Learning Objectives

Upon completion of this lesson students should be able to:

- Recall policies, requirements and textbooks for this course
- Discuss origins and use of Free and Open Source Software
- Describe the purpose of an operating system
- Outline the key features of the Linux operating system

Learning Objectives

Upon completion of this lesson students should be able to:

- Describe the origins of the Linux operating system
- Identify characteristics of various Linux distributions and where to find them
- Explain the common uses of Linux in industry today
Learning Objectives

Upon completion of this lesson students should be able to:

- Recall and describe industry certifications for Linux professionals
- Recall the Linux distributions used for this course
- Demonstrate how to run a boot-from-CD Linux distribution

Syllabus & Policies

- Syllabus
  - Blackboard
- Lectures
  - Lecture notes
- Readings
  - Textbooks
- Labs

Syllabus & Policies

- Assignments
  - Labs
  - Homework
- Exams & Quizzes
- Plagiarism
- Other Policies
Operating Systems

◆ Computers have two fundamental components:
  ▪ Hardware: Physical components inside a computer
  ▪ Software: Set of instructions or programs that understand how to use the hardware of the computer in a meaningful way

Operating Systems

◆ Hardware components include:
  ▪ Processor (CPU)
  ▪ Physical memory (RAM)
  ▪ Hard disk drives
  ▪ CD and DVD drives (optical drives)
  ▪ Flash memory card readers (SD cards)
  ▪ Sound cards
  ▪ Video cards
  ▪ Circuit boards

Operating Systems

◆ Two different types of programs are executed on a computer:
  ▪ Applications: programs designed for a specific use and with which a user interacts
  ▪ Operating system (OS) software: software components used to control the hardware of the computer
Operating Systems

- Device Driver
  - Software containing instructions that the OS uses to control and interact with a specific type of computer hardware

- User Interface
  - Application program that allows the user to interact with the OS and other application programs
  - Can be a command line prompt or a graphical user interface (GUI)

Operating Systems

- Graphical user interface (GUI): Component of an OS that provides a user-friendly interface

- System services: Applications that handle system-related tasks
  - Printing
  - Scheduling programs
  - Network access

Figure 1-1: The role of operating system hardware
The Linux Operating System

- OS used to run variety of applications on a variety of different hardware
- Multiuser and multitasking OS
  - Has the ability to manage thousands of tasks at the same time
  - Allows multiple users to access the system simultaneously
- Tux the Penguin™ is the mascot

Linus Torvalds, creator of Linux
The Linux Operating System: Versions

- Core component: Linux kernel
  - Written almost entirely in the C programming language (like UNIX)
- Software can modify Linux appearance, but the kernel is common to all Linux
- Important to understand Linux kernel version numbers to decide which version is appropriate for user needs
- Good understanding of system hardware important in deciding which kernel version to use

Identifying Kernel Versions

- Linux kernel versions composed of:
  - Major number
  - Minor number
    - If odd = developmental kernel until 3.0 (not fully tested with implied instability)
    - If even = production kernel before 3.0 (thoroughly tested/declared to be stable)
    - After 3.0 some even Minor number versions are designated long-term stable
  - Revision number – developmental versions now include “rc” following Minor number

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<td>January 1992</td>
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<td>Active – January 2017</td>
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Free & Open Source Software (FOSS)

- Software liberally licensed to grant rights to users to study, change, and improve design through availability of its source code

Open Source Software (OSS)

- Programs distributed and licensed so that the source code is available to anyone who wants to examine, utilize, or improve upon it
  - Source code is the list of instructions that a software developer writes to make up a program
  - Format & structure of source code follows rules defined by the programming language in which it was written

Implications of OSS

- Developed very rapidly through widespread collaboration
- Bugs (errors) noted & promptly fixed
- Features evolve quickly based on user needs
- Perceived value of the software increases because it is based on usefulness, not on price
Software License Types

<table>
<thead>
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<th>Type</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Open Source</td>
<td>Software in which the source code and software can be obtained free of charge and can be modified</td>
</tr>
<tr>
<td>Closed Source</td>
<td>Software in which the source code is not available; although it may be distributed free of charge, it is usually quite costly</td>
</tr>
<tr>
<td>Freeware</td>
<td>Closed source software given out free of charge</td>
</tr>
<tr>
<td>Shareware</td>
<td>Closed source software that is initially given out free of charge, but that requires payment after a certain period of use</td>
</tr>
</tbody>
</table>

The GNU Public License (GPL)

- Stipulates that source code of any software distributed under this license must be made freely available
- All software distributed under the GPL requires recipients receive “a copy of the License along with the Program”

GNU Public License Provisions

- Any licensee (anyone) can modify, copy and redistribute the work or any derivative version
  - Can charge a fee or do it for free
- Right to redistribute granted only if source code (including modifications) is included
  - Distributed copies and any modifications must also be licensed under the GPL
GNU Public License Provisions

- Modified versions that are not redistributed have no requirement to divulge the modifications
  - This allows GPL open source software to be used as the basis to develop proprietary in-house information systems

GNU Public License

- Version 3 current
  - Prevents GPL software from using technical means to prevent copying
  - Addresses software patent concerns
- Linus Torvalds not happy with some provisions of version 3 so the Linux kernel still released under version 2

Effects of the License Model

- Everybody has access to the source
  - Volunteer software development on the Internet, with central coordination
  - Linus Torvalds coordinates the kernel
  - Others coordinate other pieces of the OS
Effects of the License Model

- Peer reviews are possible
  - Security
  - Performance
  - Reliability
    - “Given enough eyeballs, all bugs are shallow.”
- The license cannot change
  - So your changes (& name) stay in forever

Types of Closed Source Licenses

- Most closed source software sold commercially
  - e.g., Microsoft, Adobe, Electronic Arts, etc.
- Freeware
  - Distributed free of charge but source code is not necessarily available
- Shareware
  - Initially free, but requires payment after a period of time or usage

OSS Advantages: Cost Reduction

- OSS provided under two models:
- Free as in Freedom
  - As in “liberty” or “having freedom”, like free speech
- Free as in Beer
  - “At zero price”, free in the sense that some good or service is supplied without payment
- Many OSS projects are both
OSS Advantages: Cost Reduction

◆ Free as in Freedom
  ▪ Developers can (and do) charge money for the software
    ● Users are free to change anything
    ● Users alternatively can download and compile the source code themselves instead of paying
  ▪ Best known example: Red Hat Linux
  ▪ Nearly always still cheaper than closed source alternatives

◆ Free as in Beer
  ▪ Software distributed no charge or solely for the cost of distribution; the developer does not gain any monetary compensation
  ▪ May or may not be Open Source
  ▪ Much (most?) free software is both
    ● 98% of distributions of the Linux OS
    ● 75% of distributions of OpenOffice.org

OSS Advantages: Risk Reduction

◆ Changes in the market or customer needs may cause companies to change software frequently
  ▪ Can be costly and time-consuming
◆ Support for closed source software end
  ▪ Vendor may go out of business
  ▪ Software version may be retired
◆ OSS products offer opportunity to maintain and change the source code
Linux Today

Linux covers the whole spectrum of computing
- Embedded devices
- Laptops
- Desktop systems
- Development systems
- Small and large servers
- Megaclusters/supercomputers

Linux Today

- Linux is used throughout the world
  - ... and in space
- Linux is used by home users
  - ... and by some of the largest companies in the world
  - IBM
  - Boeing
  - NASA
  - Google

Linux Advantages: Meeting Business Needs

- Common software available for Linux includes:
  - Scientific and engineering software
  - Software emulators
  - Web servers, Web browsers, and e-commerce suites
  - Desktop productivity software
  - Graphics manipulation software
  - Database software
  - Security software
  - Multimedia and CD-ROM creation
Linux Advantages: Stability and Security

- Customers using closed source OS must rely on OS vendor to fix bugs
  - Waiting for a hot fix may take weeks or months
- Bugs and security loopholes in OSS programs can be identified and fixed quickly
  - Code freely available and scrutinized by many developers

Linux Advantages: Flexibility

- Flexibility for Different Hardware Platforms
- Partial list of hardware platforms on which Linux can run:
  - Intel
  - Itanium
  - Mainframe (S/390)
  - Cirrus Logic ARM
  - DEC Alpha
  - MIPS
  - M68K
  - PA-RISC
  - SPARC
  - Ultra-SPARC
  - PowerPC
  - AMD

Linux Advantages: Ease of Customization

- Can be customized to work on mobile and embedded devices
- Ability to control inner workings of the OS
  - To use Linux as a Web server, compile the kernel to include only the support needed to be a Web server
    - Results in a much smaller and faster kernel
  - Can choose to install only software packages needed to perform required tasks
  - Can use shell and PERL scripts to customize or automate tasks
Linux Advantages: Ease of Obtaining Support

- Linux documentation easily found on the Internet
  - Frequently asked questions (FAQs)
  - HOWTO documents
    - maintained by their authors but are centrally collected by the Linux Documentation Project (LDP)
- Linux newsgroups
- Linux User Groups (LUGs)
  - Open forums of Linux users who discuss and assist each other in using and modifying the Linux OS

Linux Advantages: Cost Reduction

- Less expensive than other OSs
  - No cost associated with acquiring the software
  - Wealth of OSS can run on a variety of hardware platforms running Linux
- Largest costs associated with Linux:
  - Costs associated with hiring people to maintain the Linux system
- Total cost of ownership (TCO):
  - overall cost of using a particular OS

Linux Advantages

- No reboots
  - Install/remove & stop/start software without interrupting OS operation
  - Only reboot for kernel recompilation
- Portable software
  - Same applications on Linux, UNIX and BSD (which includes OS X)
  - Mature desktops (X Windows with Gnome and KDE) also found across Linux, UNIX and BSD
Linux Advantages

- Downloadable applications (for free!)
- No settings hidden in code or registries
- Freedom
  - Rewrite code to do what you want or need it to do
  - Free software that is free as in speech AND free as in beer

Linux Concerns: SCO Group

- The SCO Group (formerly Santa Cruz Operation and formerly Caldera, a major Linux distributor) brought suit against IBM in March 2003
- Lawsuit was based on SCO ownership of UNIX System V
  - Even the ownership was disputed as Novell states that SCO’s purchase of UNIX was a license and not ownership of the OS itself
  - Courts ruled in favor of Novell and ruled SCO owed Novell share of income from System V

- SCO claimed Linux infringes SCO’s UNIX copyright, trade secrets, and contractual rights
  - SCO claimed that IBM placed UNIX code into the Linux kernel
- SCO also stated that the GPL violates the U.S. Constitution (!)(Huh?)
- Never proved anything…
- SCO is now profoundly dead
- Unfortunately so is Novell (bought out)
Linux Concerns: Microsoft

- Microsoft claimed in Fortune magazine article that 235 patents of their patents were infringed by Linux and other free and open source software; they claimed:
  - Linux kernel violated 42
  - user interfaces violated 65
  - OpenOffice violated 45
  - open source e-mail applications violated 15
  - various open source software violated 68

- Microsoft: they did not intend to sue but tried to collect appropriate ‘license fees’ in classic Microsoft “FUD” (Fear, Uncertainty & Doubt) technique to bully corporate America into paying license fees for free software
- Now sell a lot of Linux

- Oct 2014: “Microsoft loves Linux”
  - Linux is key element in Azure
  - Sell Linux instances or provide CentOS for free
  - Microsoft make more money from every Android device sold than Google does
    - $5-$15 in patent licensing fees
    - Large part is for FAT filesystem support
Linux Concerns: Microsoft

- Microsoft SQL Server version being released to run under Linux
- Next major release of Windows 10 will include an Ubuntu Linux bash shell
  - Win 10 developer version only
  - Uses Linux Subsystem for Windows instead of Linux kernel
    - POSIX-compliant hooks in Windows kernel
  - In theory can run all Ubuntu binaries (but not graphical shells)

The History of Linux

- Evolved from Multiplexed Information and Computing Service (MULTICS)
- First true multitasking, multiuser OS
  - Originally written in Assembler
- Developed by AT&T's Bell Labs
  - Ken Thompson & Dennis Ritchie (friends of ITM Professor Bill Lidinsky)

UNIX

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UNIX

- Rewritten in the C language in 1971
  - Portable OS
  - Bell Labs provided documentation and source code to universities almost at cost
- Functionalities very quickly added
- OS on which Linux was based
- AT&T sold source code to several companies
  - Each developed its own variety (or flavor) of UNIX yet adhered to standards agreed upon by all

Two Major UNIX forks (divisions)
- Berkeley Software Distribution (BSD)
  - Version of original UNIX source code
  - Free BSD, Net BSD, Open BSD
  - Also (as Darwin) serves as the underlying code for Apple’s OS/X
  - Generally free/Open Source
    - Backward engineered UNIX code and removed all AT&T proprietary code

Two Major UNIX forks (divisions)
- AT&T / SystemV
  - In 1983 began marketing UNIX SystemV
    - proclaimed as “the” UNIX standard
  - Now belongs to Novell/Attachmate

Quarrels between vendors prevented standardization of the UNIX family
Major flavors of UNIX today include:

- Oracle (formerly Sun) Solaris (UNIX System V; has free/Open Source version but portions are still binary-only)
- Hewlett-Packard HP-UX
- IBM’s AIX UNIX
- Various BSD versions (mostly free)
- Apple OS/X (built on BSD)

---

A Short History of Linux

- 1984: Richard Stallman starts GNU project
  - GNU’s not UNIX
  - http://www.gnu.org
- Purpose: Produce a free version of UNIX
  - “Free as in Free Speech, not Free Beer”

---

First step for GNU: re-implement UNIX Utilities

- C compiler, C library
- emacs
- bash

To fund the GNU project, Free Software Foundation is founded

- http://www.fsf.org/

Original kernel was HURD Mach
A Short History of Linux

- 1991: Linus Torvalds writes first version of Linux kernel
  - Initially, research into 386 protected mode
  - Linus' UNIX → Linux
  - Combined with the GNU and other tools to form a complete UNIX system
- 1992: First distributions emerge
  - Linux kernel
  - GNU and other tools
  - Installation procedure

The Hacker Culture

- Hacker: Someone wanting to expand their computing knowledge through experimentation
- Cracker: Someone who illegally uses computers for personal benefit or to cause damage
- GNU Project led to publication of GNU Public License (GPL)

Linux

- Developed by Linus Torvalds in 1991
  - Published under the GNU public license
- Linux kernel developed collaboratively and centrally managed (by Linus)
  - Linux OS is simply a by-product of OSS development
- Some prefer to call it GNU/Linux
  - (Richard Stallman but not me)
A distribution contains the UNIX utilities including the set of tools developed as part of the GNU Project.

Also includes an installation package, & a selection of software applications.

A key element is a package manager:

- Enable installation of additional applications, often in online repositories
- Package branches: RPM and .deb

Normally includes GUI components:
- A window system, a window manager and a desktop environment

Over 80 desktop distributions

Some include a large number of server-related tools, such as Web servers and database servers.
## Major Linux Distributions

- In Alpha Order:
  - Arch
  - Debian
  - Fedora
  - Gentoo
  - Linux Mint
  - Knoppix
  - Mageia
  - PCLinuxOS
  - Red Hat
  - Slackware
  - SUSE
  - TurboLinux
  - Ubuntu
  - Zorin OS

## New Distros on “Best Of” Lists

- Bodhi Linux
- DouDou Linux
- Elementary OS
- Korora
- Manjaro
- Sparky Linux
- Ubuntu derivatives
  - Xubuntu
  - Edubuntu
  - Kubuntu
  - Lubuntu
  - Ubuntu Server

## RedHat Enterprise Distributions

- Since Red Hat must release source code for their commercial product under the GNU Public License, some groups compile & distribute the current distribution for free
- Whitebox Linux
  - Supported by Beauregard Parish Public Library in DeRidder, Louisiana (inactive)
- CentOS
  - Maintained by a community of open source contributors and users but owned by Red Hat
  - Officially supported in Microsoft environments
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<tr>
<th>URL</th>
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</thead>
<tbody>
<tr>
<td>redhat.com</td>
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<td>fedoraproject.org</td>
<td>Fedora Linux</td>
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<td>centos.org</td>
<td>CentOS Linux</td>
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<td>opensuse.com</td>
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<td>knoppix.org</td>
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<td>Zorin OS</td>
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<td>linuxiso.com</td>
<td>CD-ROM ISO images of Linux distributions</td>
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<tr>
<td>distrowatch.com</td>
<td>Detailed information about Linux distributions</td>
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<tr>
<td>kernel.org</td>
<td>Linux kernel</td>
</tr>
<tr>
<td>ftp.uwsg.indiana.edu</td>
<td>ISO images of almost every Linux &amp; BSD distribution</td>
</tr>
</tbody>
</table>

**Linux Distribution Web Sites**

**Specialized Distributions**

- **Routers**
  - OpenWrt, Coyote, FREESCO, DD-WRT
- **Bioinformatics**
  - DNALinux
- **Home theater PCs (MythTV)**
  - KnoppMyth, Mythbuntu, GeeXboX
- **Specific platforms**
  - Yellow Dog Linux on pre-Intel Apple Macintosh

**Specialized Distributions**

- **Educational users**
  - Edubuntu, EduLinux, Karoshi
- **Scientific servers/workstations**
  - Scientific Linux, Poseidon Linux
- **Gaming**
  - SteamOS, SuperGamer
- **Embedded Systems**
  - ELinOS, MontaVista Linux, UBOS
Linux Distributions

- Distributions may appear different on the surface, but run the same kernel
- Most distributions include a GUI that can be further customized to suit needs of the user
  - Core component of this GUI is the X Window System, aka X11 or just X
  - Replacements in work: Mir (Canonical) and Wayland (former X.Org developers)

Linux Distributions

- GUI environment
  - X Windows in combination with a window manager and desktop environment
- Two major competing GUI desktop environments in Linux:
  - GNU Object Model Environment (GNOME)
  - Kommon Desktop Environment (KDE)
  - Unity - new GNOME shell on Ubuntu
    - Preferred by vendors for OEM installation

Figure 1-5: The Gnome Desktop
Linux Distributions

A Gnome Desktop (Activities ➔ Show Applications selected)

Figure 1-6: The KDE Desktop

The Unity Desktop
Linux Distributions

- **Package manager**
  - Software system that installs and maintains software
  - Red Hat package manager (RPM) standard on many Linux distributions
- **Tarball**
  - Compressed archive of files containing scripts that install software to the correct location on the system
  - Difficult to manage, upgrade or remove from system

Common Uses of Linux

- May be customized to provide services for a variety of companies in a variety of situations
- **Workstation services**
  - Services used on a local computer
- **Server services**
  - Made available for other computers across a network
**Internet Servers: Mail Services**

- **Mail transfer agent (MTA):** e-mail server used to distribute email
  - Examples: sendmail, postfix, smail, and qmail
- **Mail delivery agent (MDA):** service that downloads e-mail from an MTA
  - Examples: procmail and fetchmail
- **Mail user agent (MUA):** program that allows e-mail to be read by a user
  - Examples: mutt, pine, printmail, elm, mail, Netscape, and Eudora

**Internet Servers: Routing**

- **Routing**
  - Provides interconnection between separate networks
  - Core service necessary for Internet to function
  - Linux provides support for routing and is easily customizable
- **Router:** computer or special hardware device that provides interconnection between separate networks

**Internet Servers: FTP Services**

- **File Transfer Protocol (FTP) Services:** most common and efficient method for transferring files over the Internet
  - Also commonplace when transferring files on an internal company network
- **Most FTP servers available on the Internet allow any user to connect**
  - Called anonymous FTP servers
- **Most OS are distributed with an FTP client program**
Internet Servers: Firewalls and Proxy Services

- **Firewall**
  - Protects companies from outside intruders on the Internet
  - Linux has firewall support built into the kernel
- **Proxy server**
  - Requests Internet resources such as Web sites and FTP sites on behalf of computers inside the company
  - Common Linux proxy server is Squid

Internet Servers: Web Services and News Services

- **Web services**
  - Web servers host information (text, pictures, music, binary data, and video)
  - Can also process programs known as Common Gateway Interface (CGI) scripts and provide secure connections
- **News services**
  - News servers allow users to post messages in forums called newsgroups
  - Most Web servers do not provide means for users to communicate

Internet Servers: DNS Services

- Computers communicating on a network need to be uniquely identified
  - Each computer is assigned an Internet Protocol (IP) address
    - Long string of numbers
    - Allows computers to identify and reference each other
- **Fully Qualified Domain Name (FQDN)**
  - Masks IP addresses with user-friendly names
File and Print Servers

- Linux is well-suited for centrally sharing resources
  - More economical to share files and printers over a network
  - Inherently fast and light
  - A distribution specific to a certain task can be installed on the central server
  - Can share resources with a computer running another OS
  - Most common service used to allow clients to connect to shared information and printers on a Linux server is Samba

Cloud Systems

- Cloud
  - Large system of computers that work together to provide a wide set of services to users and organizations across the Internet
  - Examples: Facebook, Amazon, Twitter, Gmail, Office365, Paypal, and eBay
- Most cloud systems run Linux in a cloud-based configuration using cloud software
  - Collectively called a cloud platform
- OpenStack is one of the most popular open source cloud platforms available

Application Servers

- Application server
  - Intermediary between a client computer and a database
- Database
  - Organized collection of data that is arranged into tables of related information
- Database Management Systems (DBMS)
  - Set of programs designed for creation, modification, manipulation, maintenance, and access of information from databases
Supercomputers

- Clustering
  - Combining several smaller computers to act as one large supercomputer
  - Beowulf clustering
    - Most common Linux method of clustering
- Scalability
  - Computers that can increase workload as number of processors increases
  - Clustering computers often results in better scalability than adding processors to a single computer

Scientific/Engineering Workstation

- Scientific and engineering community often needs customized programs
- OSS programs can be used or modified
  - OSS software for physics, astrophysics, biophysics, biocomputation, data mining, and many other scientific and engineering fields

Office/Personal Workstation

- Workstation software designed for end users in office and home environments
  - Text editors / word processors (AbiWord)
  - Graphics editing software (Gimp)
  - Desktop publishing software (Scribus)
  - Media software (VLC)
  - Financial software (Gnucash)
  - Office productivity suites (LibreOffice)
  - BitTorrent clients (qBitTorrent)
Mobile Devices

- Following intro of Apple iPhone in 2007
  - Several Linux-based smartphone and tablet OS started to appear on the market
  - Google Android in 2008 is most notable
- By January 2014, Android installed on over 79 percent of smartphones in North America
- Other distros on mobile devices:
  - Bada, Firefox OS, Maemo, MeeGo, Moblin, Openmoko Linux, OpenZaurus, Ubuntu Phone, and many others

Linux Desktop Technology

- Desktop interface consists of
  - X Windows system
  - Windows manager
  - Menus, panels, and icons.
- X Windows system provides framework:
  - Plain gray background
  - Simple X mouse cursor
  - No menus, panels, or icons
- Windows manager
  - Adds capability to manage windows on desktop

Desktop Interface Environments

- GNOME
  - Default desktop for Fedora & Red Hat
  - Powerful & robust professional environment
- K Desktop
  - Second most popular desktop
  - Emulates a MS Windows environment
- Xfce
  - Lightweight for older computers
- LXDE
  - Energy-saving for low power devices
Using the GNOME 3 Desktop

- Login screen appears after system boots

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GNOME 3 Desktop Basics

- Desktop is nearly blank when starting
- Desktop’s top bar has
  - Activities on left
  - A clock in the middle
  - A few icons on the right
- Desktop navigation can be done with
  - Mouse
  - Keyboard

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GNOME 3 Desktop Example

- Panel
- Application Launcher
- Search Box
- Workspaces
- Minimized Windows
Many users & developers hated the new GNOME & UNITY environments.

Two more traditional desktop GNOME forks were launched in Linux Mint:

- **Cinnamon**
  - Fork of GNOME 3 with v2-style menus
- **Mate**
  - Fork of GNOME 2 being updated to use latest version of GTK
Linux Distribution Forks

- Two major and three minor forks; all share the same kernel (core of the OS)
- Major: Debian (.deb packages)
  - Derivatives: Ubuntu, Linux Mint, Mageia, PinguyOS, MEPIS, Knoppix, Zorin OS
- Major: RedHat (RPM packages)
  - Derivatives: RedHat Enterprise, Fedora, Oracle Linux, CentOS, Yellow Dog, PCLinuxOS, Scientific Linux
- Minor forks...
- Arch Linux (.pkg packages)
  - Derivatives: Manjaro, ArchBang, UBOS
- Gentoo Linux (Portage packages)
  - Derivatives: Ututo, Google Chrome, Sabayon Linux, CoreOS
- Slackware (.tgz,.txz,.tbz & .tlz packages)
  - Derivatives: SUSE Linux, VectorLinux, Slax, Frugal Linux, Zenwalk
Bootable Distributions

- Allow use of Linux without installation
- Many distributions available
  - Knoppix
  - SimplyMEPIS
  - Ubuntu
  - Fedora Live
  - Mageia
  - PCLinuxOS

- Many will require a choice, run the OS or install
- Often can be installed from booted OS
  - In some will allow configuration in booted version and then will install with that configuration

Linux Certifications

- Course taught to CompTIA Linux+ / LPI examination objectives
  - Linux+ = LPIC-1, Linux Professional Institute LX0-103 & LX0-104 exams
  - System administrator is LPIC-2
- Also there are Red Hat certs
  - Red Hat Certified System Administrator (RHCSA)
  - Red Hat Certified Engineer (RHCE)
CompTIA Linux+ Examination

- Industry and distribution agnostic
- Exams cover
  - System architecture
  - Linux installation and package management
  - GNU and Unix commands
  - Devices
  - Linux filesystems
  - Filesystem Hierarchy Standard

Linux+/RHCSA Certified personnel can
- Work at the Linux command line
- Perform maintenance tasks
- Assist users
- Install and configure workstations

- Good book for RHCSA (and as a course supplemental text) is Christopher Negus' *Linux Bible* (9th ed. current)

Linux Distributions for ITMO 456

- Fedora 20 (Heisenbug)
  - Free/developmental version of Red Hat
  - Released 13-12-17
  - "A software bug that seems to disappear or alter behavior when one attempts to study it"

- Ubuntu Server 14.04 LTS
  - Most popular Linux distribution, Debian-based
  - 14.04 (Trusty Tahr) is a current long-term support version, supported for commercial use three/five years after release
Linux Distributions for ITMO 456

◆ Why not the latest?
  ▪ Fedora 20 is “new enough”
  ▪ Ubuntu Server 14.04 is a “Long Term Support” version, is stable and fully supported, and does not have Unity (or any GUI)
  ▪ Both are used in the textbook
◆ We will look at newest releases in Boot to CD versions

Summary

◆ Linux is an OS
◆ Kernel and additional software are freely developed and improved upon by a large community of software developers
◆ Published under the GPL; is called Open Source Software (OSS)
◆ Companies find Linux a stable, low-risk, and flexible alternative to other OSs

Summary

◆ Comes in different distributions, all having a common kernel, but packaged with different OSS applications
◆ Wide variety of documentation and resources exist: Internet Web sites, HOWTOs, FAQs, newsgroups, and LUGs
◆ Extremely versatile OS that provides a wide range of workstation and server services
The End

◆ Questions?