CSN-101 (Introduction to Computer Science and Engineering)

Lecture 9: Linux Operating System and Linux Administration

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Piazza Class Room: https://piazza.com/iitr.ac.in/fall2019/csn101

[Access Code: csn101@2019]

Moodle Submission Site: https://moodle.iitr.ac.in/course/view.php?id=45

[Enrollment Key: csn101@2019]

Plan for Lecture Classes in CSN-101 (Autumn, 2019-2020)

Week	Lecture 1 (Monday 4-5 PM)	Lecture 2 (Friday 5-6 PM)
1	Evolution of Computer Hardware and Moore's Law, Software and Hardware in a Computer	Computer Structure and Components, Operating Systems
2	Computer Hardware: Block Diagrams, List of Components	Computer Hardware: List of Components, Working Principles in Brief, Organization of a Computer System
3	Linux OS	Linux OS
4	Writing Pseudo-codes for Algorithms to Solve Computational Problems	Writing Pseudo-codes for Algorithms to Solve Computational Problems
5	Sorting Algorithms – Bubble sort, selection sort, and Search Algorithms	Sorting Algorithms – Bubble sort, selection sort, and Search Algorithms
6	C Programming	C Programming
7	Number Systems: Binary, Octal, Hexadecimal, Conversions among them	Number Systems: Binary, Octal, Hexadecimal, Conversions among them
8	Number Systems: Negative number representation, Fractional (Real) number representation	Boolean Logic: Boolean Logic Basics, De Morgan's Theorem, Logic Gates: AND, OR, NOT, NOR, NAND, XOR, XNOR, Truth-tables
9	Computer Networking and Web Technologies: Basic concepts of networking, bandwidth, throughput	Computer Networking and Web Technologies: Basic concepts of networking, bandwidth, throughput
10	Different layers of networking, Network components, Type of networks	Network topologies, MAC, IP Addresses, DNS, URL
11	Different fields of CSE: Computer Architecture and Chip Design	Different fields of CSE: Data Structures, Algorithms and Programming Languages
12	Different fields of CSE: Database management	Different fields of CSE: Operating systems and System softwares
13	Different fields of CSE: Computer Networking, HPCs, Web technologies	Different Applications of CSE: Image Processing, CV, ML, DL
14	Different Applications of CSE: Data mining, Computaional Geometry, Cryptography, Information Security	Different Applications of CSE: Cyber-physical systems and IoTs

Up to MTE

Text Editors

- Vi
- Emacs
- gEdit
- kate
- kWrite
- TextPad
- And more…

Browsers

- Google Chromium
- Mozilla
  - First Open source browser
  - Released from Netscape group
- Firefox
  - High performance, feature rich, standards based web browser
- Sea Monkey
  - Integrated web application suite derived from the Mozilla source code

How is Linux Used?

❖ Personal Workstation

❖ File and Print Server

❖ Internet Service Provider

❖ Three-tier Client/Server

❖ Turnkey System
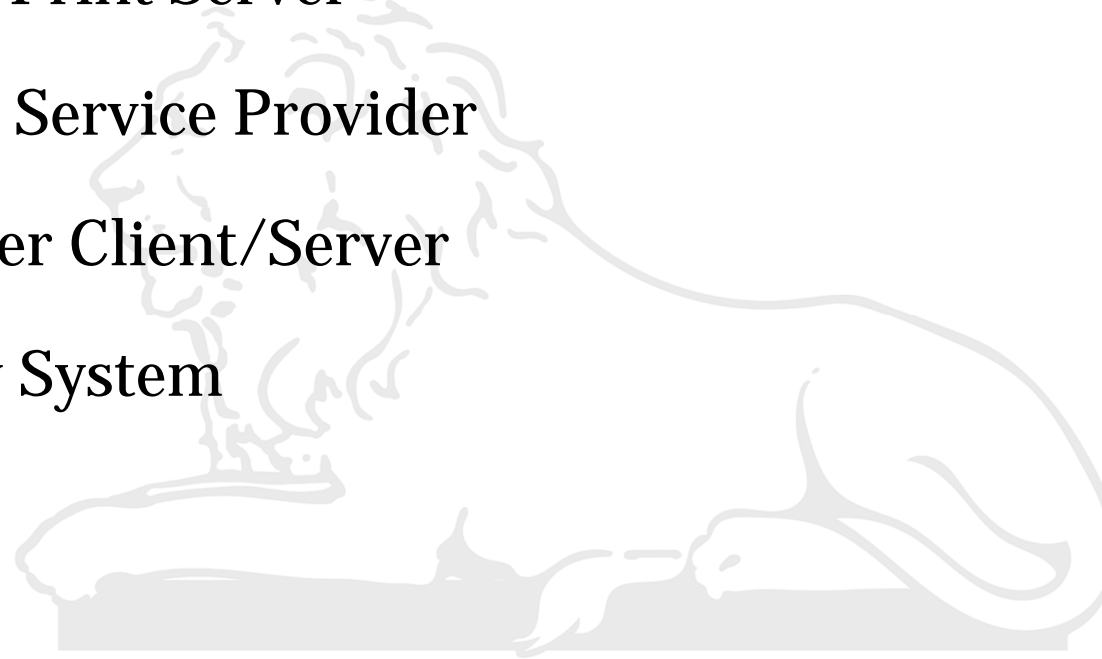
Structure of Linux OS:

Linux OS has following components:

1) Kernel

❖ Core of the operating system

❖ Establishes communication between devices and software

❖ Manages the system resources

It has four responsibilities:

a) Device management

b) Memory management

c) Process management

d) Handling system calls

2) System Libraries

❖ Special programs that helps in accessing the kernel's features

❖ A kernel has to be triggered to perform a task and this triggering is done by the applications

❖ Well known system library for Linux is glibc (GNU C library)

Structure of Linux OS:

3) System Tools

❖ Linux OS has a set of utility tools which are usually simple commands

❖ With the help of commands you can access your files, edit and manipulate data in your directories or files, change location of files or anything

4) Development Tools

❖ With the above three components your OS is running and working. But to update your system you have additional tools and libraries. These additional tools and libraries are written by the programmers and are **called tool chain**

❖ A tool chain is a vital development tool used by the developers to produce a working application

5) End User Tools

❖ These end tools make a system unique for a user

❖ Examples: graphic design tools, office suites, browsers, multimedia players, etc.

Why Use Linux?

❖ Linux is an open source OS which gives a great advantage to the programmers as they can design their own custom operating systems.

❖ Linux gives you a lot of option of programs having some different features so you can choose according to your need.

❖ A global development community look at different ways to enhance its security, hence it is highly secured and robust so you don't need an anti virus to scan it regularly. Companies like Google, Amazon and Facebook use Linux in order to protect their servers as it is highly reliable and stable.

❖ Above all you don't have to pay for software and server licensing to install Linux, its absolutely free and you can install it on as many computers as you want.

❖ Its completely trouble free operating system and don't have an issue with viruses, malware and slowing down your computer.

Difference between Linux & Unix

Comparison	Linux	Unix
Definition	It is an open-source operating system which is freely available to everyone.	It is an operating system which can be only used by its copyrighters.
Examples	It has different distros like Ubuntu, Redhat, Fedora, etc	IBM AIX, HP-UX and Sun Solaris.
Users	Nowadays, Linux is in great demand. Anyone can use Linux whether a home user, developer or a student.	It was developed mainly for servers, workstations and mainframes.
Usage	Linux is used everywhere from servers, PC, smartphones, tablets to mainframes and supercomputers.	It is used in servers, workstations and PCs.
Cost	Linux is freely distributed,downloaded, and distributed through magazines also. And priced distros of Linux are also cheaper than Windows.	Unix copyright vendors decide different costs for their respective Unix Operating systems.
Development	As it is open source, it is developed by sharing and collaboration of codes by world-wide developers.	Unix was developed by AT&T Labs, various commercial vendors and non-profit organizations.
GUI	Linux is command based but some distros provide GUI based Linux. Gnome and KDE are mostly used GUI.	Initially it was command based OS, but later Common Desktop Environment was created. Most Unix distributions use Gnome.
Interface	The default interface is BASH (Bourne Again SHell). But some distros have developed their own interfaces.	It originally used Bourne shell. But is also compatible with other GUIs.
File system support	Linux supports more file system than Unix.	It also supports file system but lesser than Linux.
Coding	Linux is a Unix clone,behaves like Unix but doesn't contain its code.	Unix contain a completely different coding developed by AT&T Labs.
OS	Linux is just the kernel.	Unix is a complete package of Operating system.
Security	It provides higher security. Linux has about 60-100 viruses listed till date.	Unix is also highly secured. It has about 85-120 viruses listed till date
Error detection and solution	As Linux is open-source, whenever a user post any kind of threat, developers from all over the world start working on it.	In Unix, users have to wait for some time for the problem to be resolved.

Linux Commands

Linux Directories

What are Commands

❖ A command is an instruction given to our computer by us to do whatever we want.

❖ In Mac OS, and Linux it is **called terminal**, whereas, in windows it is **called command prompt**.

❖ Commands are always case sensitive.

❖ This command further passes to the shell which reads the command and execute it. Shell is a method for the user to interact with the system. **Default shell in Linux is called bash (Bourne-Again Shell).**

There are two types of shell commands

❖ **Built-in shell commands:** They are part of a shell. Each shell has some built in commands.

❖ **External/Linux commands:** External command is a separate executable program written in C or other programming language

Command Structure

❖ Command <Options> <Arguments>

❖ Multiple commands separated by ; can be executed one after the other

Linux Directory Commands

Directory Command	Description
pwd	The pwd command stands for (print working directory). It displays the current working location or directory of the user. It displays the whole working path starting with /. It is a built-in command.
ls	The ls command is used to show the list of a folder. It will list out all the files in the directed folder.
cd	The cd command stands for (change directory). It is used to change to the directory you want to work from the present directory.
mkdir	With mkdir command you can create your own directory.
rmdir	The rmdir command is used to remove a directory from your system.

Continued to Next Class…