



**SuSE* Linux Enterprise Server
10 SP1 and 10 SP2 (x86 and
x64) Dual SCM (ALUA)
Installation BKM**

Intel Order Number: E37642-006

SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 Dual SCM Installation BKM – Table of contents

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UPGRADING FROM SINGLE SCM TO DUAL SCM

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SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation

- This section covers the steps required to update a SLES 10 SP1 and 10 SP2 Single SCM installation to a Dual SCM configuration.
The steps assume that the installation was performed with default settings for fstab values.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

Prior to installing the second SCM, perform the following steps:

- Boot the system and log in to the OS
- Type the following: `ls -la /dev/disk/by-id`
- Note the SCSI-ID associated with each partition (`sdx`)
- Edit `/etc/fstab` to reflect the “by-id” references
 - Modify the `/dev/sd*` references with `/dev/disk/by-id/scsi<xxxx>` obtained from the above steps
- Next, edit `/boot/grub/menu.lst`
 - Modify the `/dev/sd*` entries to `/dev/disk/by-id/scsi<xxxx>`



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

The screenshot displays a Remote KVM Session window titled "Remote KVM Session to Server 1 - 4 fps". The window contains two terminal windows. The top terminal window shows the output of the command `ls -la /dev/disk/by-id/`. The output lists various disk and partition identifiers, including `edd-int13_dev80` and `scsi-2226f000155593266`. A red box highlights the `scsi-2226f000155593266` entries. The bottom terminal window shows the YaST2 configuration file `/etc/yast2/conf.d/` with modifications for the dual SCM installation. The configuration includes the title "SUSE Linux Enterprise Server 10 SP1" and the kernel `/vmlinuz-2.6.16.46-0.12-smp`. The root filesystem is set to `/dev/disk/by-id/scsi-2226f000155593266-part3` and the resume device is `/dev/disk/by-id/scsi-2226f000155593266-part2`. The configuration also includes the title "SUSE Linux Enterprise Server 10 SP1" and the kernel `/vmlinuz-2.6.16.46-0.12-smp`. The root filesystem is set to `/dev/sda3` and the resume device is `/dev/disk/by-id/scsi-2226f000155593266-part2`.

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SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

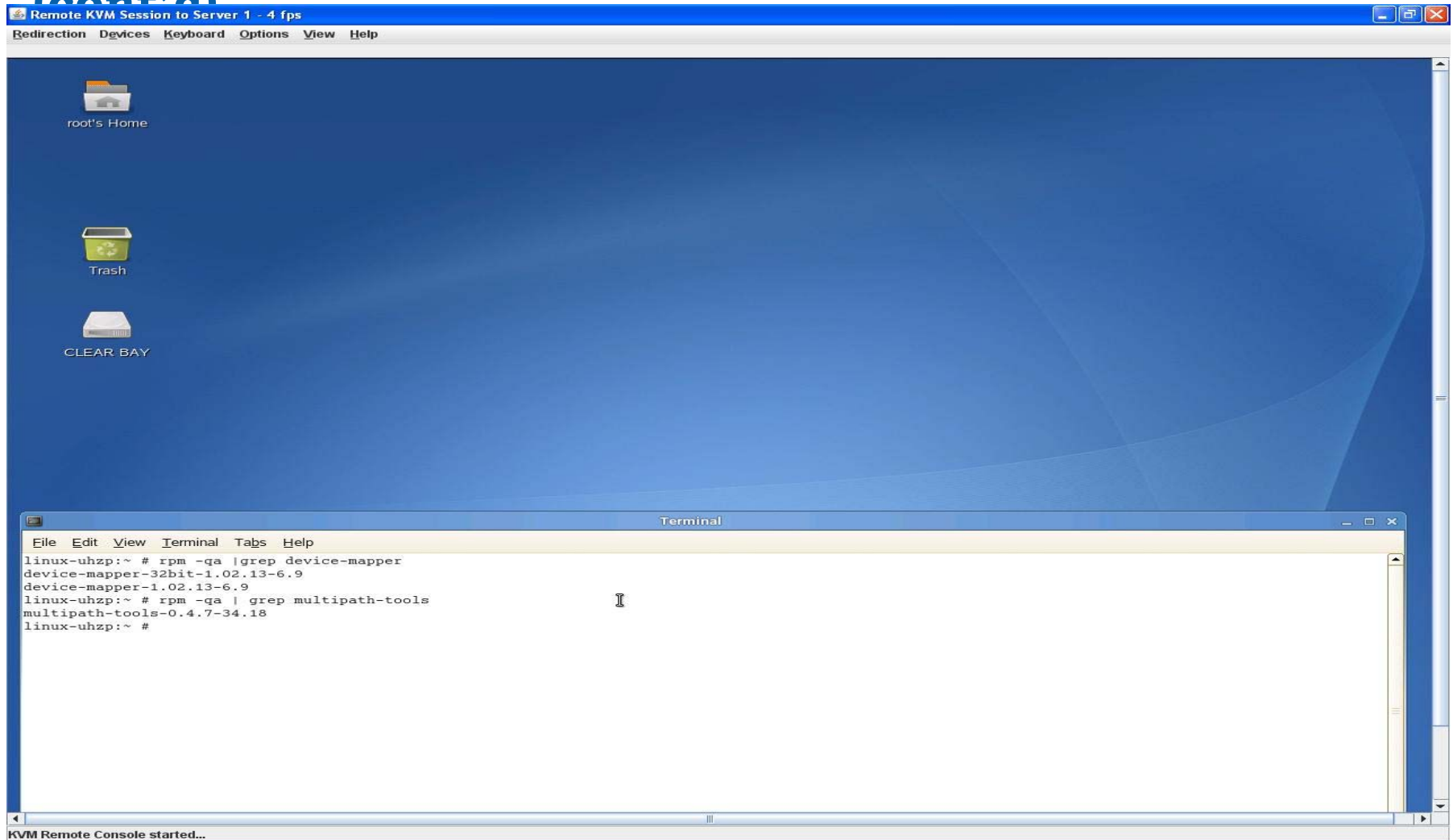
- Verify the installation of the packages by typing:
 - `rpm -qa | grep device-mapper`
 - This should return [device-mapper-1.02.13-6.9](#)
 - Version may be slightly different based on the installation package.
 - `rpm -qa | grep multipath-tools`
 - This should return [multipath-tools-0.4.7-34.18](#)
 - Version may be slightly different based on the installation package.

See the screenshot on the next slide for reference.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation

(cont'd)



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SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

- Update the LSI MPT SAS driver only for SuSE* Linux Enterprise Server 10 SP1 as follows:
 - Copy the SuSE* Linux Enterprise Server driver package (mptlinux-4.00.36.00-1-sles10.x86_64.rpm) to a known location on the system under test.
 - /temp is assumed for the remainder of the BKM.
 - Open a terminal window
 - cd /temp/
 - Type “rpm -ivh mptlinux-4.00.36.00-1-sles10.x86_64.rpm”

NOTE: You do not need to update the LSI driver for SuSE* Linux Enterprise Server 10 SP2, as it already contains an updated driver.

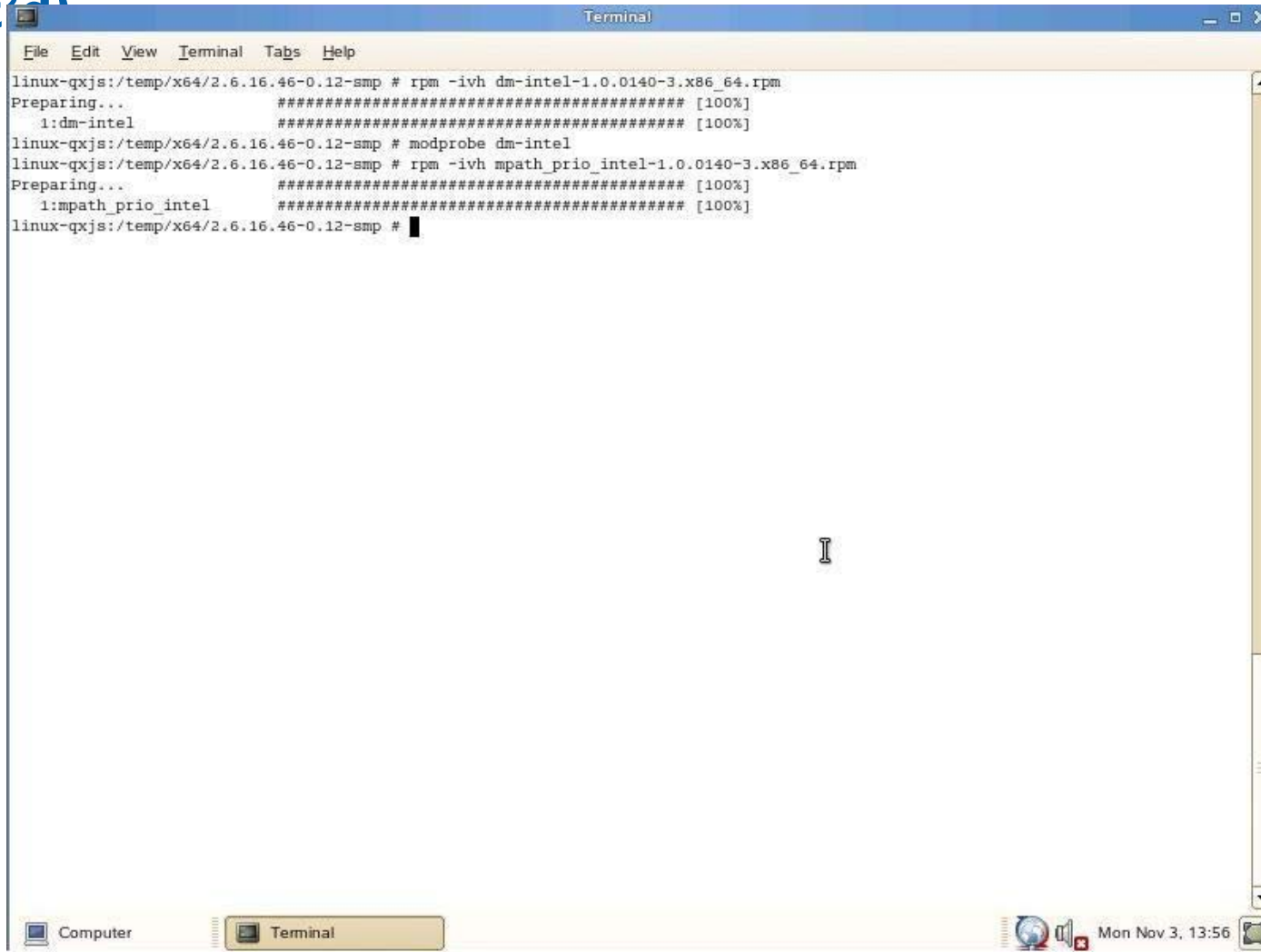


SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

- Set up Multipath ALUA
 - Copy the SuSE* Linux Enterprise Server driver package to a known location on the system under test
 - /temp is assumed for the remainder of the BKM
 - Open a terminal window
 - `cd /temp/<OS type>/2.6.16.46-0.12-smp`
 - Load the priority driver by typing:
 - For an x86 installation: `rpm -ivh dm-intel-1.0.0140-3.i586.rpm`
 - For an x64 installation: `rpm -ivh dm-intel-1.0.0140-3.x86_64.rpm`
 - Type “`modprobe dm-intel`”
 - The system will not return anything, which indicates a successful installation.
 - Verify the module loaded by typing “`lsmod | grep dm_intel`”
 - Load the priority driver by typing:
 - For an x86 installation: `rpm -ivh mpath_prio_intel-1.0.0140-3.i586.rpm`
 - For an x64 installation: `rpm -ivh mpath_prio_intel-1.0.0140-3.x86_64.rpm`



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont¹)



```
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp # rpm -ivh dm-intel-1.0.0140-3.x86_64.rpm
Preparing...
 1:dm-intel
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp # modprobe dm-intel
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp # rpm -ivh mpath_prio_intel-1.0.0140-3.x86_64.rpm
Preparing...
 1:mpath_prio_intel
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp #
```

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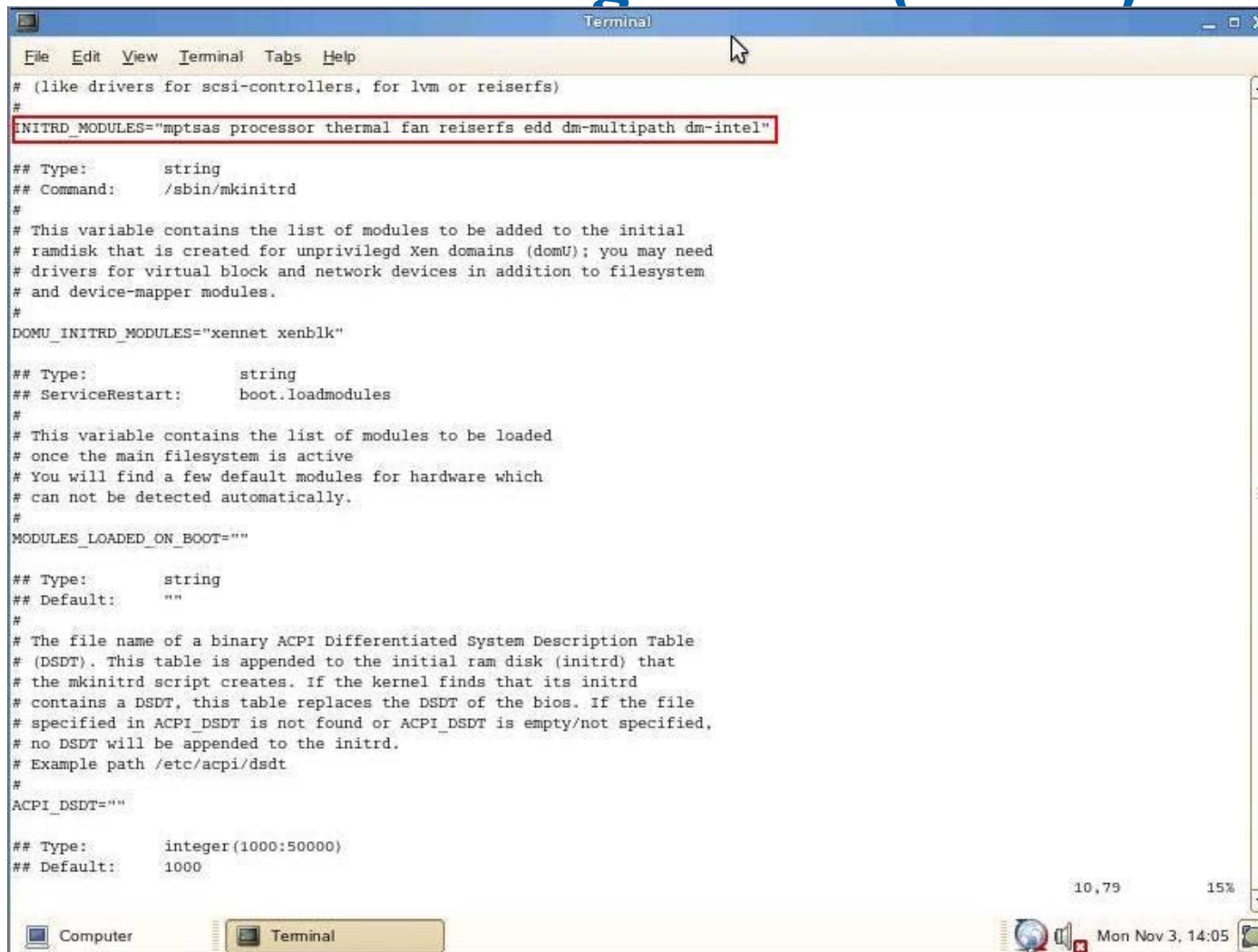


SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

- Copy “multipath.conf.SLES” to the /etc directory and rename multipath.conf
- Type the following commands:
 - `chkconfig boot.multipath on <return>`
 - `chkconfig multipathd on <return>`
- Edit /etc/sysconfig/kernel by adding “dm-multipath” and “dm-intel” to the INITRD_MODULES section in the mentioned sequence.
 - See the screenshot on the next slide for reference.
- Type the following:
 - `mkinitrd`
This will create a new kernel image file.
- Shut down the compute module and install the second SCM.
- Once the required FW updates have completed on the second SCM, power on the compute module.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)



A terminal window titled "Terminal" with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal displays configuration text for the INITRD_MODULES variable. The line `INITRD_MODULES="mptsas processor thermal fan reiserfs edd dm-multipath dm-intel"` is highlighted with a red box. The terminal also shows comments about the variable's purpose and other related variables like DOMU_INITRD_MODULES, MODULES_LOADED_ON_BOOT, and ACPI_DSDT.

```
File Edit View Terminal Tabs Help
# (like drivers for scsi-controllers, for lvm or reiserfs)
#
INITRD_MODULES="mptsas processor thermal fan reiserfs edd dm-multipath dm-intel"
## Type:      string
## Command:   /sbin/mkinitrd
#
# This variable contains the list of modules to be added to the initial
# ramdisk that is created for unprivileged Xen domains (domU); you may need
# drivers for virtual block and network devices in addition to filesystem
# and device-mapper modules.
#
DOMU_INITRD_MODULES="xennet xenblk"
## Type:      string
## ServiceRestart:  boot.loadmodules
#
# This variable contains the list of modules to be loaded
# once the main filesystem is active
# You will find a few default modules for hardware which
# can not be detected automatically.
#
MODULES_LOADED_ON_BOOT=""
## Type:      string
## Default:   ""
#
# The file name of a binary ACPI Differentiated System Description Table
# (DSDT). This table is appended to the initial ram disk (initrd) that
# the mkinitrd script creates. If the kernel finds that its initrd
# contains a DSDT, this table replaces the DSDT of the bios. If the file
# specified in ACPI_DSDT is not found or ACPI_DSDT is empty/not specified,
# no DSDT will be appended to the initrd.
# Example path /etc/acpi/dsdt
#
ACPI_DSDT=""
## Type:      integer(1000:50000)
## Default:   1000
10,79 15%
Computer Terminal Mon Nov 3, 14:05
```

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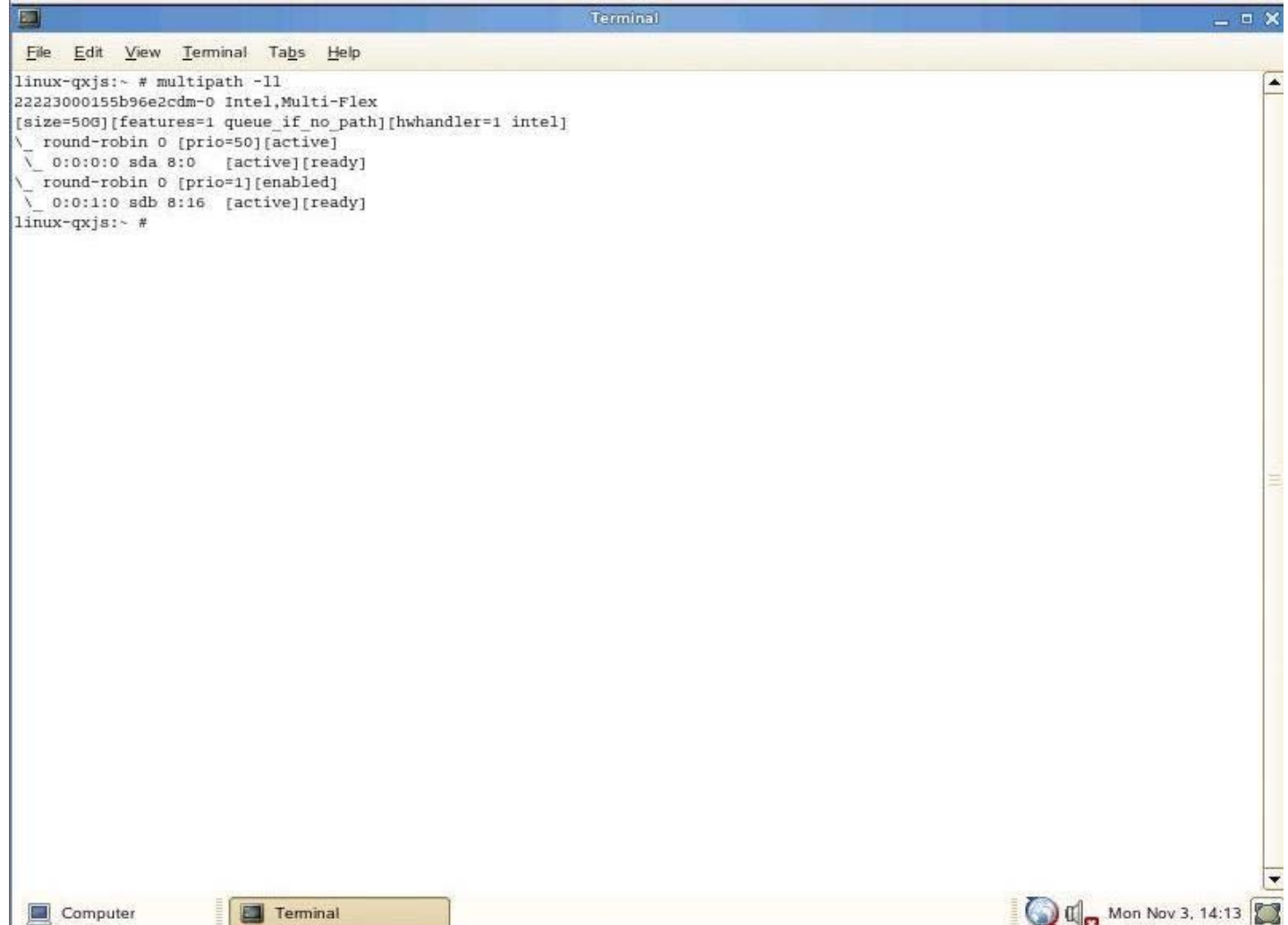
SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

- To display the topology, type the following command:
 - `multipath -ll`

For a sample output of the “`multipath -ll`” command, see the screenshot on the next slide.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)



```
linux-qxjs:~ # multipath -ll
22223000155b96e2cdm-0 Intel,Multi-Flex
[size=50G][features=1 queue_if_no_path][hwhandler=1 intel]
\_ round-robin 0 [prio=50][active]
  \_ 0:0:0:0 sda 8:0 [active][ready]
  \_ round-robin 0 [prio=1][enabled]
    \_ 0:0:1:0 sdb 8:16 [active][ready]
linux-qxjs:~ #
```

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SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Updating from Single SCM Installation to Dual SCM Installation (cont'd)

- The server is now properly configured for Multipath usage.

NOTE: Some I/O errors are normal on a properly configured system. Each multipath device is composed of an active path and a standby path. The standby path is only used if the active path fails. Any I/Os to the standby path will be rejected while the active path is healthy. Normal attempts by the Linux OS to probe standby paths can result in some I/O errors in /var/log/messages as follows:

```
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdd, sector 0
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdd, sector 0
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdc, sector 0
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdc, sector 0
```

Other attempts to access the standby paths, such as with fdisk, will also result in failures. This is normal for Linux Multipath solutions and is not specific to an Intel® Modular Server.



NEW OS INSTALLATION IN A DUAL SCM CONFIGURATION

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New Installation in Dual SCM Configuration

- This section covers a fresh install of SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 in a Dual SCM configuration.



Virtual Drive Creation and Slot Assignment

- Create Storage Pool -> Virtual Drive and assign to a compute module
 - Note the SCM assigned as the active path (see the red box in the screenshot on the next slide).
 - It is recommended to set controller Affinity to SCM1 during Virtual Drive creation, although installation to a drive with controller Affinity set to SCM2 is also supported.
 - If SCM1 is not the active path, it can be changed by selecting the virtual drive from the Storage tab, then clicking the “affinity” button, and choosing SCM1 from the drop-down menu.



Virtual Drive Properties Page Showing SCM1 Affinity/Active Controller

intel Modular Server Control
Built on Intel® Multi-Flex Technology

Current user: admin | Log off | Help

Dashboard | Chassis Front | Chassis Back | Storage | Events

System
Servers
Storage
Switches
Reports
Storage Layout
Events
Dashboard
Diagnostics
Settings
Storage
IP Configuration
Date/Time
SNMP
Users
Event Policies
Notification
Language
Firmware
Restore Settings
Dev

Navigation

view back

“Server 4” Actions
Power On
Remote KVM & CD
Identify
Server Failover
Global Actions
Power On/Off Multiple Servers
Server Help
Get Help

General | Events | Sensors | **Virtual Drives**

Virtual Drive To Server Mappings

| Name | Size | RAID Level | Status | Server | Drive # (LUN) | Affinity/Active |
|---------|----------|------------|--------|--------|---------------|-----------------|
| SLES_10 | 100.00GB | RAID0 | OK | 4 | 0 | SCM 1/SCM 1 |

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Done

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Boot Drive Order in System BIOS

- Boot the compute module and enter the system BIOS (press F2 during POST)
 - If the active SCM for LUN 0 is SCM #1, place it first in the HDD boot order. Typically, this will show up as ID00 (LUNs assigned to SCM #1 usually have lower ID values than SCM #2, but not always) LUN0 (see the screenshot on the next slide).
 - If the active SCM for LUN 0 is SCM #2, place it first in the HDD boot order. Typically, this will show up as ID01 (LUNs assigned to SCM #2 usually have higher ID values than SCM #1, but not always) LUN0 (see the screenshot on the next slide).



HDD Ordering Based on Active SCM

```
Aptio Setup Utility - Copyright (C) 2005-2008 American Megatrends, Inc.
Boot Options
Hard Disk #1      [#0400 ID00 LUN0 In...]
Hard Disk #2      [#0400 ID01 LUN0 In...]
Set hard disk boot order
by selecting the boot
option for this position.

><      Select Screen
↑↓      Select Item
+/-     Change Value
Enter   Select Field
F1      General Help
F9      Optimized Defaults
F10     Save and Exit
ESC     Exit

Version 1.20.1093 Copyright (C) 2005-2008 American Megatrends, Inc.
```

SCM #1 Controller VD

SCM #2 Controller VD

The smaller ID value corresponds to the path to SCM #1 and the bigger value corresponds to the path to SCM #2.



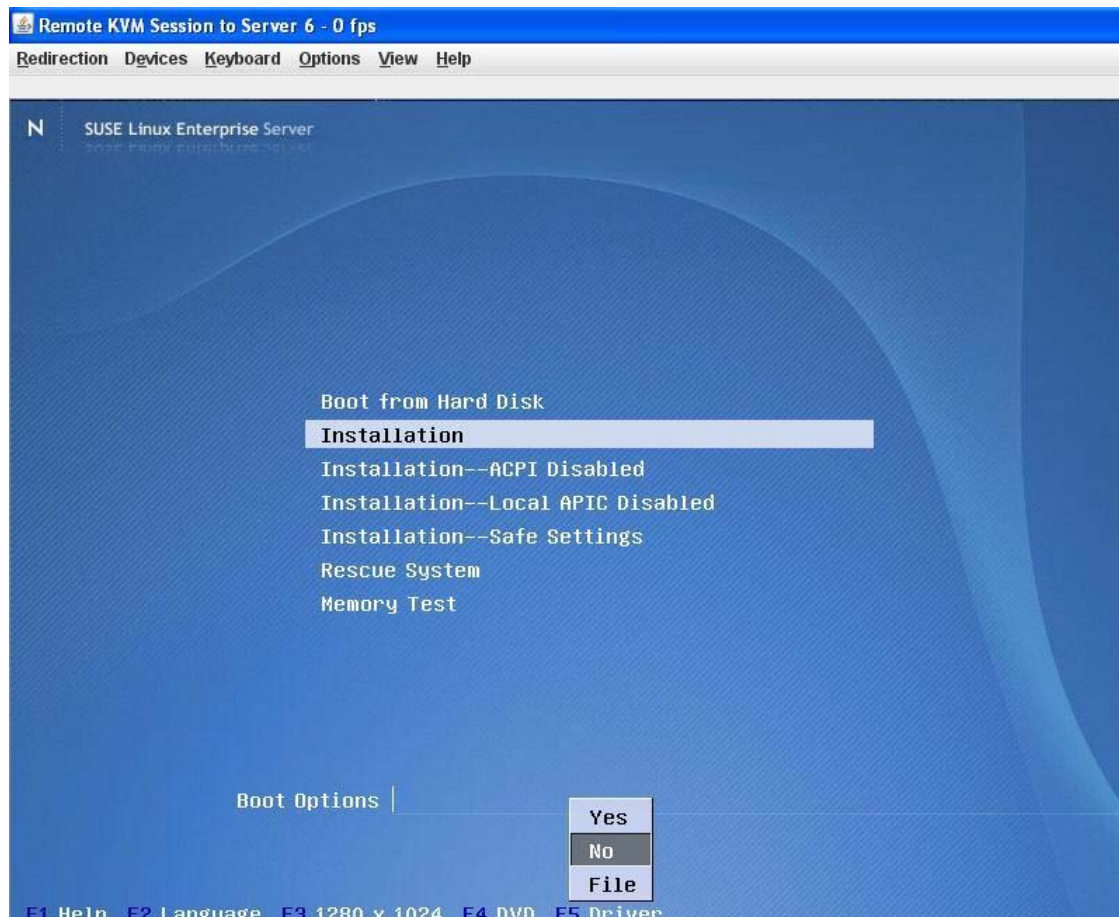
SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 Notes

- It is recommended that you perform the installation with only a single VD assigned to the compute module; however, installations may be performed with multiple VDs assigned.
- BIGSMP kernel is NOT supported – if the system is configured with 4 GB memory, it is highly recommended that you install the x64 version.
- LSI SAS driver update procedure is needed only for SuSE* Linux Enterprise Server 10 SP1. SuSE* Linux Enterprise Server 10 SP2 already has an updated driver (skip slides 24 – 27).



SuSE* Linux Enterprise Server 10 SP1 - Updating LSI MPT Drivers

- At the initial installation screen, press <F5> and change the selection from “No” to “Yes”.



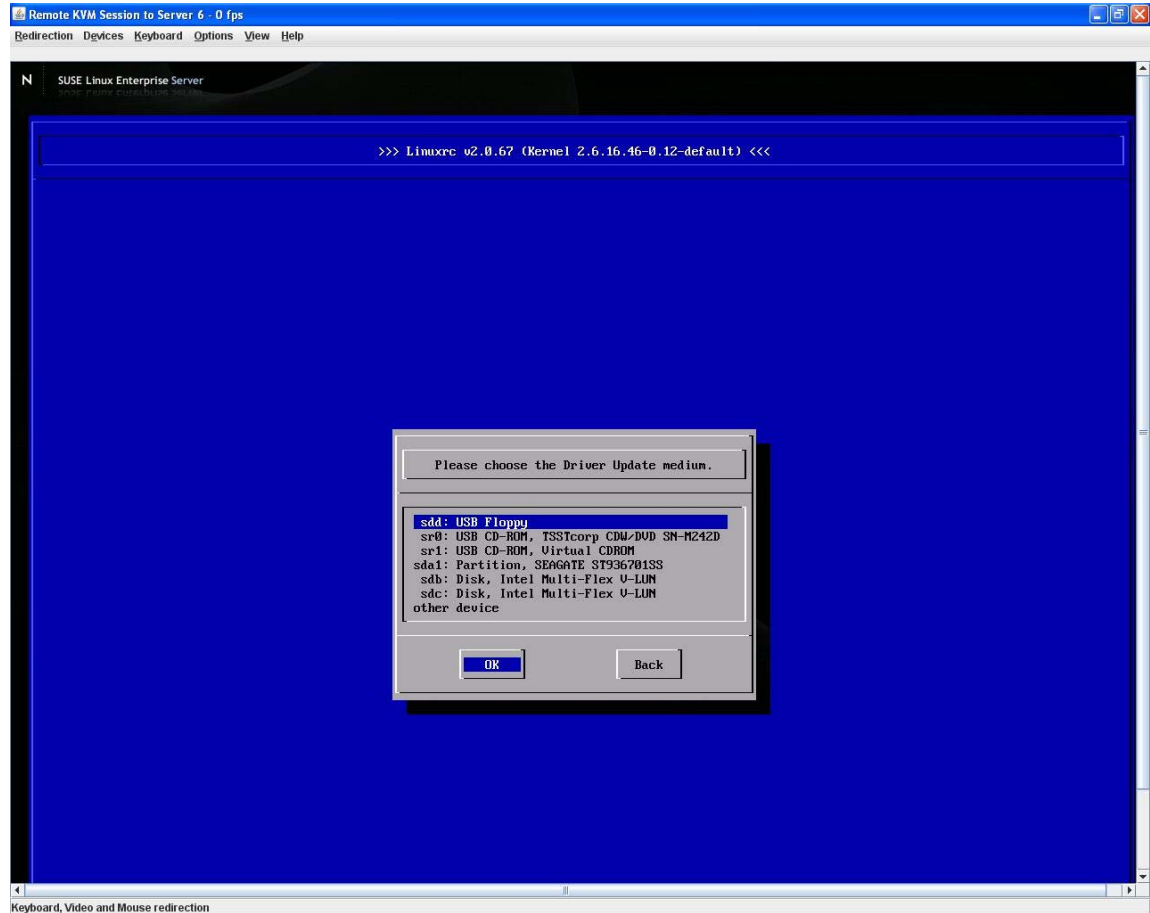
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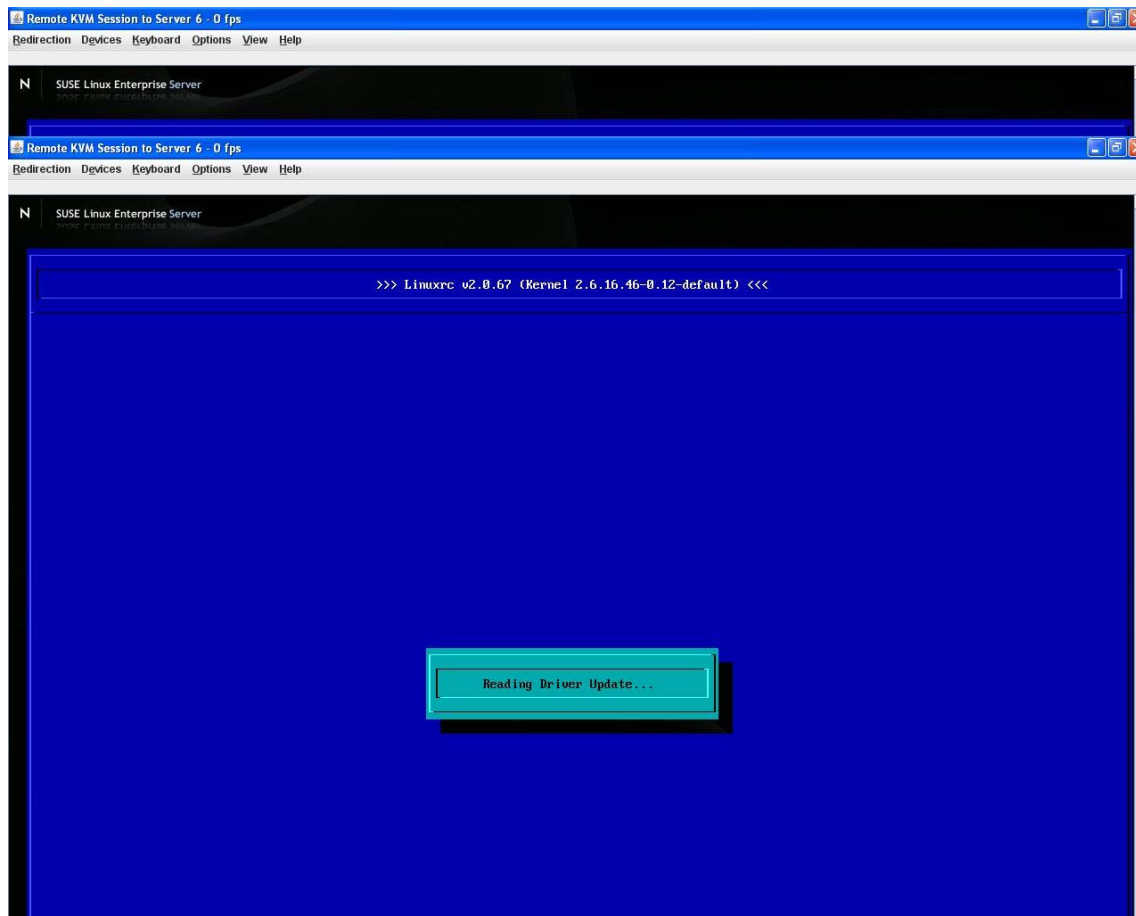
SuSE* Linux Enterprise Server 10 SP1 - Updating LSI MPT Drivers

- Select the device where the .dd image is located. In the example shown, the image is located on the USB floppy.



SuSE* Linux Enterprise Server 10 SP1 - Updating LSI MPT Drivers

Screenshot showing the image being read from the .dd image.



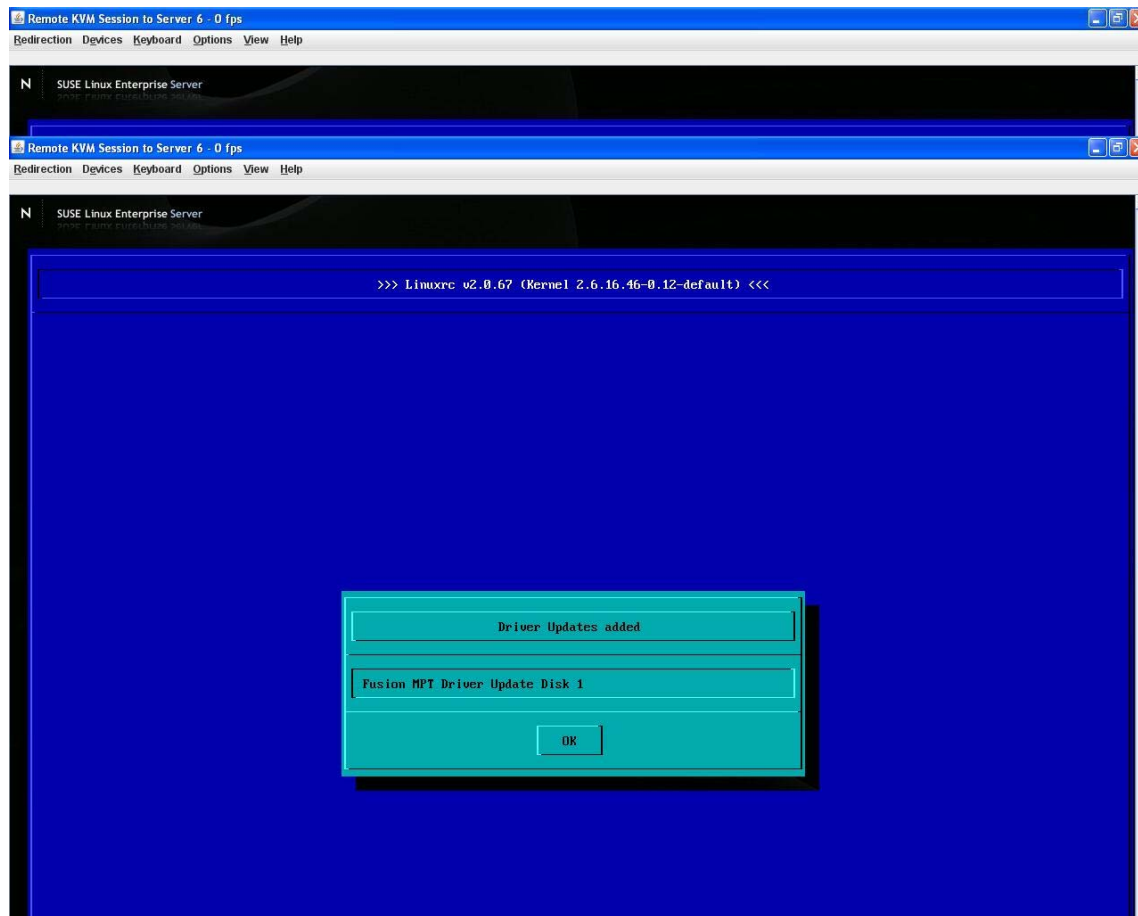
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SuSE* Linux Enterprise Server 10 SP1 - Updating LSI MPT Drivers

Screenshot
indicating the
completion of the
.dd image
transfer.



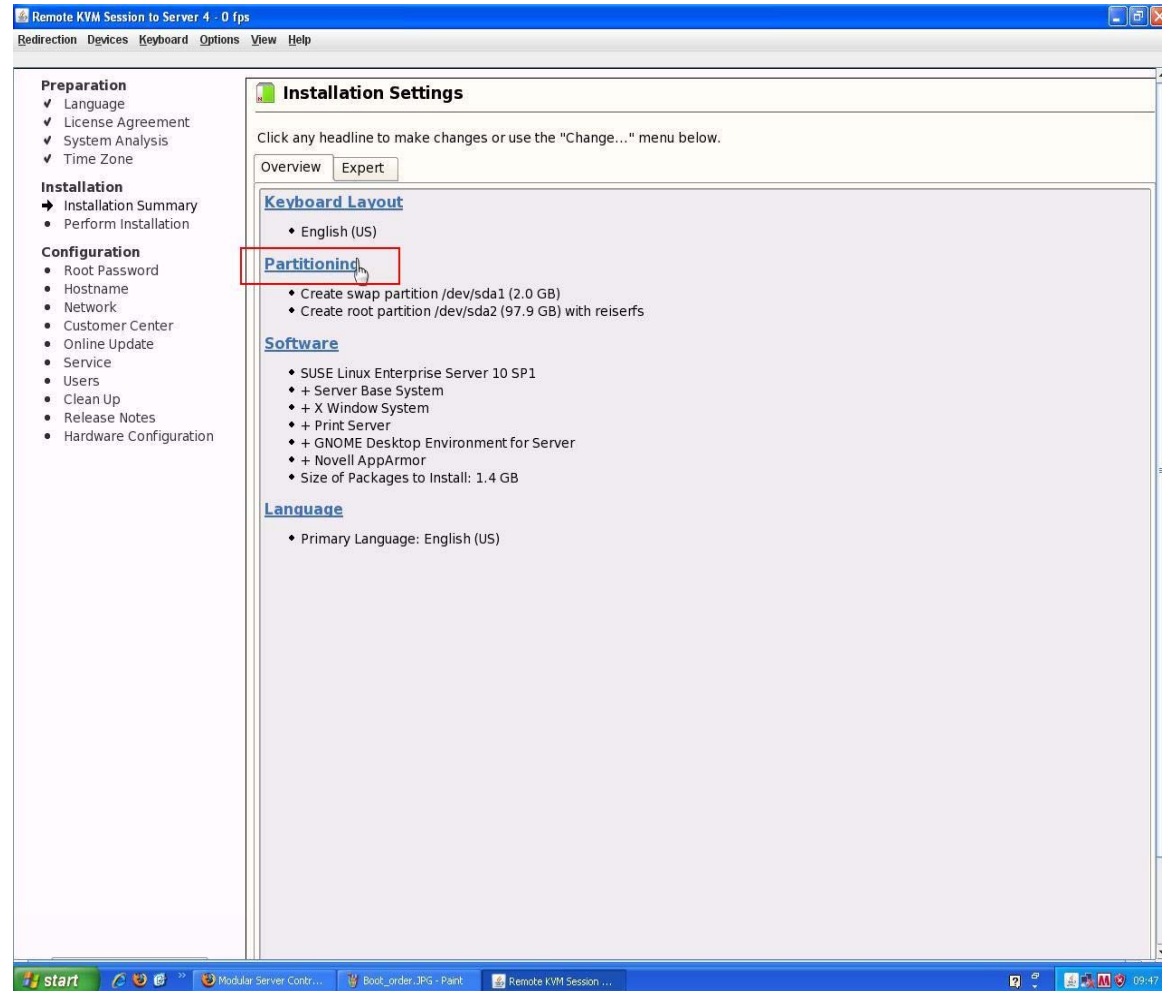
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Changes Required to Partitioning

- Select the appropriate responses to the setup questions based on the system setup.
- On the “Installation Settings” screen (shown on the right), select “Partitioning”.



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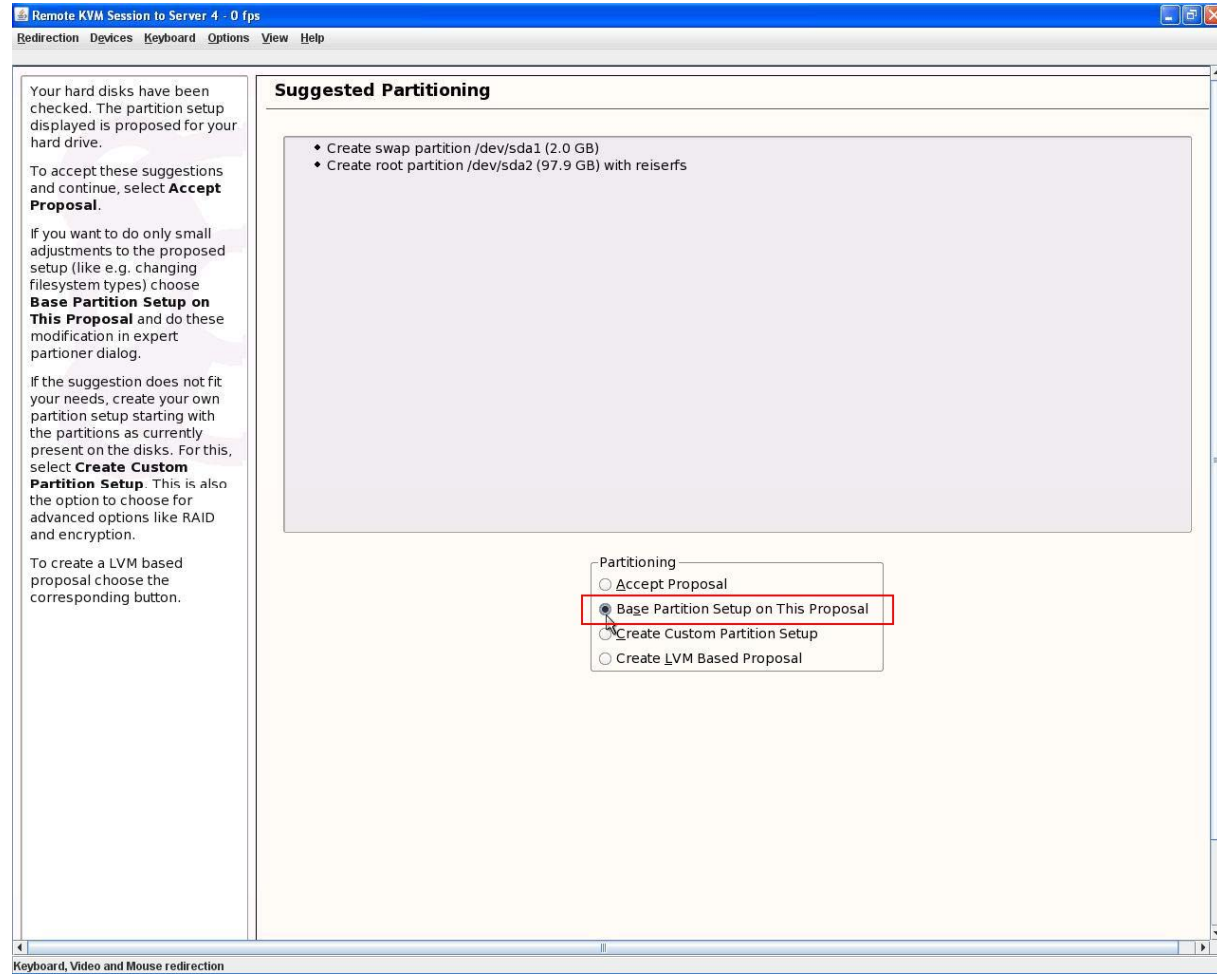
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“Suggested Partitioning” Screen

After selecting “[Partitioning](#)”, the “Suggested Partitioning” screen will appear.

- Select “[Base Partition Setup on This Proposal](#)” and click the “Next” button at the bottom of the screen (see the screenshot).



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Expert Partitioner Screen

Clicking “Next” on the “Suggested Partitioning” screen brings up the “Expert Partitioner” screen (see the screenshot).

- On this screen, note the partitions are mounted by their “Device Name” as indicated by “K” in the highlighted box in the screenshot to the right.

NOTE: If the drives are mounted by ID as the default (indicated by an “I” in the Mount By column), no changes are required.

- Select either the “swap” or “/” partition (“swap” selected in the screenshot) and click the “Edit” button at the bottom of the screen.

Partition your hard disks...

This is intended for **experts**. If you are not familiar with the concepts of hard disk **partitions** and how to use them, you might want to go back and select **automatic** partitioning.

Please note that **nothing will be written to your hard disk** until you confirm the entire installation in the last installation dialog. Until that point, you can safely abort the installation.

For LVM setup, using a non-LVM root device and a non-LVM swap device is recommended. Other than the root and swap devices, you should have partitions managed by LVM.

The table to the right shows the current partitions on all your hard disks.

Hard disks are designated like this

```
/dev/hda 1st EIDE
disk /dev/hdb 2nd EIDE
disk /dev/hdc 3rd EIDE disk
etc.
- or -
/dev/sda 1st SCSI
disk /dev/sdb 2nd SCSI
disk /dev/sdc 3rd SCSI disk
etc.
```

This notation always refers to the entire disk.

Partitions are designated like this:

```
/dev/hda1 1st primary
partition on the 1st EIDE
```

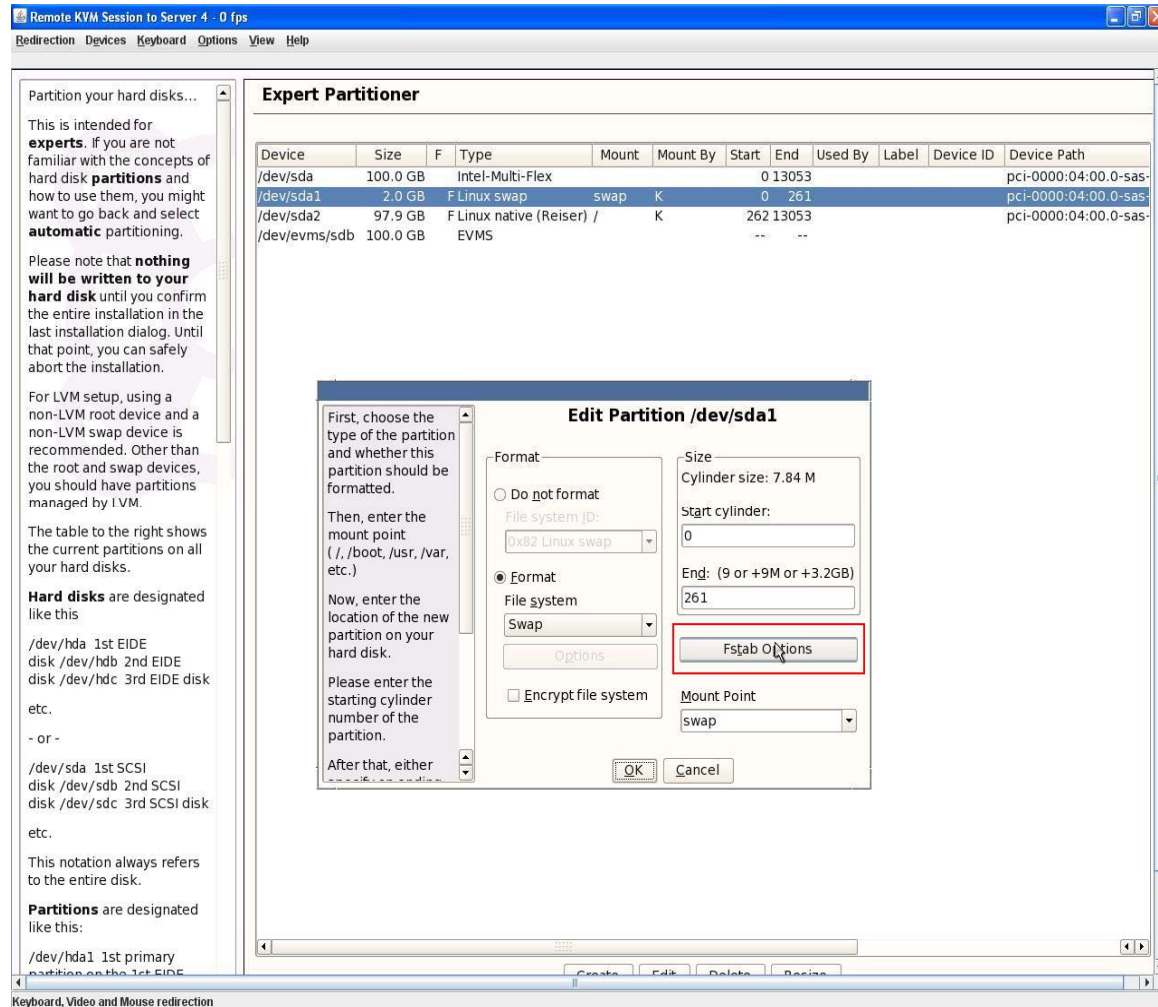
| Device | Size | F | Type | Mount | Mount By | Start | End | Used By | Label | Device ID | Device Path |
|---------------|----------|---|-------------------------|-------|----------|-------|-------|---------|-------|-----------|-----------------------|
| /dev/sda | 100.0 GB | | Intel-Multi-Flex | | | 0 | 13053 | | | | pci-0000:04:00.0-sas- |
| /dev/sda1 | 2.0 GB | F | Linux swap | swap | K | 0 | 261 | | | | pci-0000:04:00.0-sas- |
| /dev/sda2 | 97.9 GB | F | Linux native (Reiser) / | | K | 262 | 13053 | | | | pci-0000:04:00.0-sas- |
| /dev/evms/sdb | 100.0 GB | | EVMS | | | | | | | | |

Keyboard, Video and Mouse redirection

Expert Partitioner Screen – Edit Partition

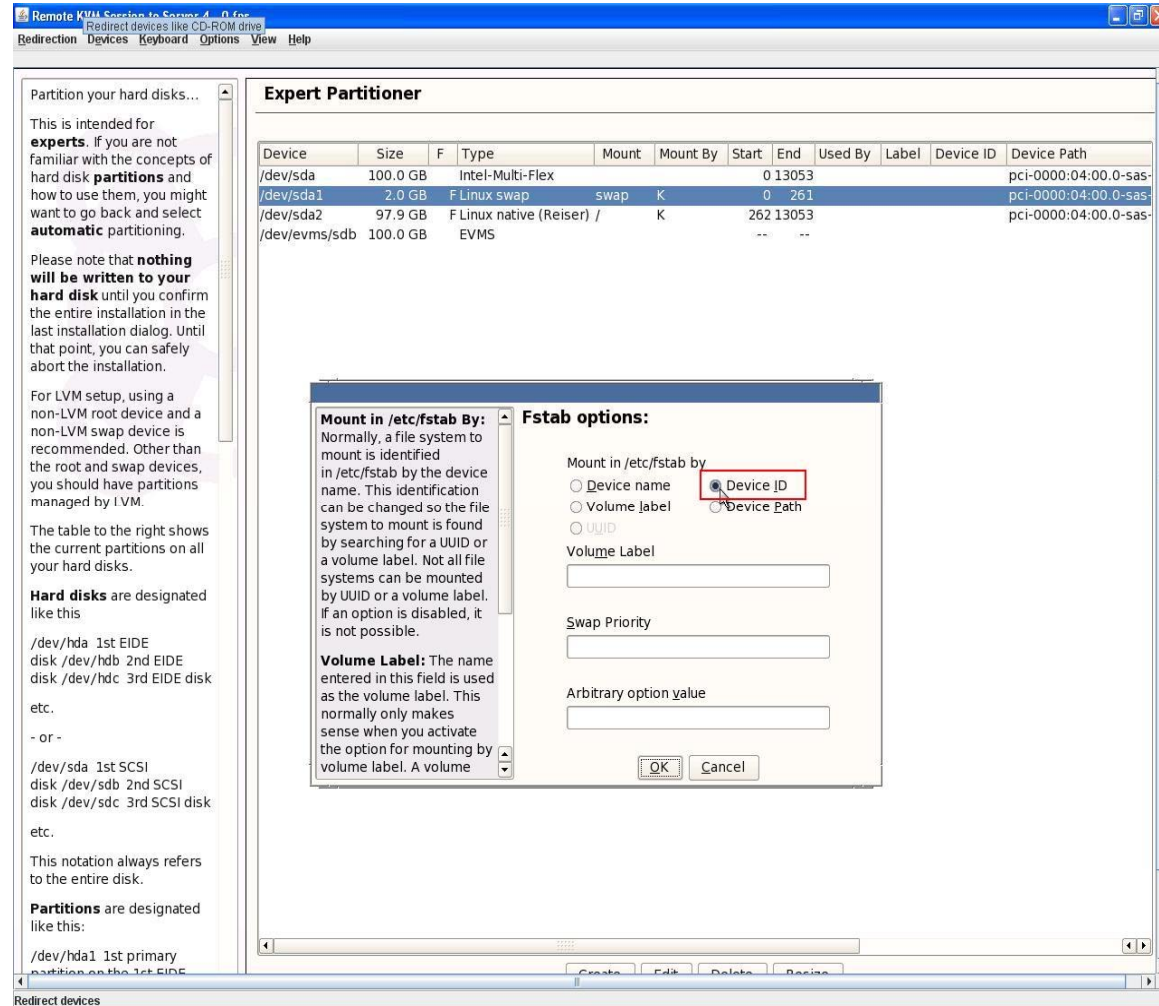
Clicking the “Edit” button at the bottom of the screen brings up the “Edit Partition” dialog (see the screenshot).

- In the “Edit Partition” dialog, click the “Fstab Options” button (highlighted in the screenshot).



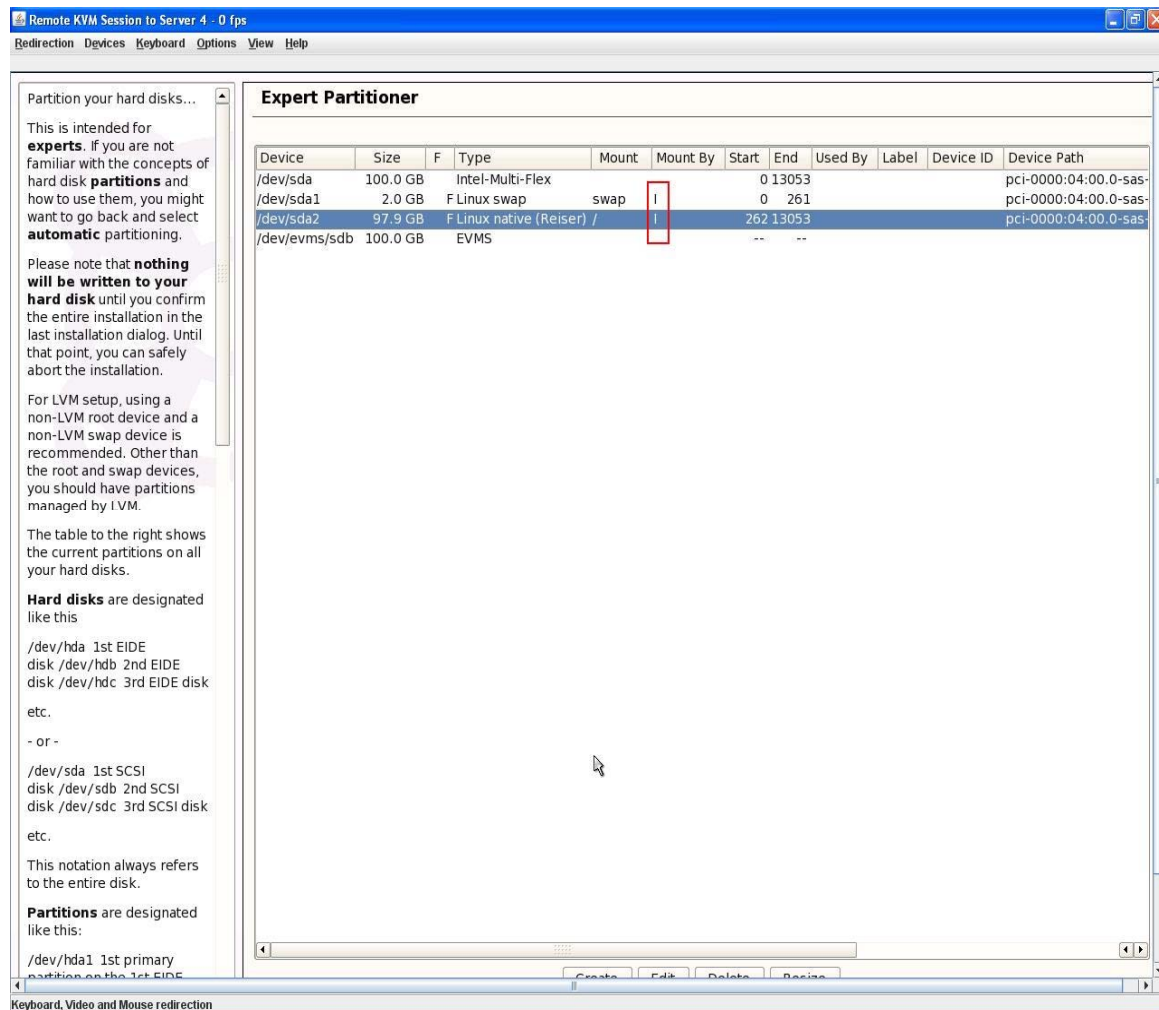
Expert Partitioner Screen – Fstab Options

- In the “Fstab options” dialog, select “Device ID” and click “OK” (see the screenshot).
- Perform the steps on slides 30 and 31 for each of the partitions (“swap” and “/” for most installations or additional ones for expert users).



Expert Partitioner Screen – Completed

- After modifying all the partitions to mount by their “Device-ID”, the “Mount By” column should change to “I” (see the screenshot on the right) from “K” (as seen in the screenshot on slide #30).
- Click the “Finish” button to proceed with the installation.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 Installation

- Complete the installation and reboot the host as instructed via the installation process.

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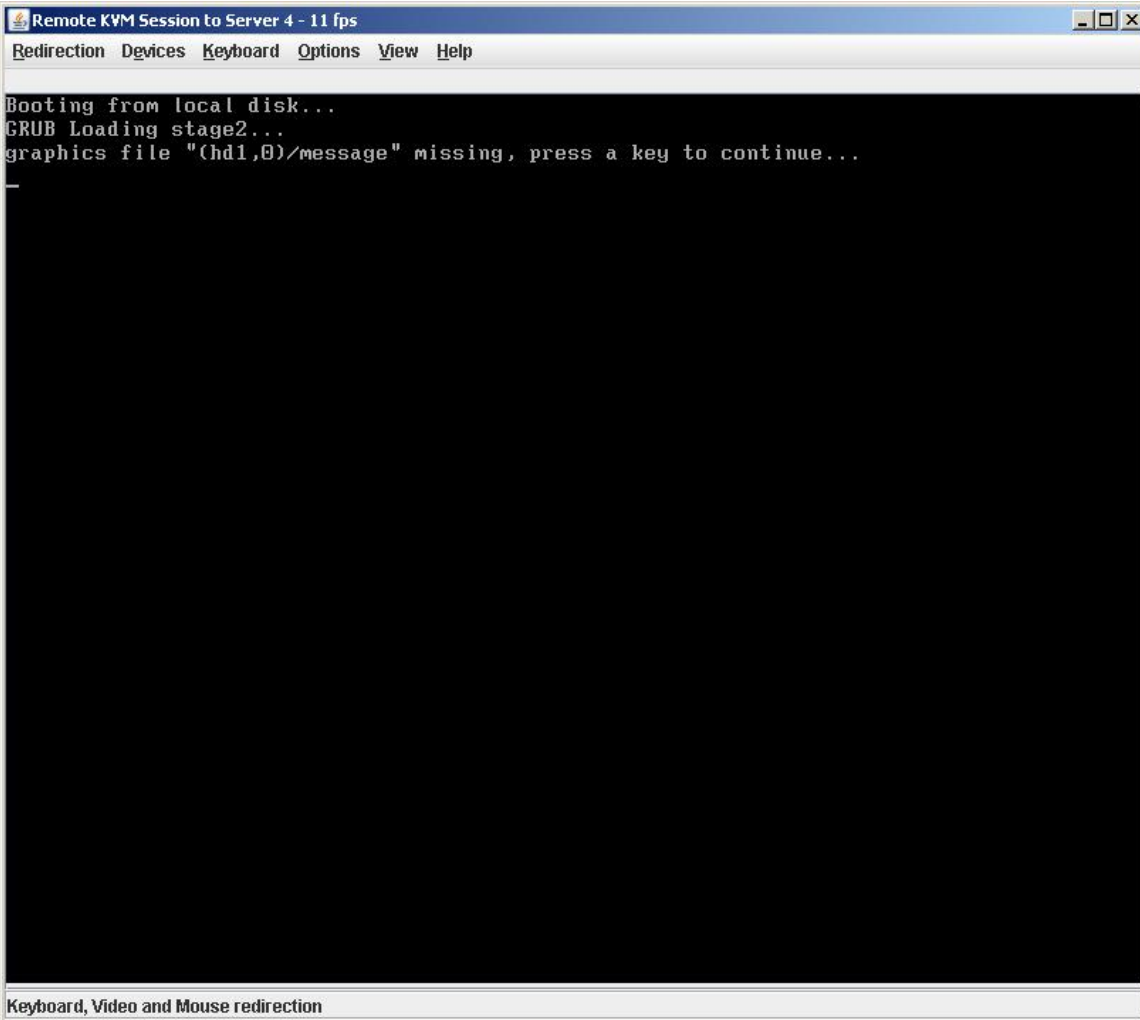
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SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 – Possible Error Scenario #1

Upon reboot, there is a possibility that it will fail with the message shown in the screenshot.

- If this screenshot appears, press the “Return” key to continue.



The screenshot shows a remote KVM session window titled "Remote KVM Session to Server 4 - 11 fps". The window has a menu bar with "Redirection", "Devices", "Keyboard", "Options", "View", and "Help". The main area displays the following text:

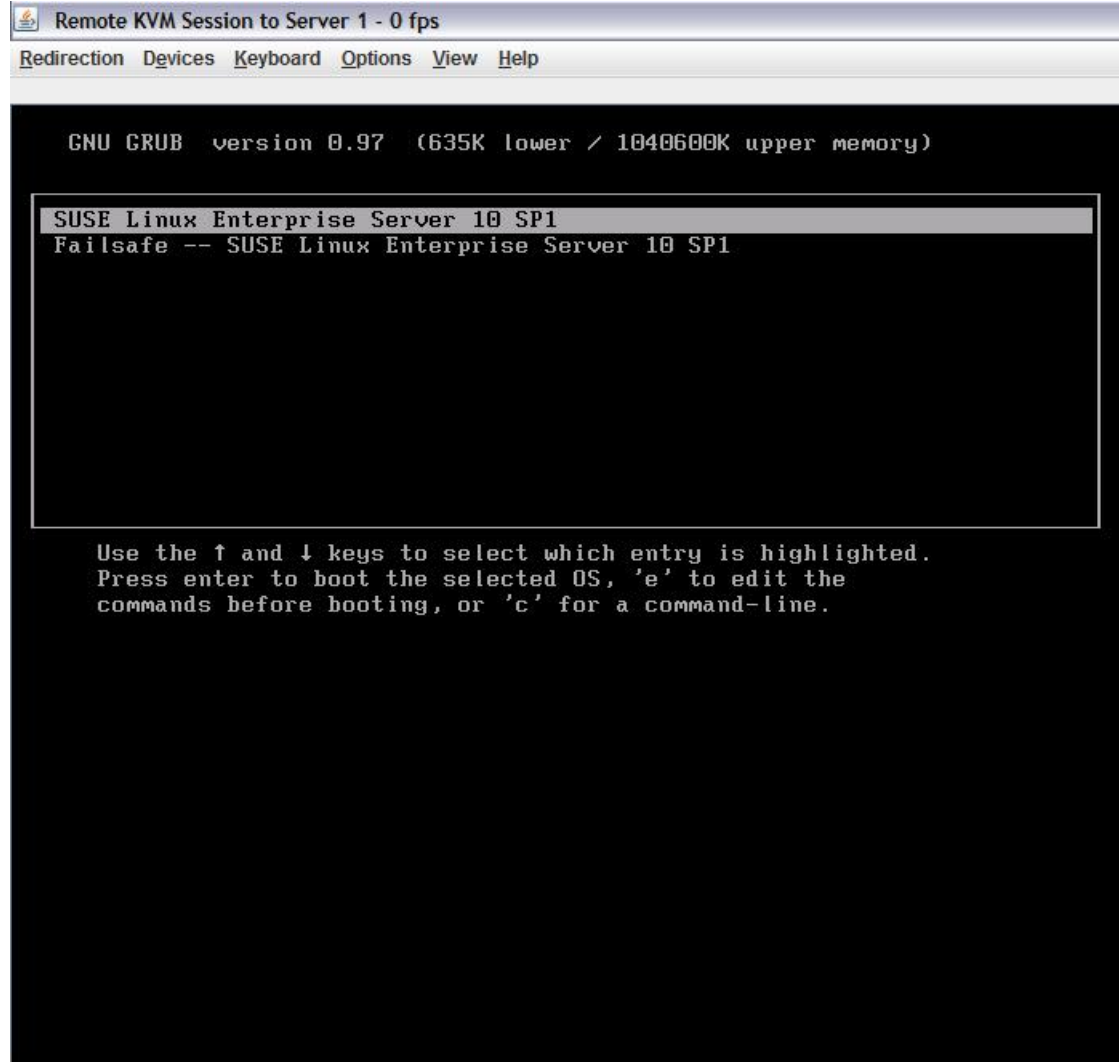
```
Booting from local disk...
GRUB Loading stage2...
graphics file "(hd1,0)/message" missing, press a key to continue...
```

At the bottom of the window, there is a status bar that reads "Keyboard, Video and Mouse redirection".

SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 – Possible Error Scenario #1 (Resolution)

The GRUB boot order screen appears (see the screenshot).

- Using the arrow keys, highlight the first row as shown in the screenshot and press “e”.



```
Remote KVM Session to Server 1 - 0 fps
Redirection Devices Keyboard Options View Help

GNU GRUB  version 0.97  (635K lower / 1040600K upper memory)

SUSE Linux Enterprise Server 10 SP1
Failsafe -- SUSE Linux Enterprise Server 10 SP1

Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the
commands before booting, or 'c' for a command-line.
```

SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 – Possible Error Scenario #1 (Resolution)

The GRUB boot screen appears (see screenshot).

- Using the arrow keys, highlight the “root (hd \underline{x} , 0)” line similar to the one in the screenshot.
- Once highlighted, press the “e” key to edit the command .
- Modify the line as follows:
 - If the line is “root (hd0,0)”, change it to “root (hd1,0)”.
 - If the line is “root (hd1,0)”, change it to “root (hd0,0)”.
 - Press the “Return” key when the modification is complete.
- In some instances, you may need to hit the “Esc” key and “e” key several times before the “root (hd \underline{x} ,0)” line is displayed.
- **NOTE:** If this step is performed, the menu.lst file will need to be updated to reflect this change once the OS boots.

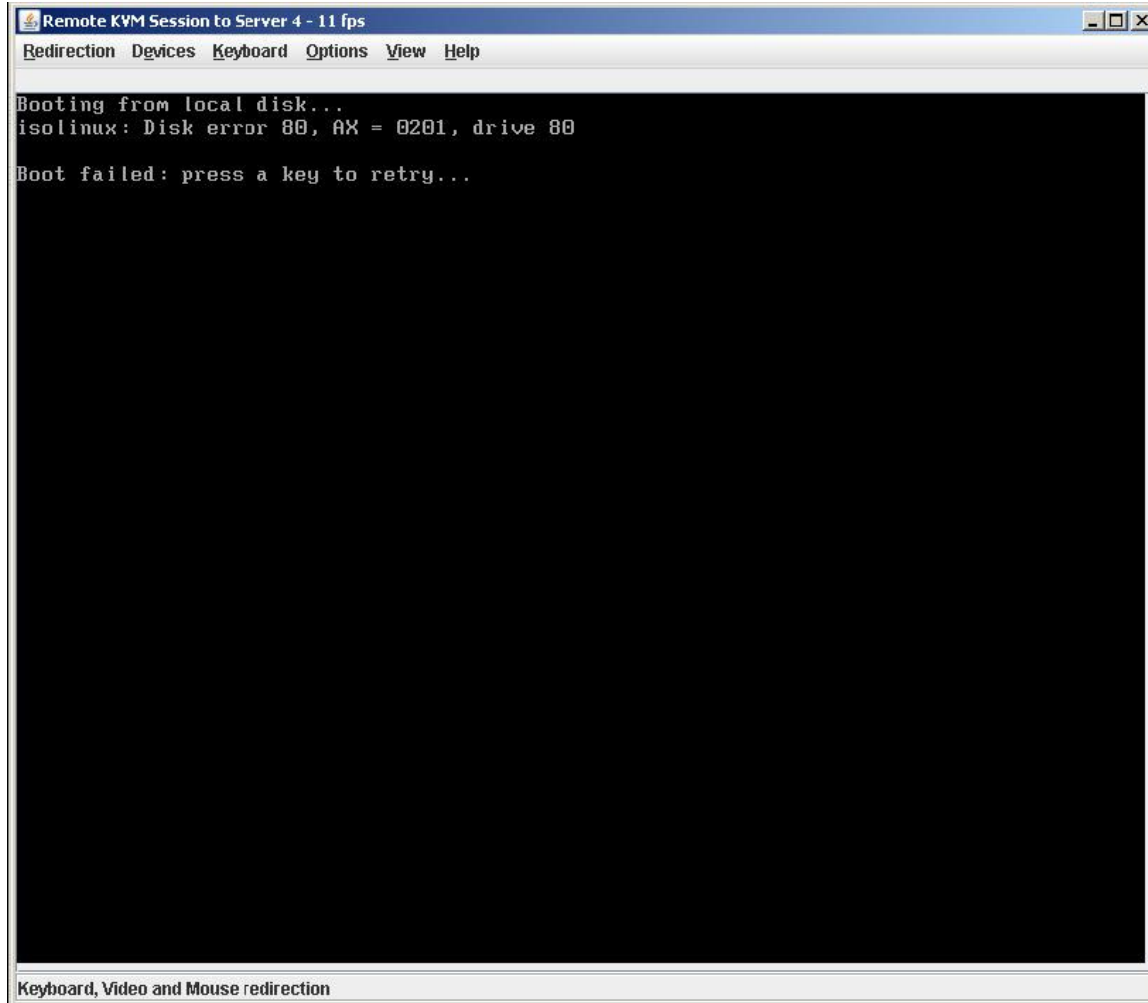
```
GNU GRUB  version 0.97  (635K lower / 2067572K upper memory)

root (hd1,0)
kernel /vmlinuz-2.6.16.46-0.12-smp root=/dev/disk/by-label/ROOT vga=0
initrd /initrd-2.6.16.46-0.12-smp

Use the ↑ and ↓ keys to select which entry is highlighted.
Press 'b' to boot, 'e' to edit the selected command in the
boot sequence, 'c' for a command-line, 'o' to open a new line
after ('O' for before) the selected line, 'd' to remove the
selected line, or escape to go back to the main menu.
```

SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 – Possible Error Scenario #2

- If the boot drive order was not set properly prior to OS installation, the error condition in the screenshot will appear.
- If this error condition occurs, reboot the server and enter the system BIOS by pressing “F2” during POST.
 - Once in the system BIOS, swap the HDD boot order.



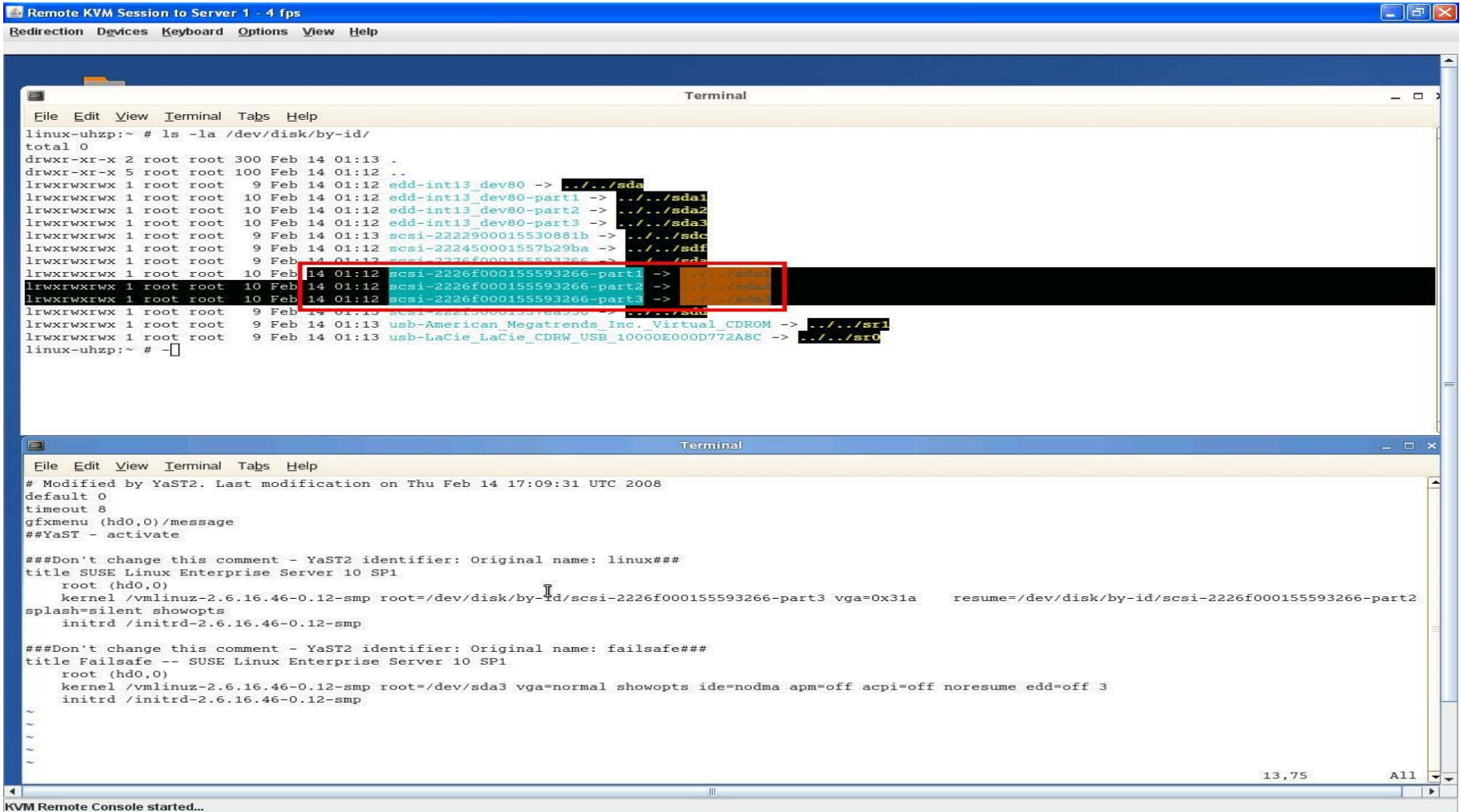
The screenshot shows a remote KVM session window titled "Remote KVM Session to Server 4 - 11 fps". The window has a menu bar with "Redirection", "Devices", "Keyboard", "Options", "View", and "Help". The main area is a black terminal window with white text. The text reads: "Booting from local disk...", "isolinux: Disk error 80, AX = 0201, drive 80", and "Boot failed: press a key to retry...". At the bottom of the window, there is a status bar that says "Keyboard, Video and Mouse redirection".

SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 – Post Install Configuration

- Once the installation completes, log in to the system.
- Open a terminal window
 - Verify /, /boot, and swap are all referenced by their ID
 - Type “ls -la /dev/disk/by-id”
- Edit /etc/fstab to reflect the “by-id” references
 - Modify the /dev/sd* references with /dev/disk/by-id/scsi<xxxx>
 - For <xxxx>, refer to the red box in the screenshot on the next slide for values on the system under test.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)



The screenshot displays a Remote KVM Session window titled "Remote KVM Session to Server 1 - 4 fps". The window contains two terminal windows. The top terminal window shows the output of the command `ls -la /dev/disk/by-id/`, listing various disk partitions and their identifiers. The bottom terminal window shows the YaST2 configuration file, including the title "SUSE Linux Enterprise Server 10 SP1" and the kernel configuration for the root partition.

```
linux-uhzp:~ # ls -la /dev/disk/by-id/
total 0
drwxr-xr-x 2 root root 300 Feb 14 01:13 .
drwxr-xr-x 5 root root 100 Feb 14 01:12 ..
lrwxrwxrwx 1 root root 9 Feb 14 01:12 edd-int13_dev80 -> ../../sda
lrwxrwxrwx 1 root root 10 Feb 14 01:12 edd-int13_dev80-part1 -> ../../sda1
lrwxrwxrwx 1 root root 10 Feb 14 01:12 edd-int13_dev80-part2 -> ../../sda2
lrwxrwxrwx 1 root root 10 Feb 14 01:12 edd-int13_dev80-part3 -> ../../sda3
lrwxrwxrwx 1 root root 9 Feb 14 01:13 scsi-2222900018530881b -> ../../sdc
lrwxrwxrwx 1 root root 9 Feb 14 01:12 scsi-222450001857b29ba -> ../../sdf
lrwxrwxrwx 1 root root 9 Feb 14 01:12 scsi-2226f000155593266 -> ../../sda
lrwxrwxrwx 1 root root 10 Feb 14 01:12 scsi-2226f000155593266-part1 -> ../../sda1
lrwxrwxrwx 1 root root 10 Feb 14 01:12 scsi-2226f000155593266-part2 -> ../../sda2
lrwxrwxrwx 1 root root 10 Feb 14 01:12 scsi-2226f000155593266-part3 -> ../../sda3
lrwxrwxrwx 1 root root 9 Feb 14 01:13 usb-American_Megatrends_Inc_Virtual_CDROM -> ../../sr1
lrwxrwxrwx 1 root root 9 Feb 14 01:13 usb-LaCie_LaCie_CDRW_USB_10000E00D772A8C -> ../../sr0
linux-uhzp:~ #
```

```
# Modified by YaST2. Last modification on Thu Feb 14 17:09:31 UTC 2008
default 0
timeout 8
gfxmenu (hd0,0)/message
##YaST - activate

###Don't change this comment - YaST2 identifier: Original name: linux###
title SUSE Linux Enterprise Server 10 SP1
root (hd0,0)
kernel /vmlinuz-2.6.16.46-0.12-smp root=/dev/disk/by-id/scsi-2226f000155593266-part3 vga=0x31a resume=/dev/disk/by-id/scsi-2226f000155593266-part2
splash=silent showopts
initrd /initrd-2.6.16.46-0.12-smp

###Don't change this comment - YaST2 identifier: Original name: failsafe###
title Failsafe -- SUSE Linux Enterprise Server 10 SP1
root (hd0,0)
kernel /vmlinuz-2.6.16.46-0.12-smp root=/dev/sda3 vga=normal showopts ide=nodma apm=off acpi=off noresume edd=off 3
initrd /initrd-2.6.16.46-0.12-smp
~
~
~
```

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SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)

- Next, edit /boot/grub/menu.lst
 - Modify the /dev/sd* entries to /dev/disk/by-id/scsi<xxxx>
 - See the red box in the screenshot on the next slide for reference.
 - If the steps on slide #37 were required to boot, also modify the line “root (hdx,y) to reflect the changes made when booting.



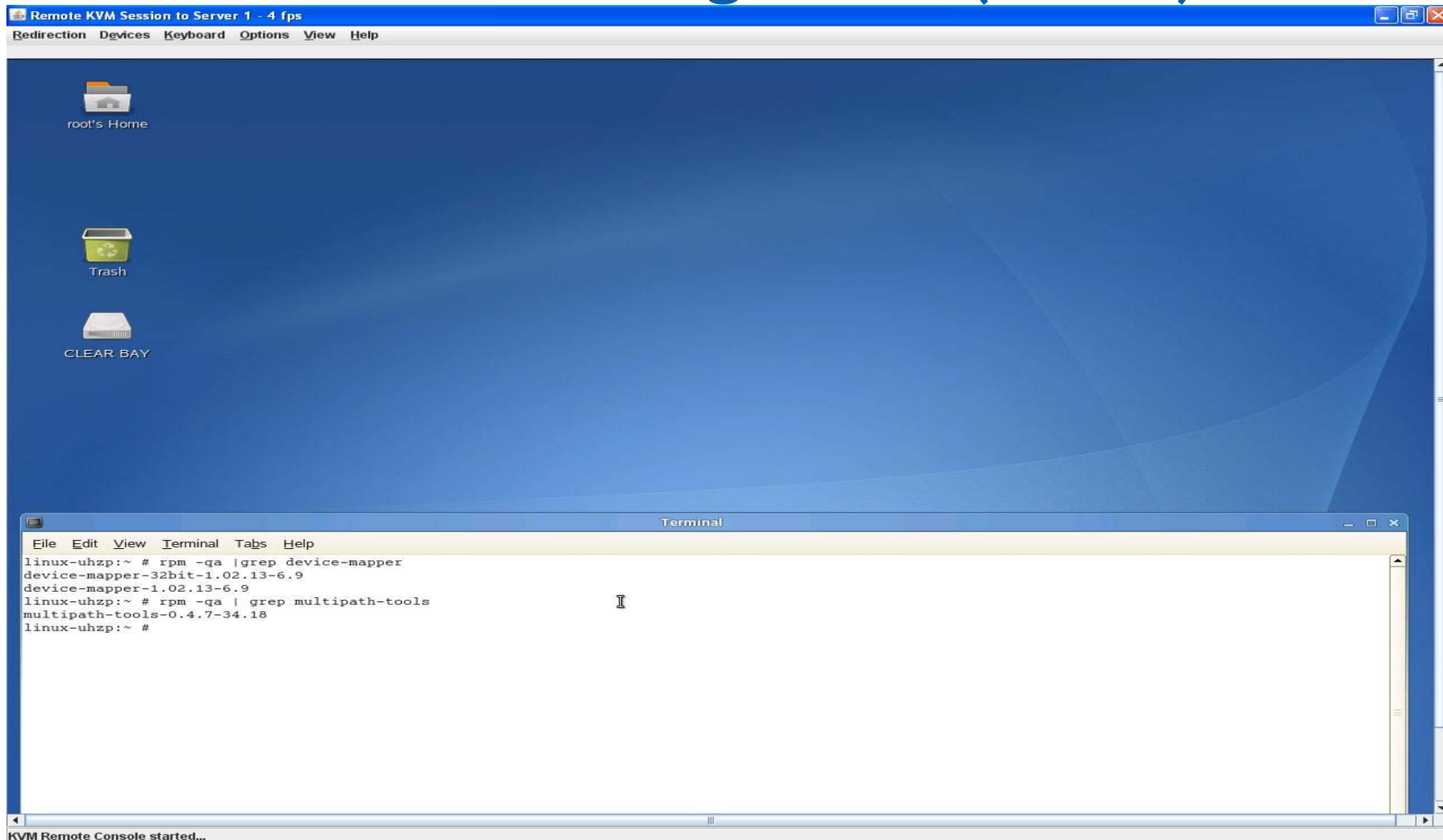
SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)

- Verify the installation of packages by typing:
 - `rpm -qa | grep device-mapper`
 - This should return [device-mapper-1.02.13-6.9](#)
 - Version may be slightly different based on the installation package.
 - `rpm -qa | grep multipath-tools`
 - This should return [multipath-tools-0.4.7-34.18](#)
 - Version may be slightly different based on the installation package.

See the screenshot on the next slide for reference.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)



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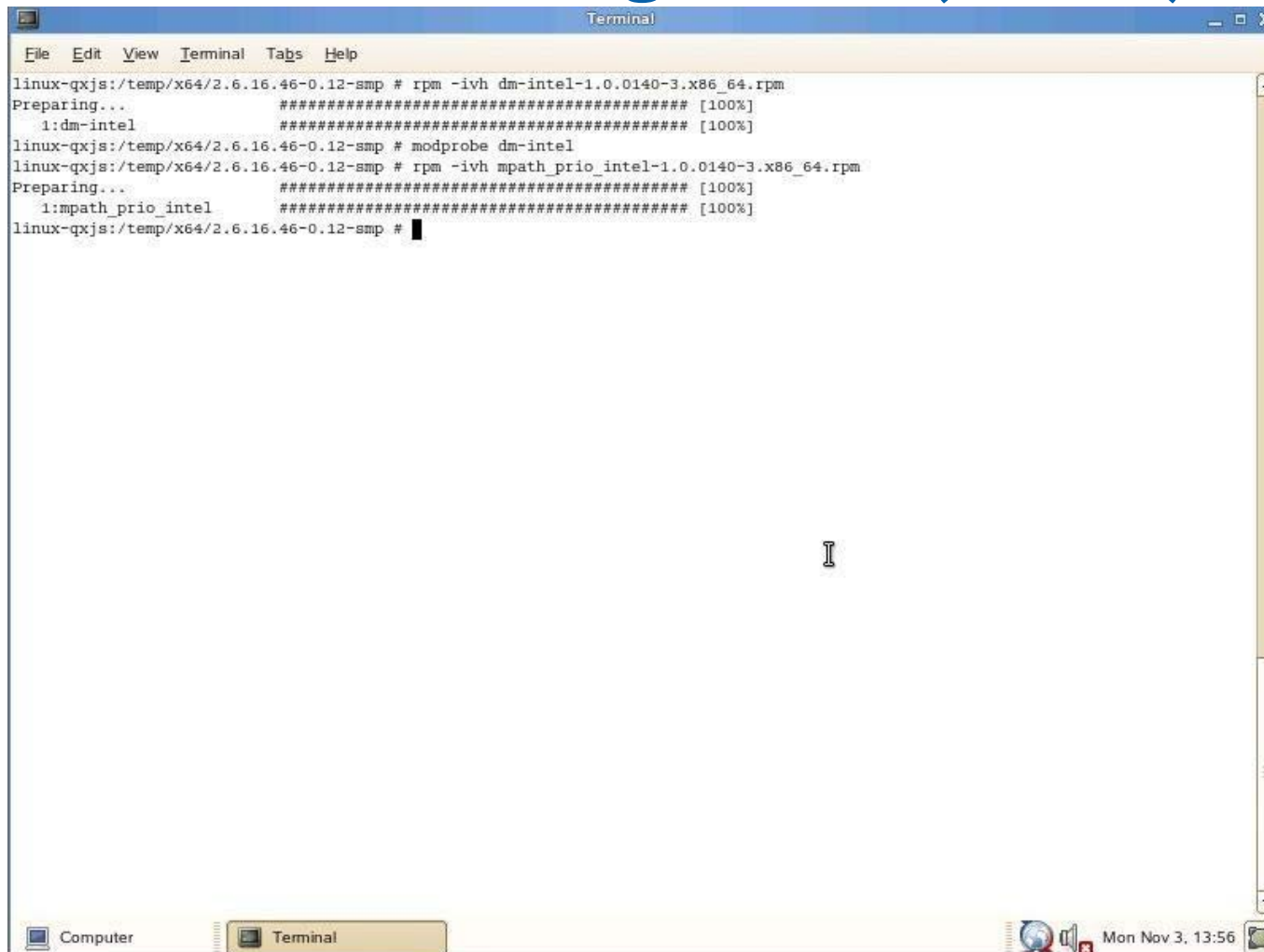


SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)

- Setting up Multipath ALUA
 - Copy the SuSE* Linux Enterprise Server driver package to a known location on the system under test
 - /temp is assumed for the remainder of the BKM
 - Open a terminal window
 - `cd /temp/<OS type>/2.6.16.46-0.12-smp`
 - Load the priority driver by typing:
 - For an x86 installation: `rpm -ivh dm-intel-1.0.0140-3.i586.rpm`
 - For an x64 installation: `rpm -ivh dm-intel-1.0.0140-3.x86_64.rpm`
 - Type “`modprobe dm-intel`”
 - The system will not return anything, which indicates a successful installation.
 - Verify the module loaded by typing:
`lsmod | grep dm_intel`
 - Load the priority driver by typing:
 - For an x86 installation: `rpm -ivh mpath_prio_intel-1.0.0140-3.i586.rpm`
 - For an x64 installation: `rpm -ivh mpath_prio_intel-1.0.0140-3.x86_64.rpm`



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)



```
Terminal
File Edit View Terminal Tabs Help
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp # rpm -ivh dm-intel-1.0.0140-3.x86_64.rpm
Preparing... ##### [100%]
 1:dm-intel ##### [100%]
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp # modprobe dm-intel
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp # rpm -ivh mpath_prio_intel-1.0.0140-3.x86_64.rpm
Preparing... ##### [100%]
 1:mpath_prio_intel ##### [100%]
linux-qxjs:/temp/x64/2.6.16.46-0.12-smp #
```

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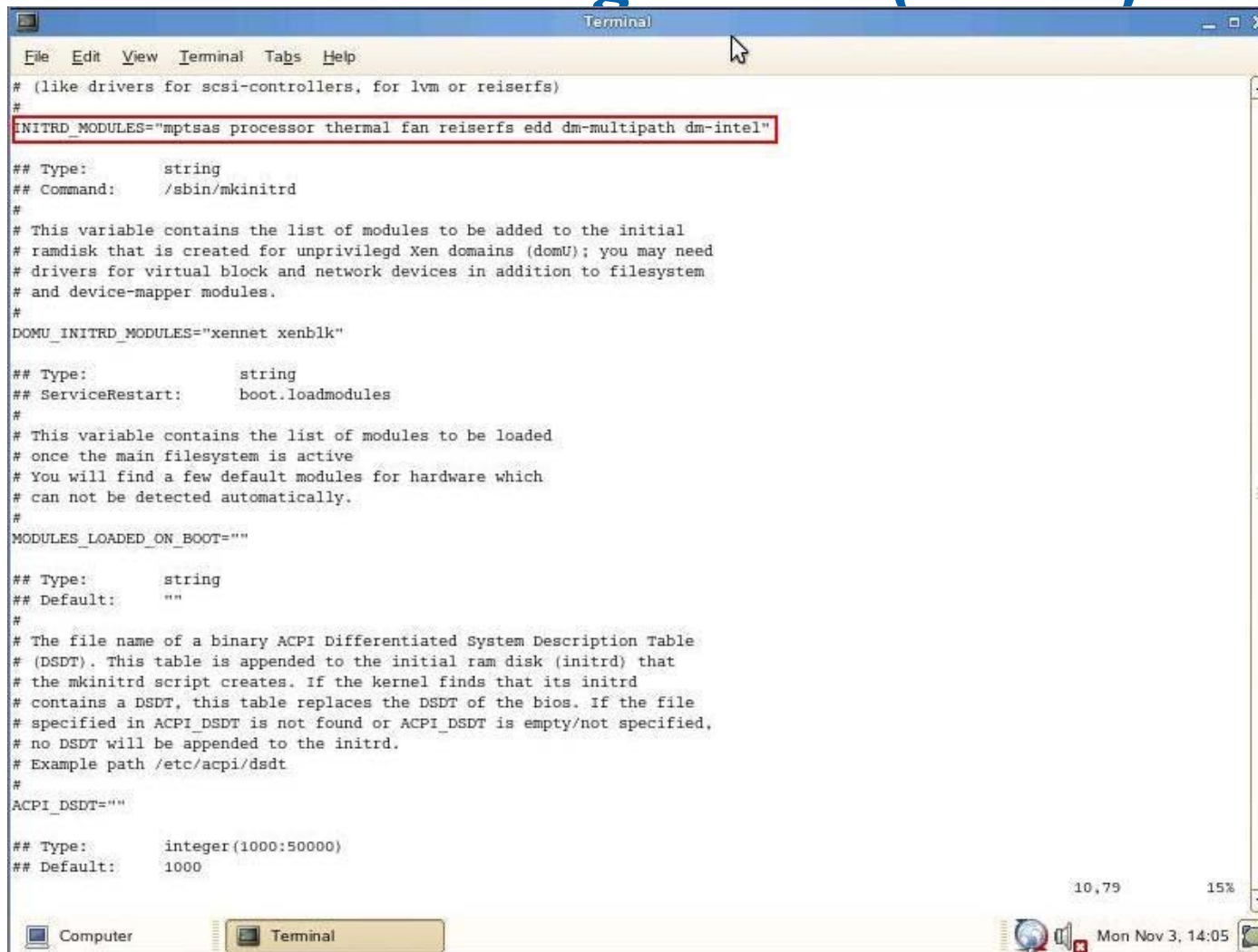


SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)

- Copy “multipath.conf.SLES” to the /etc directory and rename multipath.conf
- Type the following commands:
 - `chkconfig boot.multipath on <return>`
 - `chkconfig multipathd on <return>`
- Edit /etc/sysconfig/kernel by adding “dm-multipath” and “dm-intel” to the INITRD_MODULES section in the mentioned sequence.
 - See the screenshot on the next slide for reference.
- Type the following:
 - `mkinitrd`
This will create a new kernel image file.
- Reboot the server by typing “reboot”.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)



A terminal window titled "Terminal" with a menu bar (File, Edit, View, Terminal, Tabs, Help). The terminal displays configuration text for the INITRD_MODULES variable. The line `INITRD_MODULES="mptsas processor thermal fan reiserfs edd dm-multipath dm-intel"` is highlighted with a red box. The terminal also shows comments and other configuration variables like `DOMU_INITRD_MODULES="xen-net xenblk"`, `MODULES_LOADED_ON_BOOT=""`, and `ACPI_DSDT=""`. The bottom of the terminal shows a taskbar with "Computer" and "Terminal" icons, and a system tray with "10,79", "15%", and "Mon Nov 3, 14:05".

```
File Edit View Terminal Tabs Help
# (like drivers for scsi-controllers, for lvm or reiserfs)
#
INITRD_MODULES="mptsas processor thermal fan reiserfs edd dm-multipath dm-intel"
## Type:      string
## Command:   /sbin/mkinitrd
#
# This variable contains the list of modules to be added to the initial
# ramdisk that is created for unprivileged Xen domains (domU); you may need
# drivers for virtual block and network devices in addition to filesystem
# and device-mapper modules.
#
DOMU_INITRD_MODULES="xen-net xenblk"
## Type:      string
## ServiceRestart:  boot.loadmodules
#
# This variable contains the list of modules to be loaded
# once the main filesystem is active
# You will find a few default modules for hardware which
# can not be detected automatically.
#
MODULES_LOADED_ON_BOOT=""
## Type:      string
## Default:   ""
#
# The file name of a binary ACPI Differentiated System Description Table
# (DSDT). This table is appended to the initial ram disk (initrd) that
# the mkinitrd script creates. If the kernel finds that its initrd
# contains a DSDT, this table replaces the DSDT of the bios. If the file
# specified in ACPI_DSDT is not found or ACPI_DSDT is empty/not specified,
# no DSDT will be appended to the initrd.
# Example path /etc/acpi/dsdt
#
ACPI_DSDT=""
## Type:      integer(1000:50000)
## Default:   1000
10,79 15%
Computer Terminal Mon Nov 3, 14:05
```

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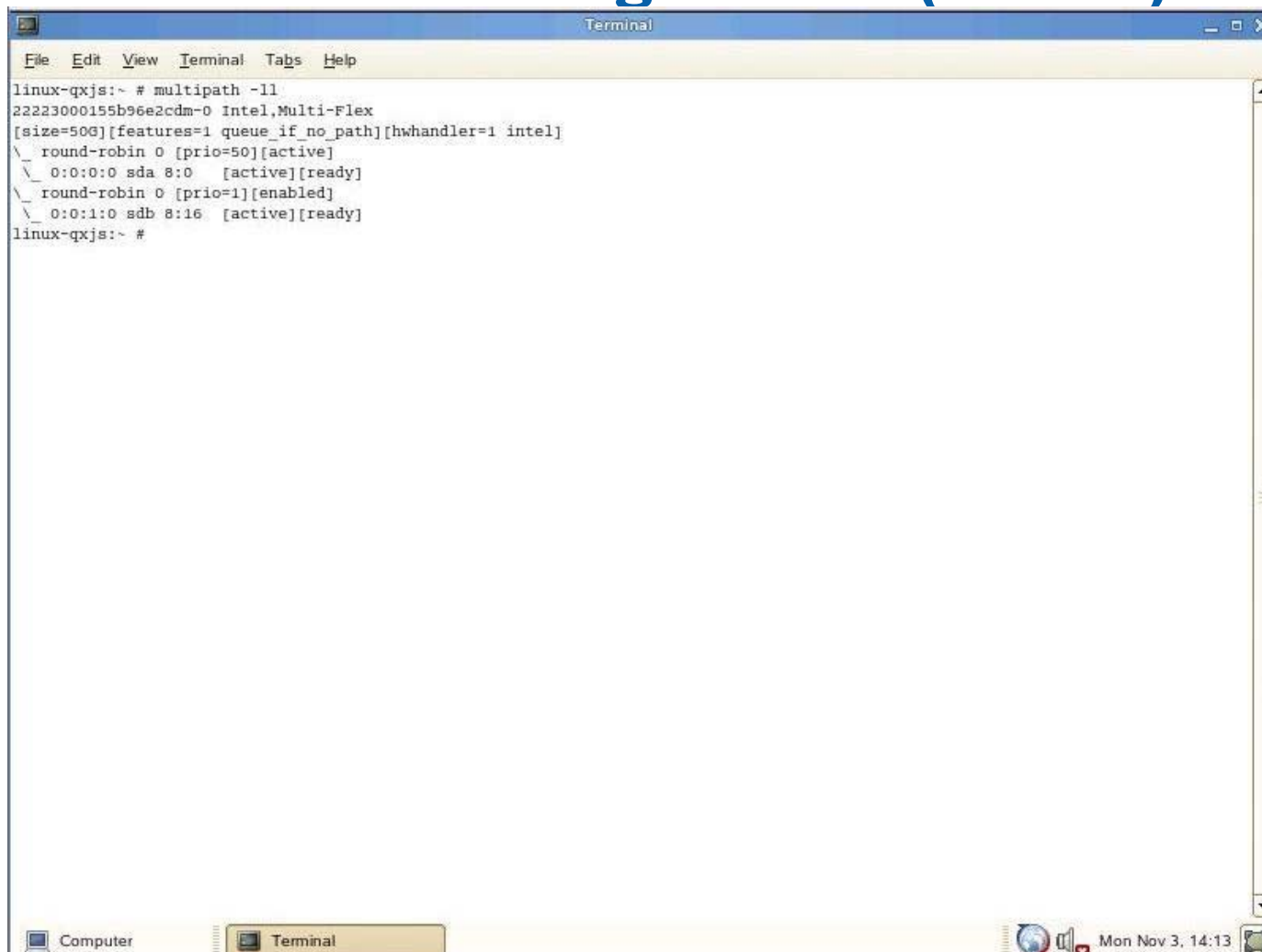
SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)

- To display the topology, type the following command:
 - `multipath -ll`

For a sample output of the “`multipath -ll`” command, see the screenshot on the next slide.



SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)



```
linux-qxjs:~ # multipath -ll
22223000155b96e2cdm-0 Intel,Multi-Flex
[size=50G][features=1 queue_if_no_path][hwhandler=1 intel]
\ _ round-robin 0 [prio=50][active]
  \_ 0:0:0:0 sda 8:0 [active][ready]
\ _ round-robin 0 [prio=1][enabled]
  \_ 0:0:1:0 sdb 8:16 [active][ready]
linux-qxjs:~ #
```

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SuSE* Linux Enterprise Server 10 SP1 and 10 SP2 - Post Install Configuration (cont'd)

- The server is now properly configured for Multipath usage.

Note: Some I/O errors are normal on a properly configured system. Each multipath device is composed of an active path and a standby path. The standby path is only used if the active path fails. Any I/Os to the standby path will be rejected while the active path is healthy. Normal attempts by the Linux OS to probe standby paths can result in some I/O errors in /var/log/messages as follows:

```
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdd, sector 0
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdd, sector 0
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdc, sector 0
Apr 23 10:28:49 gruherstest kernel: end_request: I/O error, dev sdc, sector 0
```

Other attempts to access the standby paths, such as with fdisk, will also result in failures. This is normal for Linux Multipath solutions and is not specific to an Intel® Modular Server.

