Lecture 8: Introduction, Features and Applications of UNIX

Now that you are familiar with the concepts of Operating Systems let us begin knowing about the UNIX OS.

Introduction to UNIX

> ➢ Developed in 1969 by Ken Thompson
> ➢ Popular Operating System, available from micro to mainframe
> ➢ Available for scientific as well as commercial use
> ➢ Designed for effectiveness of:
>   - Application Software Development
>   - System Software Development
>   - Application Execution
>   - Academic and Research work

The **UNIX** operating system has a powerful set of mechanisms, combined together to provide an environment of considerable power and effectiveness. Originally it was developed by programmers for their own use, thus making the **UNIX** Operating System **Programmer Friendly** rather than **User Friendly.**

It has a simple user interface that has the power to provide a majority of services that users want. It provides a simple and consistent interface to peripheral devices.   .

The latest versions of **UNIX** shows that it is not only powerful and a complex Operating System but has become more regular, controllable and user friendly.

The growing number of application programs and power of **UNIX** are making **UNIX-based** systems increasingly useful in the business environment also.

Question: Why is **UNIX** is a programmer friendly and not user friendly operating system?

Applications of UNIX

Business environment
- Word processing
- Financial accounting
- Database management
- Communication
- Graphics
- Software developments
- Office automation

Academic and scientific environment
- Operating System research
- Prime Operating System for conducting research work

UNIX has had great achievements in the commercial front, as being truly inexpensive and adaptable to microcomputers.

Applications of UNIX-based systems generally fall into several categories, as discussed above.

In any business house, more than one user can use the same computer system running under the

UNIX operating system. So the same application and data can be shared between users without duplicating them on different systems.

In Universities, the **UNIX** operating systems is used as a case study for Operating System research. Designing of new Operating System or enhancements to the existing features of an Operating System are simulated using **UNIX.**

The design of **UNIX** provides in-built features that allow Communication and Networking Applications. This gives more flexibility for high speed data transfer across different systems.

Thus, there is every reason to believe that **UNIX** will continue to be used far more widely and could become the primary Operating System of the future. However the "Windows NT" operating system, which has recently come to the market is a competitor to **UNIX** for small and medium sized networks.

Later, the members of **AT&T** left the project and continued their work at their own environment. Ken Thompson, Dennis Ritchie and others designed a modified sketch of the project **MUL TICS** that later evolved into an early version of **UNIX,** in 1969. The system was designed on a **PDP-7** machine.

The **UNIX** system was then moved to a **PDP-11** in 1971, and was written in B language, a language developed by Thompson, an interpreted language that was the precursor to the modern C language.

In 1973, Thompson and Ritchie rewrote the **UNIX** operating system in the C language, a language developed by Dennis Ritchie and the first version of multi-user **UNIX** was released.

90% of the **UNIX** Operating System is written in C, which made the operating system portable, but all the machine dependent low-level functions are written in **Assembly,** to make the system execute faster.

In 1974, **UNIX** was licensed to Universities for educational purposes.

Subsequently, in 1980 a microcomputer version was developed and in 1981, the first commercial version of **UNIX** was released.   .

In the early nineties AT&T sold its **UNIX** subsidiary to Santa Cruz Operations Inc., who already were AT&T licensees and marketed a **UNIX** under the brand name SCO.

Some computer manufacturers, notably DEC, HP, IBM and SUN had taken license for **UNIX** from AT&T and marketed (and still market) their own versions of **UNIX.**

The University of California at Berkley became an important secondary development center for **UNIX.** Many of the developments first made at Berkley and at SCO are now integral part of **UNIX.**

Features of UNIX

> ➢ Multi-user / Multi-tasking / Time sharing System
> ➢ Modularity
> ➢ File structure
> ➢ Input Output redirection and Pipes
> ➢ Consistent peripheral interface
> ➢ Security
> ➢ Communication and Networking
> ➢ Portability
> ➢ Utilities
> ➢ Software Development Tools

Multi-user I Multi-tasking I Time sharing system

More than one user can use the UNIX system at the same time. Users can **log on** to the system from different terminals and issue commands. User commands are executed on a **Time Sharing** basis. Each user program is given a time slot. Once the program has used up its Time Slice, the system switches to another program and this process continues.

Multitasking capabilities mean performing more than one task at a time. In **UNIX** systems, a user can initiate more than one task to run at a time from the same terminal.

Modularity

UNIX is unique in its modular design, which allows users to add or remove modules to fit their precise needs. If a part or module is not needed, it can be removed or replaced by another module without impairing the operation of the rest of the system. This feature is especially useful in microcomputers with limited disk drive capacity.

73

File structure

UNIX has a hierarchical file structure. It is like an inverted tree, having the **root** at the top, which provides dynamic growth of files. The number of files and file size in **UNIX** systems is unlimited. The hierarchical structure also offers maximum flexibility for grouping and retrieving various files.

Input/Output Redirection and Pipes

UNIX commands have been designed in such a way that they will take input from a standard input device and produce output onto a standard output device. However the user can change the default source of input and destination of output. This is called **redirection** of input and output. Further, output of any command can be given as input to some other command. This process is called **Piping.** Different commands can be joined together through **pipes** to solve a particular problem.

Consistent Peripheral Interface

Programs or commands in **UNIX** systems have no knowledge of the internal format of the files. They treat the data as unformatted stream of bytes. The same rule applies while communicating with the peripheral devices. All these devices are treated as special device files in **UNIX** systems. The operations on files are also applied to device files and most programs do not have to know internally the types of files they manipulate.

Security

As a multi-user Operating System, **UNIX** has different levels of protection; these apply to the users, their information and the processes. These security measures are possible by maintaining a list of users who are authorized to work on the system and setting the control of access to user files and directories.

Communication and Networking

The UNIX system has several in-built programs, enabling the users to send and receive messages to or from different terminals. It also facilitates interactive conversations, transfer of files between two different UNIX systems and between UNIX and other Operating Systems. Local Area Networks (LAN) have become the method of choice in many applications. UNIX has in-built features supporting networked operation.

Portability

Portability is the ability of software to operate on different types of machines (often called platforms). **UNIX** is very portable in itself as it is written in a high level language, C. Only hardware dependent portions of the Operating System needs to be modified in case we want to move **UNIX** to a different computer having a different architecture. The major part of the operating system can be recompiled for any computer that has a C compiler running on it.

.UNIX Utilities and Software Development Tools

Over two hundred utilities are available in **UNIX** for functions like **sorting data, processing text, searching for information** etc. These are a powerful collection of tools that can be used to accomplish many tasks without writing new programs.

A UNIX system consists of various tools that help the programmers to develop different applications. These include the C **compiler; file processing** and **syntax analyzer, version control system, library management utility, source code debugger, macro processor** etc.

Questions:

1. Why is the **UNIX** Operating System portable?

2. What do you mean by "Modular Design of the **UNIX** Operating System "?

Typical UNIX Based Systems

> ➢ System unit
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> ➢ Console
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> ➢ User terminals
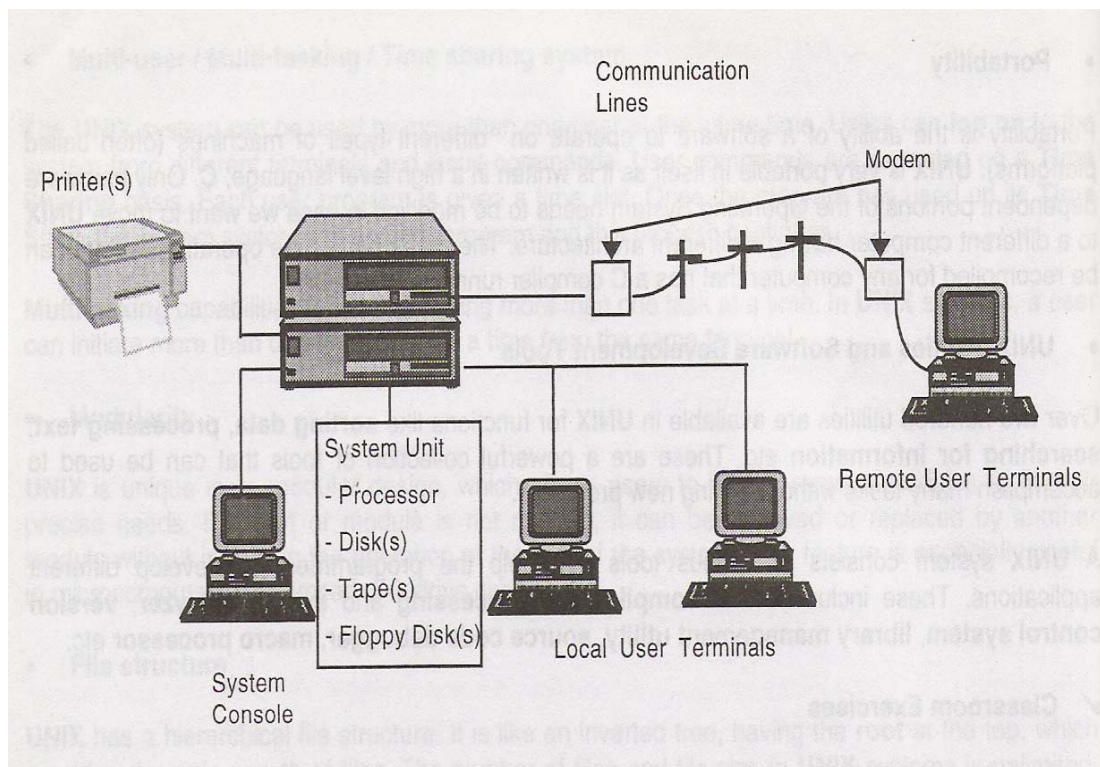>
> ➢ Communication lines
>
> ➢ Printer(s)
>
> ➢ Modem

Fig: Typical UNIX based system

A typical **UNIX** based system comprises of a **system unit, a console, user terminals** (can be on-line or remote), **communication lines and printer(s).**

- ➢ The **System Unit** houses the **Central Processing Unit,** and one or more disk drives for mass storage.
- ➢ The **Console** controls system operation and can also be used as an ordinary user terminal.
- ➢ **User terminals** are terminals from which users interact with the system by typing commands on the keyboard and receiving outputs on the monitor. **UNIX** supports **on-line terminals** that are directly attached to the computer system as well as **remote terminals** that are connected to the system by the communication lines and modems.
- ➢ **Communication lines, which** may be dedicated or "dial up" connect the system to remote terminals, another **UNIX** based system or other mainframe computers.
- ➢ **Printers** are used to obtain hard copy of the output **UNIX** supports all types of printers available in the market.
- ➢ **Modem** converts the digital signals given by the computer to analog signals to be transmitted over the communication lines and the analog signals back to digital.