Advanced SUSE Linux Enterprise Server Administration (Course 3038)

Chapter 9

Manage Hardware and Component Changes

Objectives

- Describe the Differences Between Devices and Interfaces
- Describe How Device Drivers Work
- Describe How Device Drivers Are Loaded
- Describe the sysfs File System

Objectives (continued)

- Describe How the SLES 9 Hotplug System Works
- Use the hwup Command
- Add New Hardware to a SLES 9 System

Describe the Differences between Devices and Interfaces

- Device
  - Real, physical piece of hardware
  - Can have more than one interface
- Interface
  - Software component associated with a device
  - Usually created by a driver
- Driver
  - Software module that can be loaded into the Linux kernel
  - Glue between a device and its interfaces

Describe How Device Drivers Work

- Types of device drivers
  - Kernel modules
  - User space drivers
- Manage kernel modules using commands
  - lsmod
    - Lists all loaded kernel modules
  - modprobe
    - Loads kernel modules
  - rmmod
    - Removes loaded kernel modules

Describe How Device Drivers Work (continued)

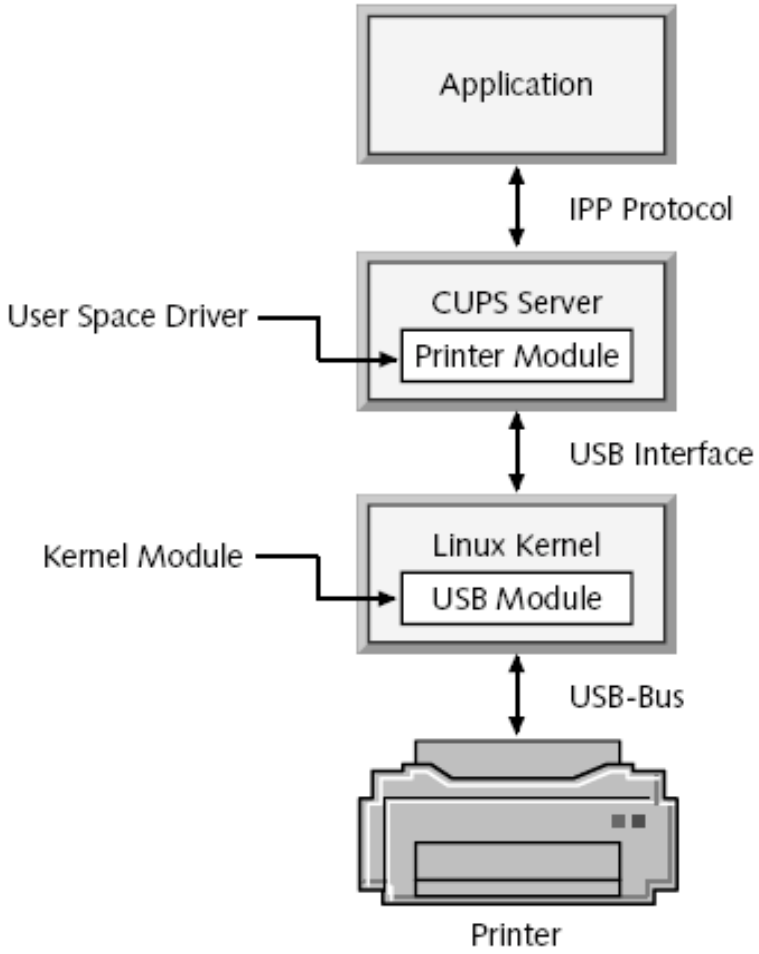

Figure 9-1

Describe How Device Drivers are Loaded

- initrd
  - Special file loaded into memory by the boot loader
  - Loads other device drivers
- initscripts
  - Dedicated to loading and setting up hardware devices
- hotplug
- X Server
  - Loads special drivers to enable hardware 3D support
- manually
  - Use commands modprobe, hwup, or hwdown

Describe the sysfs File System

- sysfs
  - Virtual file system that is mounted under /sys
  - Represents all devices and interfaces of a Linux system
  - Determines which interface belonged to which device
- Main directories
  - /sys/bus and /sys/devices
    - Contain different representations of system hardware
  - /sys/class and /sys/block
    - Represent the interfaces of the devices

Describe the sysfs File System (continued)

- Connect an interface with a device
  - Use file system links
- There are also the device files in the /dev directory

Describe How the SLES 9 Hotplug System Works

- Hotplug
  - Loads driver modules and set up interfaces
- Every action hotplug performs
  - Must be triggered by a hotplug event
- Hotplug events can be created in the following ways
  - By the Linux kernel
    - When a connection to a device is established
  - By Coldplug
    - Coldplug is a script that starts at boot time
    - Scans the system creating events for all devices it finds

Describe How the SLES 9 Hotplug System Works (continued)

- Hotplug event
  - Basically a call of the script /sbin/hotplug
  - Kernel is configured to call this script
    - By an entry in /proc/sys/kernel/hotplug
- Every hotplug event has an event type
  - Determined by a single parameter
    - ieee1394 – used by the Firewire subsystem
    - usb – used by the USB subsystem
    - net – used by the networking subsystem
    - pci - used for PCI devices

Describe How the SLES 9 Hotplug System Works (continued)

- Hotplug agents
  - Device agents
    - Load kernel modules and call additional commands to set up a device
    - Call the hwup script
  - Interface agents
    - Register an interface for the device
  - Located in the directory /etc/hotplug/
- It might not be possible to start some devices with the hwup script

Describe How the SLES 9 Hotplug System Works (continued)

- Agents have routines to find and load correct driver module automatically
  - By searching module map files in the directories /etc/hotplug/ and /lib/modules/*kernelversion*/
- /etc/hotplug/blacklist
  - Contains a list of driver modules that should never be loaded by hotplug
- Switch off both coldplug and hotplug
  - NOCOLDPLUG=1
  - NOHOTPLUG=1

Describe How the SLES 9 Hotplug System Works (continued)

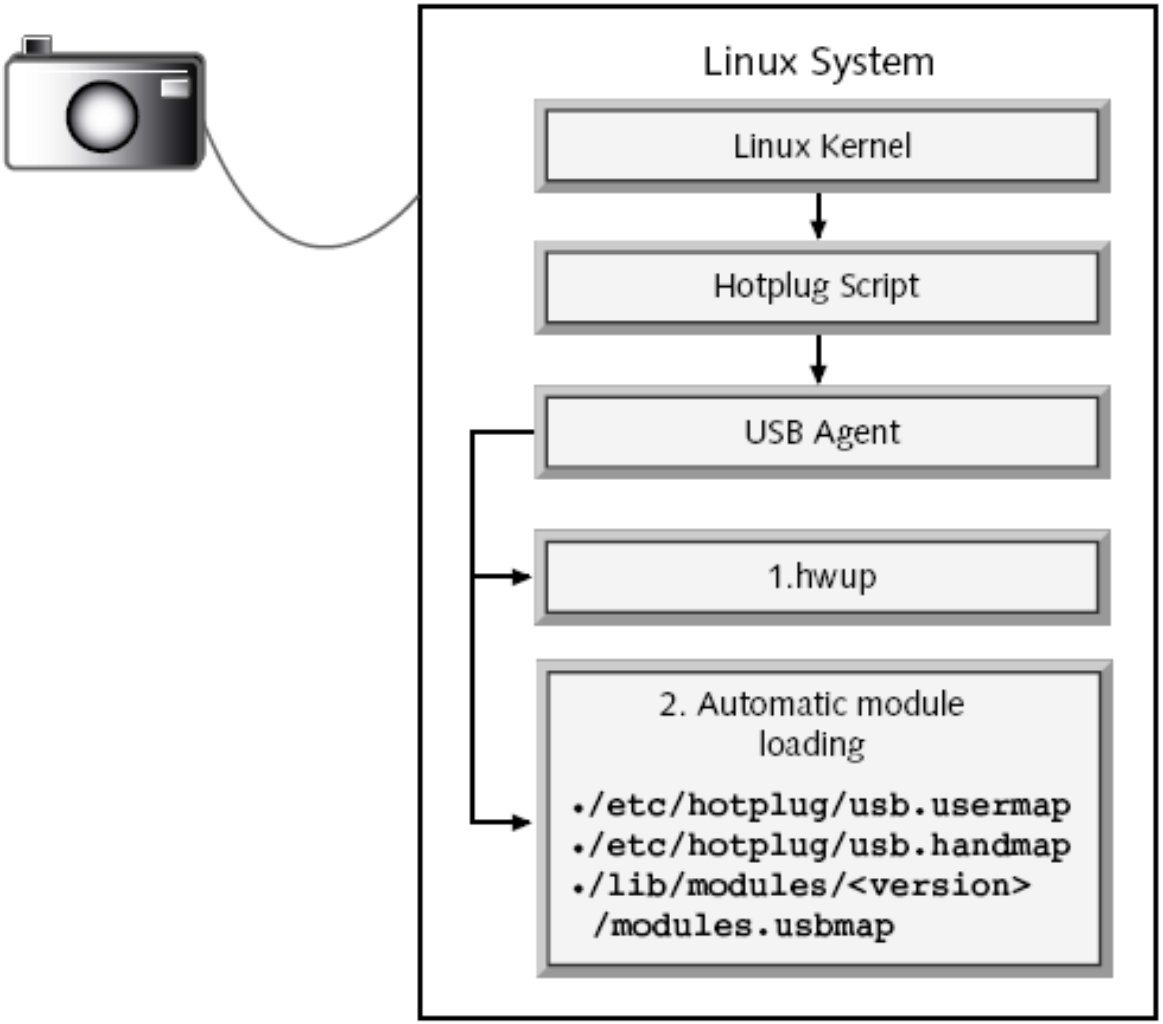

Figure 9-2

Use the hwup Command

- Command hwup
  - Used by hotplug agent to start preconfigured devices
  - Reads device configurations from files in directory /etc/sysconfig/hardware/
- Filename example: hwcfg-bus-pci-0000:02:08.0
  - Filename consists of the following four elements:
    - hwcfg
    - bus
    - pci
    - Address of device in PCI bus

Use the hwup Command (continued)

- Command lspci
  - Displays the PCI address of a device
- Start the network card
  - hwup bus-pci-0000:02:08.0
- Deconfigure network card
  - hwdown bus-pci-0000:02:08.0

Use the hwup Command (continued)

Table 9-1

Variable	Description
STARTMODE	This determines when and how a device will be started: • **auto.** The device is automatically started at boot time or by hotplug when the device is connected to the system. • **manual.** The device *should not* be started automatically, but it *can* be started manually. • **off.** The device should never be started.

Use the hwup Command (continued)

Table 9-1 (continued)

Variable	Description
MODULE	The value of this variable determines the name of the kernel module that should be loaded for the device. If multiple modules have to be loaded, you can use this variable multiple times with any suffix appended. You must then use the same suffixes for multiple MODULE_OPTIONS variables. Example: **MODULE_A="foo"** **MODULE_B="bar"** **MODULE_OPTIONS_A="foo-opt"** **MODULE_OPTIONS_B="bar-opt1=xyz"**
MODULE_OPTIONS	With this variable, options can be passed to the kernel module.
SCRIPT{UP,DOWN}_[type]	This specifies the script to be called for initialization and deconfiguration of a specific device type. This script is called if the type of the device to be initialized matches the type given in this parameter.
SCRIPT{UP,DOWN}	This specifies the script to be called for initialization and deconfiguration of the device. It will be called only if no matching type-specific scripts are configured.

Exercise 9-1 Trace How a Network Adapter Is Set Up With hwup and ifup

- In this exercise, you will do the following
  - Part I: Boot the System with Hot- and Coldplug Disabled
  - Part II: Use hwup to Load a Driver Module
  - Part III: Use ifup to Set Up the Network Interface

Add New Hardware to a SLES 9 System

- Objectives
  - Add a New Drive to the System
  - Replace a Graphics Card
  - Add a New Network Adapter

Add a New Drive to the System

- Steps
  - Shut down the system and install the new drive
  - Boot the system into runlevel 1
  - Create a partition and a file system on the new drive
  - Mount the drive temporarily in the /mnt directory
  - Copy the existing data from /srv to /mnt
  - Verify copied data and delete content of /srv directory
  - Umount the new hard disk
  - Edit /etc/fstab to mount new hard drive automatically
  - Reboot the system to the default runlevel

Replace a Graphics Card

- Steps
  - Shut down the system and replace the graphics card
  - Boot the system into runlevel 3
  - Log in as root and start sax2 to configure the new graphics card
  - When finished, change to runlevel 5

Add a Network Adapter

- Steps
  - Open interface configuration file of existing adapter
  - Add the following line to the configuration file:
    - PERSISTENT_NAME='external'
  - Shut down system and install new network adapter
  - Start the system and boot into runlevel 1
  - Configure the new network adapter with YaST
  - Open interface configuration file of the new network adapter and add the following line:
    - PERSISTENT_NAME='internal'
  - Reboot the system into the default runlevel

Summary

- Operating system interacts with interfaces
  - That use a device driver to communicate with hardware devices
- Device drivers are typically loaded into the Linux kernel as modules
- Command modprobe
  - Inserts modules manually into the Linux kernel
- /sys directory uses the sysfs virtual filesystem
  - Lists information about devices and interfaces
  - Directories include: /sys/bus, /sys/devices, /sys/class, and /sys/block

Summary (continued)

- Hotplug devices
  - Linux kernel typically detects the addition of the device and runs a hotplug script
- Command hwup
  - Used by hotplug agents to locate the appropriate device driver module
- Hotplug devices may also be detected using a coldplug script
- Use boot options to prevent the hotplug and coldplug subsystems from starting

Summary (continued)

- Adding a new hard disk to the system
  - Boot to runlevel 1 to configure the partitions, file systems, and /etc/fstab entries
- Adding a new graphics card to the system
  - Boot to runlevel 3 and run the sax2 utility to configure the appropriate driver and settings
- Use multiple network interfaces
  - Ensure that each interface contains a persistent name in its configuration file