bLecture #01: Linux Fundamentals & Ubuntu Installation

Topics:

1. Linux Fundamentals & Ubuntu Installation
2. Open-source OS Philosophy
3. Ubuntu vs Windows – Key Differences
4. Kernel vs OS vs Distro
5. Ubuntu Variants: Desktop, Server, Minimal
6. UEFI, BIOS, GRUB Bootloader
7. Filesystem Types: ext4, swap, NTFS

Lecture Objectives:

- Understand what Linux is and why Ubuntu is a preferred Linux distribution.
- Learn the philosophy and power of open-source software.
- Compare Ubuntu and Windows to appreciate their operational differences.
- Distinguish between Kernel, Operating System, and Linux Distros.
- Get introduced to various Ubuntu variants based on use cases.
- Learn the basics of system startup: UEFI, BIOS, and GRUB.
- Recognize common file systems used in Ubuntu and how they impact storage.

Topic 1: Linux Fundamentals & Ubuntu Installation

Definition:

Linux is a Unix-like, open-source, multi-user, multitasking operating system kernel. Ubuntu is a **distribution** (distro) of Linux, user-friendly and widely used in servers, desktops, and cloud environments.

Ubuntu Installation Essentials:

Steps:

1. Download Ubuntu ISO (Desktop/Server)
2. Create a bootable USB (via Rufus or dd on Linux)
3. Boot into USB via BIOS/UEFI
4. Choose “Install Ubuntu” and follow on-screen steps
5. Set up username, password, partitions, and complete installation

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Topic 2: Open-source OS Philosophy

Definition:

Open-source software provides its source code freely for use, modification, and distribution.

Linux Philosophy:

- Freedom to use
- Freedom to modify
- Freedom to distribute

Famous Open-Source Licenses:

- GPL (GNU Public License)
- MIT
- Apache

Example:

Ubuntu, Firefox, LibreOffice, GIMP

Topic 3: Ubuntu vs Windows – Key Differences

Feature	Ubuntu (Linux)	Windows
Source Code	Open-source	Closed-source
Package Manager	apt	.exe installers
Terminal Usage	Essential	Optional
System Resource Use	Lightweight	Heavier
Virus Risk	Low	High
Filesystem	ext4	NTFS
Community	Strong & Free	Paid Support Mostly

Example:

Software installation:

- Ubuntu: sudo apt install vlc
- Windows: Download .exe, double-click, install wizard

Engagement Activity:

Try running ls, pwd, and apt list in your Ubuntu terminal and note how different it feels from Windows.

Topic 4: Kernel vs OS vs Distro

Definitions:

- **Kernel:** Core of the OS. Manages hardware.
- **OS:** Combination of kernel + utilities + interface (e.g., Ubuntu)
- **Distro:** A packaged version of Linux with specific tools and configurations (e.g., Ubuntu, Fedora, Kali)

Real-Life Analogy:

- **Kernel** = Engine
- **OS** = Complete Car
- **Distro** = Car with custom mods for a specific purpose (e.g., Racing Car = Kali Linux, Family Car = Ubuntu)

Topic 5: Ubuntu Variants – Desktop, Server, Minimal

Variant	Purpose	GUI?
Ubuntu Desktop	General Use (browsing, docs, etc.)	Yes
Ubuntu Server	Headless servers, networking	No
Ubuntu Minimal	Lightweight install	Optional

Topic 6: UEFI, BIOS, GRUB Bootloader

UEFI vs BIOS:

Feature	BIOS	UEFI
Age	Legacy	Modern
Interface	Text-based	Graphical
Speed	Slower	Faster
Disk Support	< 2TB	> 2TB (GPT)

GRUB Bootloader:

- **GRUB** = GRand Unified Bootloader
- Loads the kernel at boot
- Can boot multiple OSes (dual booting)

Visual Process:

[Power ON] → [UEFI/BIOS] → [GRUB] → [Ubuntu Kernel] → [Login Screen]

Topic 7: Filesystem Types

Filesystem	Use Case	OS Support
ext4	Default for Ubuntu	Linux only
swap	Virtual memory	Linux only
NTFS	Used by Windows	Read/Write by Ubuntu
FAT32	USB drives	Universal support

Example:

- Ubuntu installed on ext4
- Swap partition improves performance
- Shared USB drive formatted with FAT32

Engagement Activity:

- Open a terminal and run:

lsblk

df -h

- Identify your file systems
- Which one is ext4? Which is swap?

Summary:

- Linux is a secure, open-source OS and Ubuntu is one of its most user-friendly distros.
- Open-source philosophy empowers collaboration and innovation.
- Ubuntu differs from Windows in design, usage, and ecosystem.
- Kernel is the core, OS is the whole, distro is the flavor.
- You can choose from different Ubuntu variants based on need.
- UEFI and GRUB control how your machine boots.
- Understanding filesystems helps manage storage and cross-platform usage.

Homework:

1. Install Ubuntu in VirtualBox or on real hardware.
2. Identify key directories after installation: /home, /etc, /var, /bin.
3. Find your current file system using lsblk or df -T.
4. Research:
    - Why does Linux use ext4 and not NTFS by default?
    - What’s the role of swap in performance?