Reading Assignment-1

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1 Mainframe Operating System

A mainframe operating system is networking software infrastructure that allows a mainframe computer to run programs, connect linked machines, and process complex numerical and data-driven tasks. All computers use some sort of basic operating system (OS), which is what enables them to organize files and execute commands. The biggest difference between a simple, one-computer OS and a mainframe operating system is where each is located. Simply put, a mainframe system works on a mainframe computer, which is usually thought of as sort of the "headquarters" or server for a computer network. Most major networks and infrastructures have a mainframe, which is where data is backed up and systems are broadly organized.

Types of Mainframe Operating Systems

- **z/OS**, a widely used mainframe operating system, is designed to offer a stable, secure, and continuously available environment for applications running on the mainframe.

- As a control program, z/Virtual Machine (**z/VM**) is a hypervisor because it runs other operating systems in the virtual machines it creates.

- z/Virtual Storage Extended (**z/VSE**) is popular with users of smaller mainframe computers. Some of these customers eventually migrate to z/OS when they grow beyond the capabilities of z/VSE.

- The z/Transaction Processing Facility (**z/TPF**) operating system is a special-purpose system that is used by companies with very high transaction volume, such as credit card companies and airline reservation systems.

Applications

A number of today's busiest Web sites save their production databases on a mainframe host. The mainframe inhabits a coveted place in today's e-business environment.

In banking, financing, healthcare, insurance, utilities, government, and a wide range of various other public and private enterprises. CICS (Customer Information Control System) used in bank-teller applications, ATM systems, 90 percent of Fortune 500, companies, there is a transaction web server that runs mainly on mainframe systems.

2 Desktop Operating Systems

Desktop operating system is the main control program in a user's desktop or laptop computer, also known as client operating system. It can either be freeware or commercial software. The top 3 most popular desktop operating systems are: Windows, Mac and Linux. The first two being the fiercest competitors in the commercial market, and the third, their freeware rival the Linux.

- **Windows** - Undoubtedly the most popular OS ever created. Survey shows that about 90% of all desktop or laptop computers are running on a Windows platform. The first Windows version launched in 1985 was nothing more than a GUI offered as an extension to the existing Microsoft Disk Operating System (MS-DOS) based pretty much on licensed concepts of the Macintosh System Software.

- **Mac** - Apple computers use a proprietary operating system called Mac OS. The first iteration of the Mac operating system, now known as Classic Mac OS, launched in 1984. The second, and current, iteration of the Mac operating system, known as Mac OS X, launched in 2001. Unlike Microsoft Windows, which is compatible with a variety of different processors and hardware, Mac OS (both Classic and OS X) is specially optimized for Apple-approved hardware only.

- **Linux** - Unlike Windows and Mac OS, which are operating systems written and distributed by one company, Linux refers to an entire family of operating systems, built upon the Linux kernel.It has a lot of variants, the most popular being the Ubuntu Linux. The advantages Linux has over its competitors are most importantly, the open source and the "lightness" of the system, making it the best option for older or weaker machines.

Advantages

- O/S allows to User Friendly Graphic Interface for all users because it provides various menus, buttons, icons, and more for easy navigation

- It has responsible for controlling and manipulate of all computer functions.

- It allows the best features such as "Plug and play", means no need any drivers for using their devices like as mouse, keyboard, and more.

- Cost effective and are comfortable for all programs.

- O/S implements all types of scheduling techniques such as first come-first served, Round robin, Priority scheduling and shortest job first scheduling etc for scheduling the all process in CPU for execution.

Disadvantages

- If operating system get fault then your data can be destroyed from O/S.

- It required more improvement in multilevel page tables and variable page sizes.

- It is very difficult task for providing the entire protection from all viruses because any threat can be inserted any time.

- Need more memory for memory management.

3 Multiprocessor Operating Systems

Multiprocessor operating system allows the multiple processors, and these processors are connected with physical memory, computer buses, clocks, and peripheral devices. Main objective of using multiprocessor operating system is to consume high computing power and increase the execution speed of system.

Multiprocessor systems are used when users need extremely high processing speed to process a high volume of data. In most of the cases, such operating systems are used to carry out scientific calculations or operations such as satellite processing, deep data analysis, and weather forecasting.

Types of Multiprocessor Operating Systems

- **Symmetric Multiprocessor** - In this system, every processors have own identically copy of operating system, and they can make communication in between each other. In which all processors are connected each other with peer to peer relationship nature, it means no master & slave relation.

- **Asymmetric Multiprocessor** - In this system, every processor is allotted predefined tasks, and master processor has power for controlling entire system. In which, It use the master-slave relationship.

- **Shared Memory Multiprocessor** - In this system, each CPU contains sharable common memory.

- **Distributed Memory Multiprocessor** - In this system, all types of processors consists own private memory.

- **UMA Multiprocessor** - UMA Multiprocessor stands for "Uniform Memory Access Multiprocessor". In which, it allows to access all memory at the uniform speed rate for all processors.

- **NUMA Multiprocessor** -NUMA Multiprocessor stands for "Non Uniform Memory Access Multiprocessor". In this system, it involves some areas of the memory for accessing at the faster rate, and left parts of memory are utilized for other tasks.

Advantages

- If due to any reason, any one processor gets fails then do not worry because, entire system will do work properly. Therefore , Great Reliability.

- Enhancing the throughput of system, entire system is improved, if couples of processors work with getting collaboration.

- Multiprocessor systems are cost effective compare to single processor system in long life because this system is capable to share all input/output devices, power supplies system, and data storage center. In multiprocessor, do not need to connect all peripheral terminals separately with each processor.

- Multiprocessor O/S gets high performance due to parallel processing. In this system, single job is divided into various same small jobs, and execute them like as Parallel nature.

Disadvantages

- Multiprocessor operating system has a daunting task for scheduling processes due to its shareable nature.

- It is more expensive due to its large architecture.

- Multiprocessor system needs large memory due to sharing its memory with other resources.

- It has more time delay when processor receives message and take appropriate action.

Examples

- **Symmetric** - Windows NT, Solaris, Digital UNIX

- **Asymmetric** - SunOS Version 4, IOS architecture.

- **Other** Intel Nehalem – Beckton, Westmere, Sandy Bridge, AMD Opteron – K10

4 Distributed Operating Systems

This operating system involves multiple computers, nodes, and sites, and these components are linked each other with LAN/WAN lines. Distributed OS is capable for sharing their computational capacity and I/O files with allowing the virtual machine abstraction to users. Processors communicate with each other through various communication lines (like high-speed buses or telephone lines). These are known as loosely coupled systems or distributed systems. Processors in this system may vary in size and function. They are referred as sites, nodes, computers, and so on.

Types of Distributed Operating Systems

- **Client-Server Systems** - This system is designed mostly for multiprocessors and homogeneous multi computer. Client-Server Systems works as a centralized server because it provides the approval to all requests, which are generated by client systems side.

- **Peer-to-Peer System** - This concept is implemented in the computer network application because it contains the bunch of processors, and they are not shareable memories or clocks as well. Every processors consist own local memory, and these processors make communication with each other through various communication medium such as high speed buses or telephone lines.

- **Middle ware** - Middleware allows the interoperability in the between of all applications, which are running on other operating systems. With using these services those applications are capable for transferring all data each other.

Advantages

- It can share all resources such as (CPU, disk, network interface, nodes, computers, and more) from one site to another site, and it increases the data availability on entire system.

- It reduces the probability of data corruption because all data are replicated on all site, if any site gets fail then user can access data from other running site.

- It can be scaled easily; it means any network can be attached with other network without hindrance.

- Entire system works independently from each other and due to this feature if any one site gets crash then entire system does not halt.

- Better flexibility, due to easy to use, install and error detection.

Disadvantages

- Distributed operating system is designed with such language, which is not well defined till now.

- This system is more costly because it is not easily readable, and it contains the huge infrastructure.

- Its maintenance is more costly because it is distributed across multiple servers.

- Administration is very difficult task in distributed operating system. Some time security issues can be arise while sharing data on entire networks.

Examples

- LOCUS
- MICROS
- IRIX
- SOLARIS

5 Clustered Operating Systems

Clustered systems are similar to parallel systems as they both have multiple CPUs. However a major difference is that clustered systems are created by two or more individual computer systems merged together. Basically, they have independent computer systems with a common storage and the systems work together. All nodes of clusters implement two different techniques for making communication with each other like as message passing Interface (MPI) and Parallel virtual machine (PVM).

Types of Clustered Operating Systems

- **Asymmetric Clustering System** - In this system, one of the nodes in the clustered system is in hot standby mode and all the others run the required applications. The hot standby mode is a fail safe in which a hot standby node is part of the system . The hot standby node continuously monitors the server and if it fails, the hot standby node takes its place.

- **Symmetric Clustering System** - In symmetric clustering system two or more nodes all run applications as well as monitor each other. This is more efficient than asymmetric system as it uses all the hardware and doesn't keep a node merely as a hot standby.

- **Parallel Cluster System** - Parallel cluster system allows to multiple users to access similar data on the common shared storage system. This system is created by special software version and other applications.

Classification on its operations

- **Load-Balancing Cluster** - In this type of cluster, nodes share the workload for load balancing which enhances the system performance.

- **High-Availability Clusters** - To increase the availability of the clustered system, additional nodes are present in the cluster. These extra nodes are put to use when any of the existing nodes fails. These clusters are known as fail over clusters or HA clusters.

- **Fail-Over Clusters** - All functions of swapping applications and data resources over from failure system to other okay system in the cluster then it is known as "Fail-Over".

Advantages

- Clustered system provides much better performance for entire system because in which multiple computers are merged with each other, and they perform their tasks as parallel unit.

- Clustered system has great scalability because we can easily add new node with this system.

- Clustered system is better fault tolerance system, if anyone node gets fail then entire system does not halt.

- It is more reliable and easy to configure.

Disadvantages

- Required multiple servers and other hardware components for making one therefore, very expensive.

- It is very hard to monitor and maintenance this system.

6 Real Time Operating Systems

Real time operating systems (RTOS) are used in environments where a large number of events, mostly external to the computer system, must be accepted and processed in a short time or within certain deadlines. such applications are industrial control, telephone switching equipment, flight control, and real time simulations.
In a RTOS, Processing time requirement are calculated in tenths of seconds increments of time. It is time-bound system that can be defined as fixed time constraints. In this type of system, processing must be done inside the specified constraints. Otherwise, the system will fail.

Types of Real Time Operating Systems

- **Hard Real Time operating system** - In Hard RTOS, the deadline is handled very strictly which means that given task must start executing on specified scheduled time, and must be completed within the assigned time duration.

- **Soft Real time operating system** - Soft Real time RTOS, accepts some delays by the Operating system. In this type of RTOS, there is a deadline assigned for a specific job, but a delay for a small amount of time is acceptable. So, deadlines are handled softly by this type of RTOS.

- **Firm Real time operating system** - These type of RTOS also need to follow the deadlines. However, missing a deadline may not have big impact but could cause undesired affects, like a huge reduction in quality of a product.

Advantages

- Maximum utilization of devices and system. Thus more output from all the resources.

- Time assigned for shifting tasks in these systems are very less. For example in older systems it takes about 10 micro seconds. In shifting one task to another and in latest systems it takes 3 micro seconds.

- Focus on running applications and less importance to applications which are in queue. These types of systems are error free.

- Since size of programs are small, RTOS can also be embedded systems like in transport and others.

Disadvantages

- Very few task run at the same time and their concentration is very less on few applications to avoid errors.

- The algorithms are very complex and difficult for the designer to write on.

- It needs specific device drivers and interrupt signals to response earliest to interrupts.

Applications

- **Hard Real Time operating system** - Medical critical care system, Aircraft systems

- **Soft Real time operating system** - Online Transaction system and Livestock price quotation System

- **Firm Real time operating system** - Various types of Multimedia applications