1.1.3 Linux Introduction Facts

Linux has become a major player in computer networking and plays a vital role as servers and desktops--it even functions with mobile devices. Understanding the origin of Linux and how it has evolved to its prominent place in the industry is an important part of your training.

This lesson covers the following topics:

- Linux development history
- Linux expansion and growth
- Linux operating system overview
- Linux key components
- Linux distributions
- Other Linux implementations

Linux Development History

The Linux operating system had its start in 1991 when, as a graduate student at Finland's University of Helsinki, Linus Torvalds began a project that later became the Linux kernel. Linus based his version of Linux on a Unix-like system named MINIX, which was released by Andrew S. Tanenbaum. Linux version 0.02 was released in October of 1991 and consisted of the Linux kernel and its three basic utilities:

- A Bash shell providing a command line interface.
- An update utility used for flushing the file system buffers.
- A GCC (GNU Compiler Collection) compiler system allowing an individual to write their own programs.

The source code for the Linux operating system was shared as freeware on the internet, and others were encouraged to enhance it and make it better. At this point, Linux took on a life of its own, and it became a worldwide collaborative development project with no secrecy or tightly guarded copyrights. Access to the source code was open to anyone who wanted it. This collaborative development project on Linux continued for several years until 1994, when Linux version 1.0 was released.

The Linux kernel is licensed under the GNU general public license (GPL), which requires the source code to remain freely available to anybody who wants it. GNU is a recursive acronym for "GNU's Not Unix!"

Linux Expansion and Growth

When Linux was first released, it was considered an experimental operating system; something you may experiment with in the lab, but would probably never consider putting it into a production environment. Since that time, things have changed dramatically, and Linux is now a mainstay operating system, especially in server rooms. Using the wide variety of network services that are now available for the Linux operating system, you can configure Linux to perform almost any networking role that any competing server operating system can perform. including:

- File server
- Print server
- Database server
- Web server
- Email server

Linux is also slowly becoming more popular as a desktop operating system due to the many applications that are currently available. Many of these applications are free.

A few desktop application examples include:

| Application	Description
LibreOffice	A free office software suite for word processing, spreadsheets, and presentations.
Apache OpenOffice	A free office software suite for word processing, spreadsheets, and presentations.
GIMP	GIMP is an acronym for GNU Image Manipulation Program. It is a free and open-source image editor similar to Photoshop.
LightWorks	An editing tool available in free and for-purchase versions.

Linux Operating System Overview

As an operating system, Linux provides the following key functions of a computer:

Function	Definition
Application platform	The operating system provides a platform where applications can run.
Hardware interface	A key function of the operating system is to ensure that one application running on the system does not try to use an area in memory that's already in use by another application. It is also responsible for ensuring that a given application running on the system does not monopolize the CPU time so that other applications running on the system cannot use the CPU.
Data storage	The operating system is responsible for providing an efficient and reliable means for storing data. This is usually done using some type of storage device, like a hard disk drive formatted

with a particular file system. The file system's job is to organize the information on the hard disk in an easily retrievable format.

Security	The operating system is responsible for providing some degree of security for the data that's stored on its storage devices. For example, the system administrator can create rules and assign permissions that determine who can access what information on the system.
Network connectivity	The operating system provides some type of connectivity between computer systems over a network connection. They can do this using a variety of different network media and interfaces, such as an Ethernet connection between computer systems. There are other standards that can be used to create network connections, such as mobile broadband wireless or Wi-Fi wireless.

Linux Key Components

Component	Description
Linux kernel (Operating system)	The Linux kernel is the core of the Linux operating system. It is the actual operating system itself. It is the component that fulfills the key operating system duties listed in the Linux Operating System Overview section above. The Linux also provides libraries. Libraries contain pre-written code elements that the programmers can use within their programs, such as how to interface with a hard disk. For example, when a programmer needs to write data to a hard disk, the programmer does not need to know whether the machine has a SATA, IDE, or SCSI drive installed. Instead, the programmer simply calls the appropriate library and tells the operating system that it needs to write data to whatever hard drive is installed in the system, and then the operating system takes care of the rest using its libraries.
Utilities	The Linux operating system includes a wide variety of utilities that can complete operating system management tasks, such as creating files and maintaining file systems, editing text files, managing the applications that are running on the system, installing new applications on the system, etc.
User interfaces	The Linux operating system provides the end user with a means of interacting with the operating system, the user interface. Linux provides two different user interfaces: • Graphical user interface--a Linux graphical user interface (GUI) is similar to the GUIs used in other operating systems, such as Windows. When a user wants to complete some task, he can click on buttons or navigate through menus to accomplish the desired task.
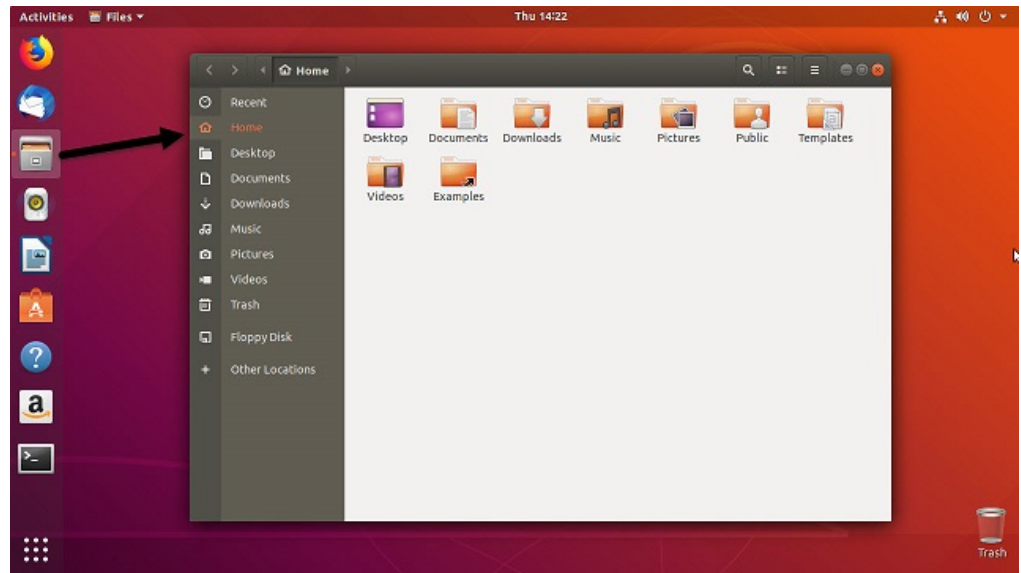
- Text-based command line interfaces--a text-based interface (often referred to as a terminal) provides a place where the user can type commands. This is similar to Windows Command Prompt and PowerShell. Linux system administrator needs to know how to perform tasks from the text-based interface because most Linux servers disable the graphical user interface to better utilize the systems memory and processor.

Linux Distributions

Simply put, a Linux distribution (also known as a distro) is a unique compilation of the Linux kernel (free and open to all), utilities, desktop environments, applications, and more.

Since the Linux operating system is not produced by a single organization, different organizations combine the desired components they want to use, sometimes creating their own unique features, and will then compile them into their own flavor of a Linux operating system or distribution. This distribution is then often made available at no cost or, in some cases (usually for server versions of Linux), for a fee. Individuals can also create their own distribution, but the process of compiling the software can be time consuming and, and it is difficult to make all of the different programs work together properly.

There are hundreds of distributions available. Some of the most popular include:

- Mint
- Ubuntu
- Debian
- Fedora
- openSUSE
- Red Hat Enterprise Linux
- Oracle
- CentOS

Other Linux Implementations

Linux is also useful in the following implementations:

Implementation	Description
Linux on mobile devices	Linux has nearly taken over the mobile device market in the form of the Android operating system. The current Android operating system is a specialized Linux distribution created by Google. It was designed primarily for touch screen mobile devices, such as smart phones and tablet computers. Android benefits include: - Cost--since Android is based on the Linux kernel, it is much less expensive than other mobile device operating systems, like iOS or Windows RT. - Performance--android performs extremely well on mobile devices. - Application or apps support--there are many apps available for Android devices. In most cases, these apps allow Android devices the ability to provide the same functionality as the more expensive devices from Apple and Microsoft.
Linux virtualization	Virtualization is the ability to install and run multiple operating systems concurrently on a single physical machine. This is typically accomplished using a hypervisor. A hypervisor is a thin layer of software that resides between the guest operating system and the hardware. A hypervisor allows virtual machines to interact with the hardware

	without going through the host operating system. The Linux operating system can be virtualized. A key benefit of virtualization is a more efficient use of system resources. All of the available computing capacity of the system hardware is allocated and distributed among all the virtual machines running on the system. Another benefit of virtualization is the ability to run multiple platforms at the same time. For example, you can run Windows at the same time you are running Linux. This can be a real benefit for Linux software developers and testers. It also makes it much easier to test how an application being developed will perform on different platforms or different versions of a given operating system.

Linux and cloud computing	In cloud computing, the hardware, software, and/or network resources that have historically been implemented on-site are moved offsite. When a new Linux system is required, you can use an internet cloud provider to deploy the new Linux virtual machine using a hypervisor at their site. You then pay that provider a fee to access this virtual machine through your organization's network connection. This process is referred to as Infrastructure as a Service (IaaS).
	
	Other cloud computing options for Linux include:
	
	• Software as a Service (SaaS)
	  SaaS provides access to software and data through the cloud.
	• Network as a Service (NaaS)
	  NaaS provides network connectivity through the cloud.
	• Storage as a Service (STaaS)
	  STaas provides access to storage devices through the cloud.

Embedded Linux	Embedded Linux is the process of embedding Linux within intelligent devices, such as automation and control equipment, smart TVs, smart phones, and tablets. To accomplish this, the operating system is customized so it only provides the functions required by that particular device, and all the remaining unnecessary elements of the Linux kernel are removed. Once that's done, the kernel itself is embedded in flash memory chips on the given device.