

Kernel & Device Drivers Installation & Configuration

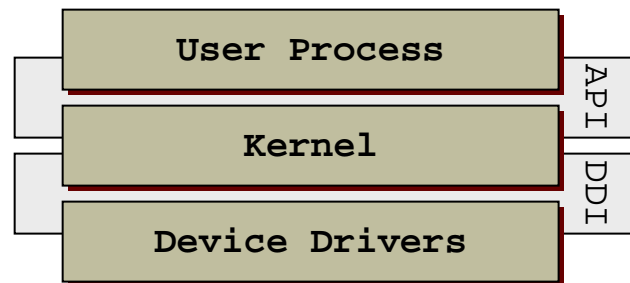
CIS 68C1-01

Lecture 5

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The Kernel & Device Drivers

- What are Device Drivers?
 - Small pieces of kernel software that controls and operates a specific device
 - Interface between kernel and device driver is similar to interface between process and kernel



The Kernel & Device Drivers

- Why are they needed?
 - Kernel does not speak a device's *language*
 - Kernel uses device drivers to talk to these devices
 - Device drivers speak the kernel's language
 - Too many devices, manufacturer's and variations
 - 200 network interfaces, 30 SCSI chipsets
 - RedHat 7.0 comes with 570 different drivers!
 - Allows *modularization*
 - Don't have to re-work entire kernel for a new device

The Kernel & Device Drivers

- Where are they located?
 - Built-in drivers
 - Statically linked into the kernel
 - Cannot be removed without rebuilding the kernel
 - Loadable Kernel Modules – *LKMs*
 - Available in the filesystem
 - */lib/modules/kernel-version*
 - List of modules:
 - */lib/modules/kernel-version/modules.dep*

The Kernel & Device Drivers

- When are they used?
 - To use a device, its driver must be **loaded**
 - Built-in drivers are loaded when the kernel is loaded
 - **LKMs** are dynamically loaded by the kernel when needed
 - A device in `/dev` generally can't be used until its driver is loaded

The Kernel & Device Drivers

- How are they loaded?
 - The **insmod** and **modprobe** commands
 - **insmod *module*** loads a module
 - Does not resolve dependent modules
 - Some modules have dependencies, others do not
 - i.e. *moduleB* requires *moduleA* to be loaded first
 - **modprobe *module*** loads *module* and its dependencies
 - Resolves all dependencies
 - Dependency list: `/lib/modules/kernel-version/modules.dep`
 - Also uses `/etc/modules.conf`

The Kernel & Device Drivers

- How are they loaded?
 - **kerneld** is the *LKM* loader daemon
 - Works on behalf of the kernel
 - When a device with an unregistered major number is used, kernel asks **kerneld** to load the device
 - Loads module associated with a major device number
 - Files used for module definitions
 - `/etc/modules.conf`
 - `/lib/modules/kernel-version/modules.dep`

The Kernel & Device Drivers

- Other module commands and files
 - **lsmod** command lists all loaded modules
 - **rmmod** command removes loaded modules
 - `/etc/modules.conf`
 - Configuration file used during load
 - Defines per module variables, names, & load options
 - Used to give an **alias** name to a module
 - Deprecated name: `/etc/conf.modules`
 - For more info on Linux *LKMs*
 - <http://www.linuxdoc.org/HOWTO/Module-HOWTO/index.html>

Kernel Installation

□ Overview

- Boot mini-Linux from floppy or CD-ROM
- Linux installer runs
- Hard disk prepared
- Linux software copied to hard disk
- Reboot to boot new Linux installation
- Configuration

Kernel Installation

□ Boot mini-Linux

■ Linux installer CD

- Configure BIOS to boot from CD
- BIOS older than '97 may not support CD booting

■ Boot floppy

- If you don't have boot floppies, make them
 - Images are available via Windows on Linux installer CD
 - Need **rawrite** utility available on CD
 - Also can be created via UNIX dd command

Kernel Installation

- mini-Linux
 - Loaded from the boot floppy or CD-ROM
 - Loaded into RAM-based filesystem called **ramdisk**
 - Why does Linux need to run?
 - The Linux installer is a Linux program
 - Software in RedHat Linux RPMs (or other) format
 - Gives access to the CD-ROM
 - To create an ext2 filesystem in the root partition
 - Device detection

Kernel Installation

- mini-Linux
 - Load supplementary device-support floppies
 - Provides a way to add additional device support
 - May need to get drivers or host bus adapters
 - May be available from vendor or elsewhere on the web
 - Mini-Linux boot loader will ask if you have any

Kernel Installation

- mini-Linux boot failures
 - Primary causes
 - Unsupported or unknown devices
 - Unseen devices
 - Device I/O or IRQ conflicts
 - Incomplete device driver support
 - Incomplete or no kernel support

Kernel Installation

- mini-Linux boot failures
 - Resolving boot failures
 - Boot in text mode
 - Pay close attention to all messages on the screen
 - Need to provide options to LILO to override defaults
 - These are *very* specific to your hardware
 - Interrupt LILO - hold down Shift or Control during boot
 - Boot with required options
 - Example: boot: **linux nousb cdrom=nodma**

Kernel Installation

□ Installer

- Graphical Installer drives installation process
 - Vendor Specific
- May be used in *text* mode for further debugging
- Asks series of configuration questions
- Runs program to partition disk
 - **fdisk** or **Disk Druid** (RedHat)
 - Root partition required; should also create swap
 - If desired, create partition for /home as well

Kernel Installation

- Installer
 - Creates initial accounts (root and a user account)
 - Creates bootable ext2 root filesystem
 - Initializes swap partitions
 - Creates additional filesystems as requested
 - Asks which software should be installed
 - Workstation, Server, or Custom
 - Installs operating system and selected *packages* from CD-ROM to root filesystem

Kernel Installation

- Installer
 - Installing asks to install LILO
 - Install in partition boot record if dual booting
 - Requires capable boot loader or Linux boot diskette
 - Install in MBR otherwise
 - Reboots when package installation completes
 - Remove boot floppy (and CD as requested)
 - Otherwise, the mini-Linux will load and run again

Kernel Installation

- First Boot
 - Supply LILO with any required settings
 - Use same procedure required to boot mini-Linux
 - Login as root
 - Reconfigure LILO permanently as needed
 - Add options required to boot in `/etc/lilo.conf`
 - Run **lilo** utility to reconfigure boot record
 - Begin Administration
 - Configure X Windows, user accounts, setup networking, etc.

Kernel Installation

□ Additional Help

■ Links

- <http://www.linuxdoc.org/HOWTO/Installation-HOWTO/index.html>
- <http://www.redhat.com/docs/manuals/linux/RHL-7-Manual/install-guide/>
- <http://www.linuxdoc.org/HOWTO/HOWTO-INDEX/howtos.html>

■ Help section on the class website

■ Start searching the web

■ Ask a friend!