**Desktop Systems:**

Earlier, CPUs and PCs lacked the features needed to protect an operating system from user programs. PC operating systems therefore were neither **multiuser** nor **multitasking**. However, the goals of these operating systems have changed with time; instead of maximizing CPU and peripheral utilization, the systems opt for maximizing user convenience and responsiveness. These systems are called Desktop Systems and include PCs running **Microsoft Windows** and the **Apple Macintosh.**

Operating systems for these computers have benefited in several ways from the development of operating systems for **mainframes.**

**Microcomputers** were immediately able to adopt some of the technology developed for larger operating systems. On the other hand, the hardware costs for microcomputers are sufficiently **low** that individuals have sole use of the computer, and CPU utilization is no longer a prime concern. Thus, some of the design decisions made in operating systems for mainframes may not be appropriate for smaller systems.

**Clustered Systems**

* Like **parallel systems,** clustered systems gather together **multiple** CPUs to accomplish computational work.
* Clustered systems differ from parallel systems, however, in that they are composed of two or more individual systems **coupled together.**
* The definition of the term clustered is **not concrete**; the general accepted definition is that clustered computers share storage and are **closely linked via LAN networking**.
* Clustering is usually performed to provide **high availability**.
* A layer of cluster software runs on the cluster nodes. Each node can monitor one or more of the others. If the monitored machine fails, the monitoring machine can take ownership of its storage, and restart the application(s) that were running on the failed machine. The failed machine can remain down, but the users and clients of the application would only see a brief interruption of service.
* **Asymmetric Clustering** – In this, one machine is in hot standby mode while the other is running the applications. The hot standby host (machine) does nothing but monitor the active server. If that server fails, the hot standby host becomes the active server.
* **Symmetric Clustering** – In this, two or more hosts are running applications, and they are monitoring each other. This mode is obviously **more efficient**, as it uses all of the available hardware.
* **Parallel Clustering** – Parallel clusters allow multiple hosts to access the same data on the shared storage. Because most operating systems lack support for this **simultaneous** data access by **multiple hosts**, parallel clusters are usually accomplished by special versions of software and special releases of applications.

Clustered technology is rapidly changing. Clustered system use and features should expand greatly as **storage-area-networks (SANs).** SANs allow easy attachment of multiple hosts to multiple storage units. Current clusters are usually **limited to two or four hosts** due to the complexity of connecting the hosts to shared storage.

**Handheld Systems:**

Handheld systems include **personal digital assistants (PDAs)**, such as **Palm-Pilots** or **cellular telephones** with connectivity to a network such as the Internet.

They are usually of **limited size** due to which most handheld devices have a small amount of memory, include **slow processors**, and feature **small display screens**.

* Many handheld devices have between **512 KB and 8 MB of memory**. As a result, the operating system and applications must manage memory efficiently. This includes returning all allocated memory back to the memory manager once the memory is no longer being used.
* Currently, many handheld devices do **not use virtual memory** techniques, thus forcing program developers to work within the confines of limited physical memory.
* Processors for most handheld devices often run at a fraction of the speed of a processor in a PC. Faster processors require **more power**. To include a faster processor in a handheld device would require a **larger battery** that would have to be replaced more frequently.
* The last issue confronting program designers for handheld devices is the small display screens typically available. One approach for displaying the content in web pages is **web clipping**, where only a small subset of a web page is delivered and displayed on the handheld device.

Some handheld devices may use wireless technology, such as **BlueTooth**, allowing remote access to e-mail and web browsing. **Cellular telephones** with connectivity to the Internet fall into this category.

Their use continues to expand as network connections become more available and other options such as **cameras** and **MP3 players**, expand their utility.

**Under Distributed Systems add two more sub-topics :**

1. **Client-Server Systems :**

**Centralized systems** today act as **server systems** to satisfy requests generated by **client systems**. The general structure of a client-server system is depicted in the figure below:

Server Systems can be broadly categorized as compute servers and file servers.

* **Compute-server systems** provide an interface to which clients can send requests to perform an action, in response to which they execute the action and send back results to the client.
* **File-server systems** provide a file-system interface where clients can create, update, read, and delete files.

1. **Peer-to-Peer Systems :**

The growth of computer networks - especially the Internet and World Wide Web (WWW) – has had a profound influence on the recent development of operating systems.

When PCs were introduced in the 1970s, they were designed for “**personal**” use and were generally considered standalone computers. With the beginning of widespread public use of the Internet in the 1980s for electronic mail, and ftp, many PCs became connected to computer networks.

In contrast to the **tightly coupled** systems, the computer networks used in these applications consist of a collection of processors that do not share memory or a clock. Instead, each processor has its own local memory. The processors communicate with one another through various communication lines, such as high-speed buses or telephone lines. These systems are usually referred to as **loosely coupled systems ( or distributed systems).**

**Changes to be made in the current content :**

**Under SIMPLE BATCH SYSTEM :**

**Given :** Following are some disadvantages of this type of system :

1. Zero interaction between user and computer.
2. No mechanism to prioritize processes.

**Replace by :**

Following are some of the disadvantages of this type of system :

1. **No** interaction between the user and the computer.
2. No mechanism to **prioritise** the processes.

**Under MULTI PROGRAMMING BATCH SYSTEM:**

**Given : (1st point )**

* In this the operating system, picks and begins to execute one job from memory.
* **Replace by** : In this, the operating system picks up and begins to execute one of the jobs from the memory.

**Given: (4th point )** : If several jobs are ready to run at the same time, then system chooses which one to run (CPU Scheduling).

* **Replace by :** If several jobs are ready to run at the same time, then the system chooses which one to run through the process of **CPU Scheduling.**