EXPERIMENT NO - 01

Aim - Introduction of O.S, need for Linux Operating System and its history & applications.

Introduction of O.S. - Here's a comprehensive introduction to Operating Systems (OS):

What is an Operating System (OS)?

An Operating System (OS) is a software that manages computer hardware resources and provides a platform for running application software. It acts as an intermediary between computer hardware and user-level applications, controlling the allocation of system resources such as memory, CPU time, and storage.

Key Functions of an Operating System:

1. Process Management: The OS manages the creation, execution, and termination of processes (programs) running on the computer.

2. Memory Management: The OS manages the allocation and deallocation of memory for running programs.

3. File System Management: The OS provides a file system to store, retrieve, and manage files.

4. Input/Output (I/O) Management: The OS manages input/output operations between devices such as keyboards, displays, and printers.

5. Security: The OS provides mechanisms for controlling access to computer resources, such as user authentication and access control.

6. Networking: The OS manages communication between the computer and other devices on a network.

7. Interrupt Handling: The OS handles interrupts generated by hardware devices.

8. Resource Allocation: The OS manages the allocation and deallocation of system resources such as CPU time, memory, and I/O devices.

Types of Operating Systems:

1. Single-User, Single-Tasking: Allows only one user to run one program at a time (e.g., old MS-DOS).

2. Single-User, Multi-Tasking: Allows one user to run multiple programs simultaneously (e.g., modern Windows, macOS).

3. Multi-User, Multi-Tasking: Allows multiple users to run multiple programs simultaneously (e.g., Unix, Linux).

Examples of Operating Systems:

1. Windows (Microsoft)
2. macOS (Apple)
3. Linux (Open-source)
4. Unix (Multi-user, multi-tasking)
5. Android (Mobile)
6. iOS (Mobile)

Evolution of Operating Systems:

1. Batch Processing (1950s-1960s)
2. Time-Sharing (1960s-1970s)
3. Personal Computing (1970s-1980s)
4. Graphical User Interface (GUI) (1980s-present)
5. Mobile and Embedded Systems (2000s-present)

Introduction of Linux O.S:

What is Linux?

Linux is an open-source, Unix-like operating system that was created by Linus Torvalds in 1991. It's a free and customizable operating system that runs on a wide range of hardware platforms, from smartphones to supercomputers.

History of Linux O.S:

Here's a detailed history of Linux:

Early Beginnings (1987-1991)

1. Linus Torvalds, a Finnish computer science student, wanted to create a free operating system.
2. Inspired by Minix (a Unix-like OS) and GNU Project (free software).
3. Started working on Linux in April 1991.

The First Release (1991)

1. Linux version 0.01 released on September 17, 1991.
2. Initial codebase: 10,000 lines of code.
3. First Linux kernel: 0.01, released under GNU General Public License (GPL).

Growth and Community (1992-1994)

1. Linux 0.95 released in 1992, with improved performance.
2. Linux 1.0 released in 1994, with 176,000 lines of code.
3. Community grew: hackers, developers, and users contributed.
4. First Linux distributions (distros): Slackware (1993), Debian (1993).

Expansion and Maturity (1995-1998)

1. Linux 1.2 released in 1995, with improved networking.
2. Linux 2.0 released in 1996, with multi-threading.
3. Commercial interest: Red Hat (1995), SuSE (1996).
4. Linux Standard Base (LSB) initiative launched.

Mainstream Recognition (1999-2005)

1. Linux 2.2 released in 1998, with improved scalability.
2. Linux 2.4 released in 2000, with improved performance.
3. Enterprise adoption: IBM, Oracle, HP.
4. Desktop Linux: GNOME (1999), KDE (1998).

Modern Linux (2006-Present)

1. Linux 2.6 released in 2003, with improved reliability.
2. Linux 3.x released in 2011, with improved performance.
3. Mobile Linux: Android (2008).
4. Cloud Linux: OpenStack (2010).
5. IoT Linux: Yocto Project (2010).

Notable Milestones

1. 1997: Linux kernel reaches 1 million lines of code.

2. 2000: Linux user base reaches 1 million.

3. 2007: Linux kernel reaches 10 million lines of code.

4. 2015: Linux user base reaches 100 million.

Key Contributors

1. Linus Torvalds (Creator)

2. Richard Stallman (GNU Project)

3. Alan Cox (Linux kernel developer)

4. Jon "maddog" Hall (Linux International)

5. Eric Raymond (Open Source Initiative)

Linux Today

1. Over 2 billion Linux users worldwide.

2. 90% of cloud infrastructure runs Linux.

3. 80% of smartphones run Android (Linux-based).

4. 60% of web servers run Linux.

Linux has come a long way since its humble beginnings. Its success is a testament to the power of open-source collaboration and community-driven innovation.

Need & Applications of Linux:

Here are some reasons why Linux is needed and its importance:

Individual Users:

1. Free and open-source: Linux is free to download and use, reducing software costs.

2. Security: Linux is generally more secure than proprietary OSes.

3. Customizability: Linux can be tailored to meet specific needs.

4. Community support: Large community provides help and documentation.

5. Freedom: Linux allows users to modify and distribute the software.

Businesses:

1. Cost-effective: Linux reduces software licensing costs.

2. Scalability: Linux supports high-performance computing.

3. Reliability: Linux is known for its stability and uptime.

4. Security: Linux provides robust security features.

5. Flexibility: Linux supports various hardware platforms.

Developers:

1. Open-source: Linux encourages collaboration and innovation.
2. Customizability: Linux allows developers to modify and extend.
3. Cross-platform: Linux runs on various architectures.
4. Large community: Collaborate with millions of developers.
5. Free tools: Linux provides free development tools.

Servers and Data Centers:

1. Reliability: Linux ensures high uptime and stability.
2. Scalability: Linux supports large-scale deployments.
3. Security: Linux provides robust security features.
4. Performance: Linux optimizes server performance.
5. Cost-effective: Linux reduces software licensing costs.

Emerging Technologies:

1. IoT (Internet of Things): Linux powers IoT devices.
2. AI and ML (Artificial Intelligence and Machine Learning): Linux supports AI/ML development.
3. Cloud Computing: Linux dominates cloud infrastructure.
4. Blockchain: Linux supports blockchain development.
5. Robotics: Linux powers robotics and automation.

Education and Research:

1. Free and open-source: Linux reduces software costs.
2. Customizability: Linux allows students to experiment.
3. Community support: Large community provides resources.
4. Security: Linux teaches security best practices.
5. Research: Linux supports research in various fields.

Government and Public Sector:

1. Cost-effective: Linux reduces software licensing costs.
2. Security: Linux provides robust security features.
3. Transparency: Linux open-source nature ensures transparency.
4. Customizability: Linux meets specific government needs.
5. Sovereignty: Linux reduces dependence on proprietary software.

Why Linux is essential:

1. Promotes open-source innovation
2. Fosters community collaboration
3. Provides security and stability
4. Supports emerging technologies
5. Offers cost-effectiveness

Linux plays a vital role in various sectors, from individual users to businesses, developers, and governments.

Key Features of Linux:

1. **Open-source:** Linux source code is freely available for modification and distribution.
2. **Free:** Linux is free to download and use.
3. **Customizable:** Linux can be tailored to meet specific needs.
4. **Multi-user:** Linux supports multiple users and user accounts.
5. **Multi-tasking:** Linux can run multiple programs simultaneously.
6. **Portable:** Linux runs on various hardware platforms.
7. **Secure:** Linux has robust security features.

Linux Distribution (Distros)

Linux is distributed in various forms, known as distros, which bundle the Linux kernel with other software. Popular distros include:

1. Ubuntu
2. Debian
3. Fedora
4. CentOS
5. Red Hat Enterprise Linux (RHEL)
6. openSUSE
7. Linux Mint
8. Arch Linux

Linux Architecture:

1. **Kernel:** The core of the Linux operating system, responsible for managing hardware resources.

2. Device Drivers: Manage communication between hardware devices and the kernel.

3. System Libraries: Provide common functions for applications.

4. Shell: Command-line interface (CLI) for interacting with the operating system.

5. Graphical User Interface (GUI): Optional, provides a visual interface (e.g., GNOME, KDE).

Linux File System:

1. Root Directory (/): Top-level directory.

2. File System Hierarchy: Organised into directories (e.g., /bin, /etc, /home).

3. File Permissions: Control access to files and directories.

Linux Commands:

Some basic Linux commands:

1. cd - Change directory

2. ls - List files and directories

3. mkdir - Create directory

4. rm - Remove file or directory

5. cp - Copy file

6. mv - Move or rename file

7. chmod - Change file permissions

8. sudo - Run command with superuser privileges

Advantages of Linux:

1. Free and open-source
2. Highly customizable
3. Secure
4. Fast performance
5. Community support
6. Cross-platform compatibility

Disadvantages of Linux:

1. Steep learning curve
2. Limited gaming support
3. Hardware compatibility issues

4. Software availability limitations

Uses of Linux:

1. **Servers:** Web, database, mail, and file servers.
2. **Supercomputers:** High-performance computing.
3. **Embedded systems:** Devices like routers, TVs, and appliances.
4. **Desktops:** Personal computers.
5. **Mobile devices:** Android, Linux-based smartphones.