/faillog` and `/var/log/tallylog`.
- ✦ Installing Red Hat Enterprise Linux 5.1 using split installation media (for example, CD or NFSISO) no longer causes an error in the installation of `amanda-server`.
- ✦ Shutdown no longer hangs when unloading `iptables` modules.
- ✦ EDAC now reports the correct amount of memory on the latest k8 processors.
- ✦ Logging in remotely to a Gnome desktop via `gdm` no longer causes the login screen to hang.
- ✦ A bug in `autofs` that prevented multi-mounts from working properly is now fixed.
- ✦ Several patches to `utrace` apply the following fixes:

- fixed a bug that causes a crash in race condition when using **ptrace**
 - fixed a regression that prevented some **wait4** calls from waking up when a child exited under certain circumstances
 - fixed a regression that sometimes prevented **SIGKILL** from terminating a process. This occurred if **ptrace** was performed on a process under certain circumstances.
- ✦ A RealTime Clock (RTC) bug that prevented alarms and periodic RTC interrupts from working properly is now fixed.

5.8. Known Issues

- ✦ The first time the **Release Notes** button is clicked in **Anaconda**, a delay occurs while the window renders the Release Notes. During this delay, a seemingly empty list appears in the window. The rendering normally completes quickly, so most users may not notice this.

This delay is mostly due to the fact that the package installation phase is the most CPU-intensive phase of installation.

- ✦ Host bus adapters that use the MegaRAID driver must be set to operate in "Mass Storage" emulation mode, not in "I2O" emulation mode. To do this, perform the following steps:
- ✦ Enter the MegaRAID **BIOS Set Up Utility**.
 - ✦ Enter the **Adapter settings menu**.
 - ✦ Under **Other Adapter Options**, select **Emulation** and set it to **Mass Storage**.

If the adapter is incorrectly set to "I2O" emulation, the system will attempt to load the i2o driver. This will fail, and prevent the proper driver from being loaded.

Previous Red Hat Enterprise Linux releases generally do not attempt to load the I2O driver before the MegaRAID driver. Regardless of this, the hardware should always be set to "Mass Storage" emulation mode when used with Linux.

- ✦ Laptops equipped with the *Cisco Aironet MPI-350* wireless may hang trying to get a DHCP address during any network-based installation using the wired ethernet port.

To work around this, use local media for your installation. Alternatively, you can disable the wireless card in the laptop BIOS prior to installation (you can re-enable the wireless card after completing the installation).

- ✦ Currently, **system-config-kickstart** does not support package selection and deselection. When using **system-config-kickstart**, the **Package Selection** option indicates that it is disabled. This is because **system-config-kickstart** uses **yum** to gather group information, but is unable to configure **yum** to connect to Red Hat Network.

At present, you need to update package sections in your kickstart files manually. When using **system-config-kickstart** to open a kickstart file, it will preserve all package information in it and write it back out when you save.

- ✦ Boot-time logging to **/var/log/boot.log** is not available in this update of Red Hat Enterprise Linux 5. An equivalent functionality will be added in a future update.
- ✦ When upgrading from Red Hat Enterprise Linux 4 to Red Hat Enterprise Linux 5, the Deployment Guide is not automatically installed. You need to use **pirut** to manually install it after completing the upgrade.

- ✦ The system may not successfully reboot into a **kexec/kdump** kernel if X is running and using a driver other than *vesa*. This problem only exists with *ATI Rage XL* graphics chipsets.

If X is running on a system equipped with *ATI Rage XL*, ensure that it is using the *vesa* driver in order to successfully reboot into a **kexec/kdump** kernel.

- ✦ When using Red Hat Enterprise Linux 5 on a machine with an *nVidia CK804* chipset installed, the following kernel messages may appear:

```
kernel: assign_interrupt_mode Found MSI capability
kernel: pcie_portdrv_probe->Dev[005d:10de] has invalid IRQ. Check vendor BIOS
```

These messages indicate that certain PCI-E ports are not requesting IRQs. Further, these messages do not, in any way, affect the operation of the machine.

- ✦ Removable storage devices (such as CDs and DVDs) do not automatically mount when you are logged in as root. As such, you will need to manually mount the device through the graphical file manager.

Alternatively, you can run the following command to mount a device to **/media**:

```
mount /dev/<device name> /media
```

- ✦ The *IBM System z* does not provide a traditional Unix-style physical console. As such, Red Hat Enterprise Linux 5 for the *IBM System z* does not support the *firstboot* functionality during initial program load.

To properly initialize setup for Red Hat Enterprise Linux 5 on the *IBM System z*, run the following commands after installation:

- **/usr/bin/setup** — provided by the **setuptools** package.
 - **/usr/bin/rhn_register** — provided by the **rhn-setup** package.
- ✦ When upgrading from Red Hat Enterprise Linux 5 to Red Hat Enterprise Linux 5.1 via Red Hat Network, **yum** may not prompt you to import the redhat-beta key. As such, it is advised that you import the redhat-beta key manually prior to upgrading. To do this, run the following command:

```
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-redhat-beta
```

- ✦ When a LUN is deleted on a configured filer, the change is not reflected on the host. In such cases, **lvm** commands will hang indefinitely when **dm-multipath** is used, as the LUN has now become *stale*.

To work around this, delete all device and **mpath** link entries in **/etc/lvm/.cache** specific to the stale LUN.

To find out what these entries are, run the following command:

```
ls -l /dev/mpath | grep <stale LUN>
```

For example, if **<stale LUN>** is 3600d0230003414f30000203a7bc41a00, the following results may appear:

```
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00 -
> ../dm-4
lrwxrwxrwx 1 root root 7 Aug  2 10:33 /3600d0230003414f30000203a7bc41a00p1
-> ../dm-5
```

This means that 3600d0230003414f30000203a7bc41a00 is mapped to two **mpath** links: **dm-4** and **dm-5**.

As such, the following lines should be deleted from **/etc/lvm/.cache**:

```
/dev/dm-4
/dev/dm-5
/dev/mapper/3600d0230003414f30000203a7bc41a00
/dev/mapper/3600d0230003414f30000203a7bc41a00p1
/dev/mpath/3600d0230003414f30000203a7bc41a00
/dev/mpath/3600d0230003414f30000203a7bc41a00p1
```

- ✳ When attempting to create a fully virtualized Windows™ guest from a CD or DVD, the second stage of the guest install might not continue upon reboot.

To work around this, edit **/etc/xen/<name of guest machine>** by properly appending an entry for the CD / DVD device.

If an installation to a simple file is used as a virtual device, the **disk** line of **/etc/xen/<name of guest machine>** will read like the following:

```
disk = [ 'file:/PATH-OF-SIMPLE-FILE,hda,w' ]
```

A DVD-ROM device located on the host as **/dev/dvd** can be made available to stage 2 of the installation as **hdc** by appending an entry like **'phy:/dev/dvd,hdc:cdrom,r'**. As such, the disk line should now read as follows:

```
disk = [ 'file:/opt/win2003-sp1-20061107,hda,w',
'phy:/dev/dvd,hdc:cdrom,r' ]
```

The precise device path to use may vary depending on your hardware.

- ✳ If the **sctp** module is not added to the kernel, running **netstat** with the **-A inet** or **-A inet6** option abnormally terminates with the following message:

```
netstat: no support for `AF_INET (sctp)' on this system.
```

To avoid this, install the **sctp** kernel module.

- ✳ Current kernels do not assert *Data Terminal Ready* (DTR) signals before printing to serial ports during boot time. DTR assertion is required by some devices; as a result, kernel boot messages are not printed to serial consoles on such devices.
- ✳ The *AMD 8132* and *HP BroadCom HT100* used on some platforms (such as the *HP dc7700*) do not support **MMCONFIG** cycles. If your system uses either chipset, your PCI configuration should use the legacy *PortIO CF8/CFC* mechanism. To configure this, boot the system with the kernel parameter **-pci nommconfig** during installation and add **pci=nommconf** to GRUB after rebooting.

Further, the *AMD 8132* chipset does not support Message Signaled Interrupts (MSI). If your system uses this chipset, you should also disable MSI. To do this, use the kernel parameter **-pci noms**i during installation and add **pci=noms**i to GRUB after rebooting.

However, if your specific platform is already blacklisted by the kernel, your system does not require the aforementioned **pci** kernel parameters. The following HP platforms are already blacklisted by the kernel:

- *DL585g2*

- *dc7500*
 - *xw9300*
 - *xw9400*
- ✦ The **Virtual Machine Manager** (**virt-manager**) included in this release does not allow users to specify additional boot arguments to the paravirtualized guest installer. This is true even when such arguments are required to install certain types of paravirtualized guests on specific types of hardware.

This issue will be addressed in a future release of **virt-manager**. To specify arbitrary kernel arguments in installing paravirtualized guests from the command line, use **virt-install**.

- ✦ With the default **dm-multipath** configuration, *Netapp* devices may take several minutes to complete failback after a previously failed path is restored. To resolve this problem, add the following *Netapp* device configuration to the **devices** section of the **multipath.conf** file:

```
devices {
    device {
        vendor                "NETAPP"
        product               "LUN"
        getuid_callout        "/sbin/scsi_id -g -u -s
/block/%n"
        prio_callout          "/sbin/mpath_prio_netapp
/dev/%n"
        features              "1 queue_if_no_path"
        hardware_handler      "0"
        path_grouping_policy  group_by_prio
        failback               immediate
        rr_weight              uniform
        rr_min_io              128
        path_checker           directio
    }
}
```