Operating System ch1
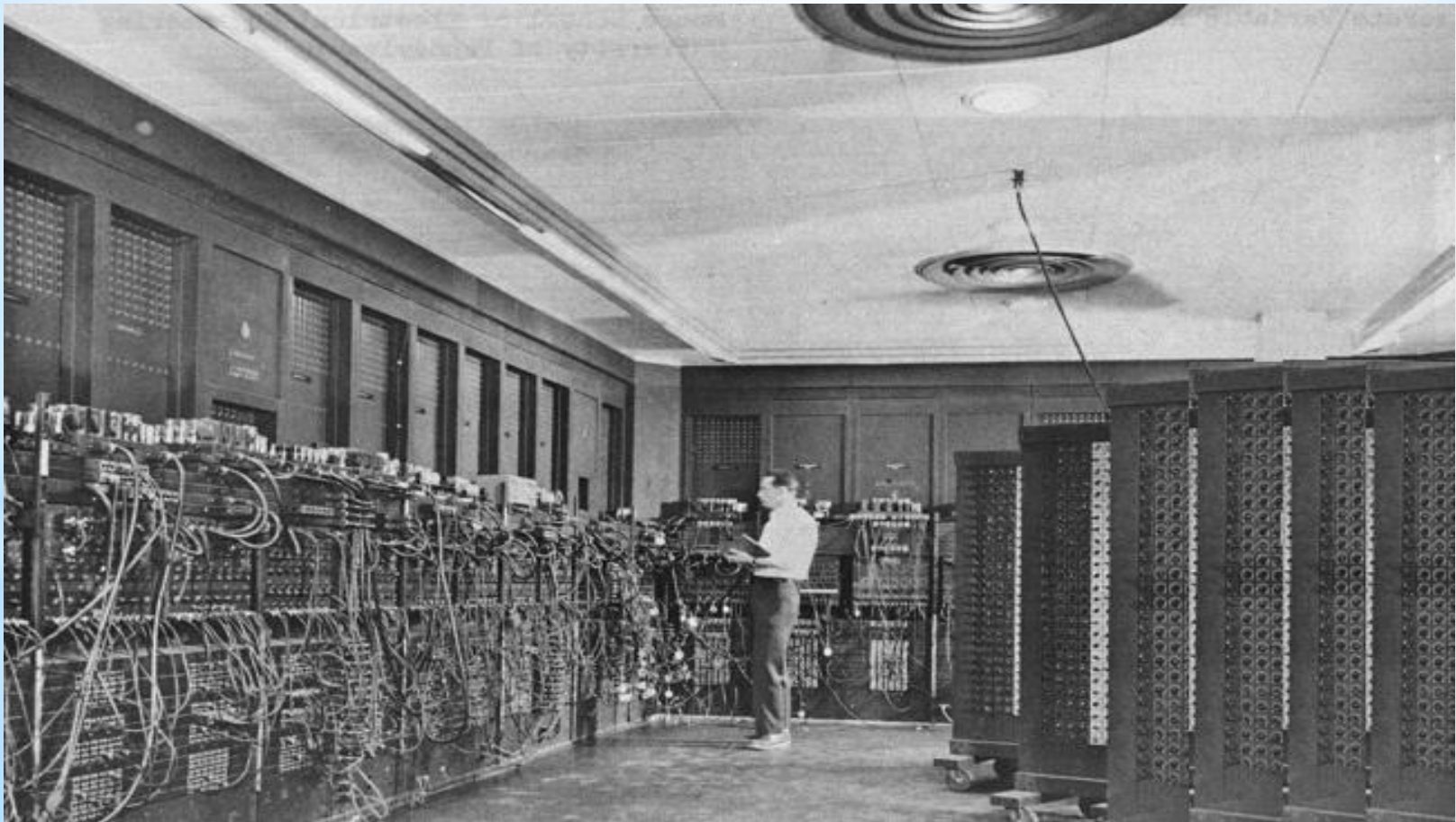
Lecturer . Ameen A. Noor

O.S Introduction

1. **History of O.S**
2. **Definition of O.S**
3. **O.S goals**
4. **Computer system components**
5. **Function of O.S**
6. **O,S categories**

*History of O.S

* 1940s to 1950s: the earliest electronic digital computers did not include O.S.

The 1960s : It is also called the **batch processing** systems but using resources more efficiently by running several jobs at once . The systems improved resource utilization, Processor bound job or compute bound job means jobs that mainly used the processor Multiprogramming, Interactive users, Timesharing, Real-time systems,Virtual machine O.S, Concurrent processes, and reduce Turnaround time, Vertual memory.

The 1970s : The systems were primarilymultimode multiprogramming systems that supported batch processing,time sharing and real –time applications, Personal computers posted by early and continuing developments in microprocessor technology and using LAN with more problem in security.

The 1980s : It was the decade of the **personnel computers**, Software such as spreadsheet programs, word processors, database packages and graphics packages and develop GUI, Distributed computing became wide spread under client/server model,the software enginering field continued to evolve.

The 1990s: operating system designers developed techniques to protect computers from attacks ,**Object technology**: each software object encapsulates a set of attributes and methods. This allows applications to be built with components that can be reused in many applications. **Open-source movement**: open-source software is distributed with the source code, allowing individuals to examine and modify (Linux operating system).

Operating system became increasingly user friendly (GUI features).

2000 and beyond: Middleware: is a software that links two separate applications to **communicate and exchange data via the internet, Massive parallelism, Computing on mobile devices which are used for e-mail , web browsing.**

* Definitions of Operating System (O.S)

* O.S is a set of programs that controls effectively the computer resources and makes them conveniently available to users i.e easy to use. During computer operation, some basic OS programs (Called O.S Core or Kernel) are resident in main memory while others are stored on hard disk and loaded into memory when needed.

* **Kernel:** software that contains the core components of the operating system

*Operating System goals

* Make S.W convenient to use.

* Use the computer hardware in an efficient manner.

* Provide a connection between the user and computer resources.

*Computer system Components

*Computer systems can be divided into four components:

1. Hardware (CPU, memory, I/O devices).
2.   Operating system (O.S)
3. Application programs (compilers, assembler, text editor, database systems).
4. Users.
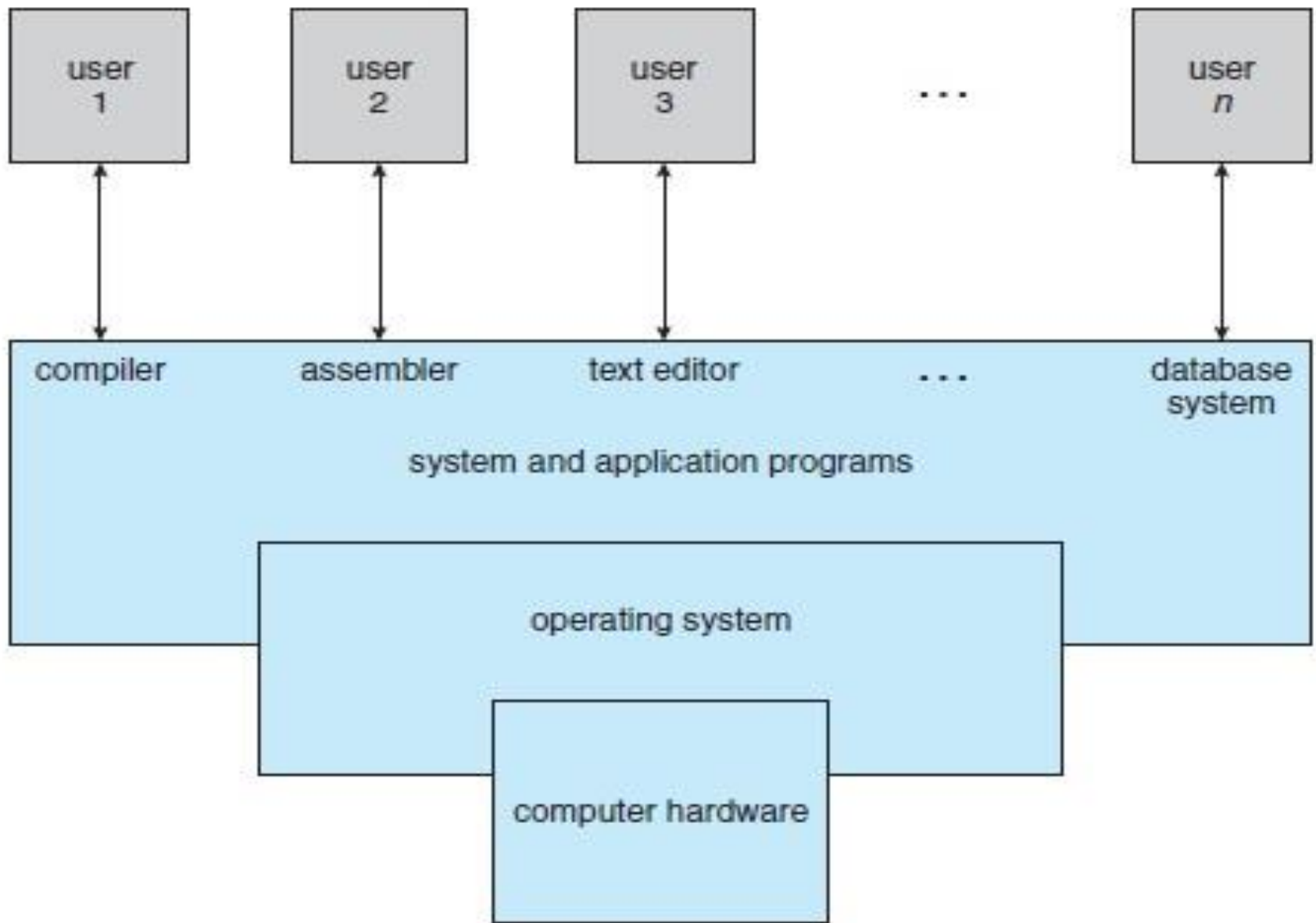
*Functions of OS

* The functions can be summarized as follows (will be explained later in more details):

1. Management of computer resources (processors, memory, disks, I/O devices, programs, etc.).

2. Scheduling resources among users (time sharing).

3. Protection of programs being executed in memory from one another.

4. Providing a proper user interface e.g Graphics User Interface (GUI).

5. File management.

6. Network communication.

7. Many others.

*O.S Categories

* Following are some of the most widely used types of Operating system.
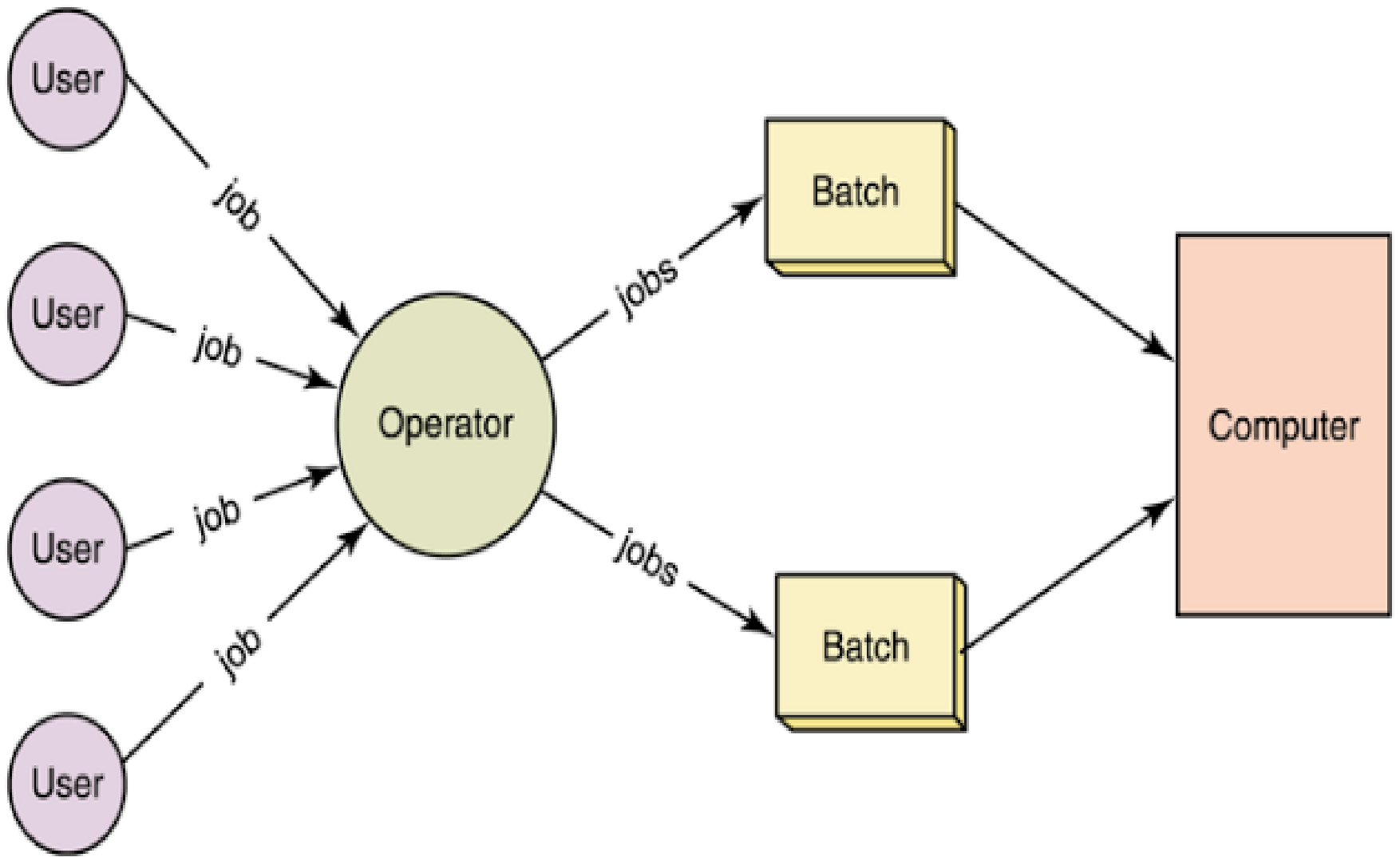
1. Batch System

The users of a batch operating system do not interact with the computer directly. The user has to submit a job (written on cards or tape) to a computer operator, then computer operator places a batch of several jobs on an input device. To speed up processing, jobs with similar needs were batch together and were run through the computer as a group. The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches. The major task of this system was to transfer control automatically from one job to the next.

Batch System (cont.)

The problems with Batch Systems are as follows:

* There is no direct interaction between the user and the job.

* CPU is often idle, because the speed of the mechanical I/O devices is slower than the CPU.

* Difficult to provide the desired priority.

Memory management in batch system is very simple. Memory is usually divided into two areas: Operating system and user program area as shown in figure 2.
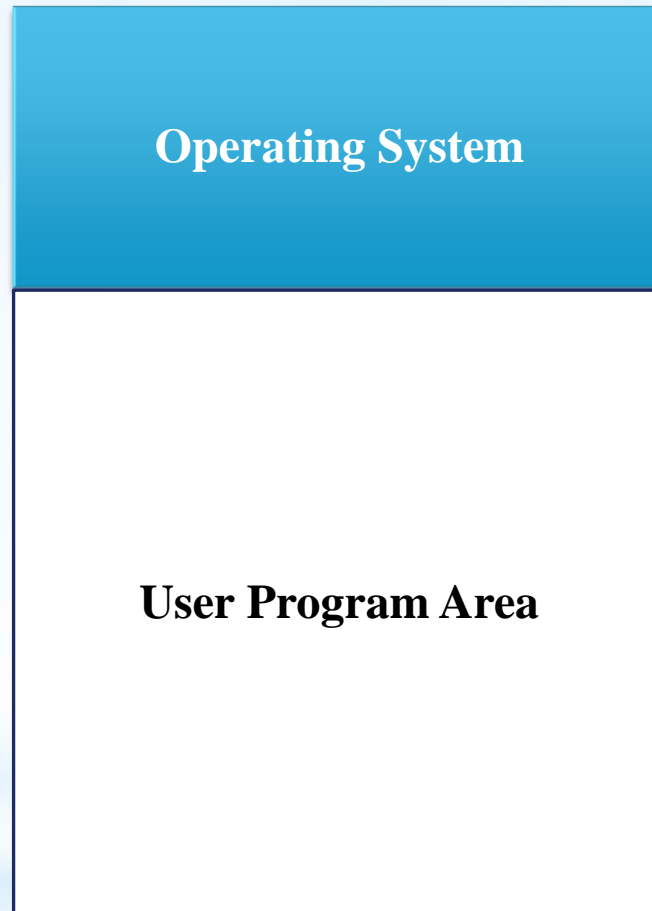
Figure 2: Memory Layout for a Batch System

*Performance Development

OS attempt to schedule computational activities to ensure good performance, where many facilities had been added to OS some of these are:

A- Spooling

Spooling stands for simultaneous peripheral operation on-line. Spooling refers to putting jobs in a buffer, a special area in memory or on a disk where a device can access them when it is ready. The I/O devices can't match with the speed of a CPU. Hence, the output from the CPU will be stored in this spool (buffer) and the I/O devices can take the output from this buffer as and when required according to their speed. The CPU is hence not bound to this I/O device and can perform other operations. So, spooling keeps both the CPU and the I/O devices working at high rates without any waiting.
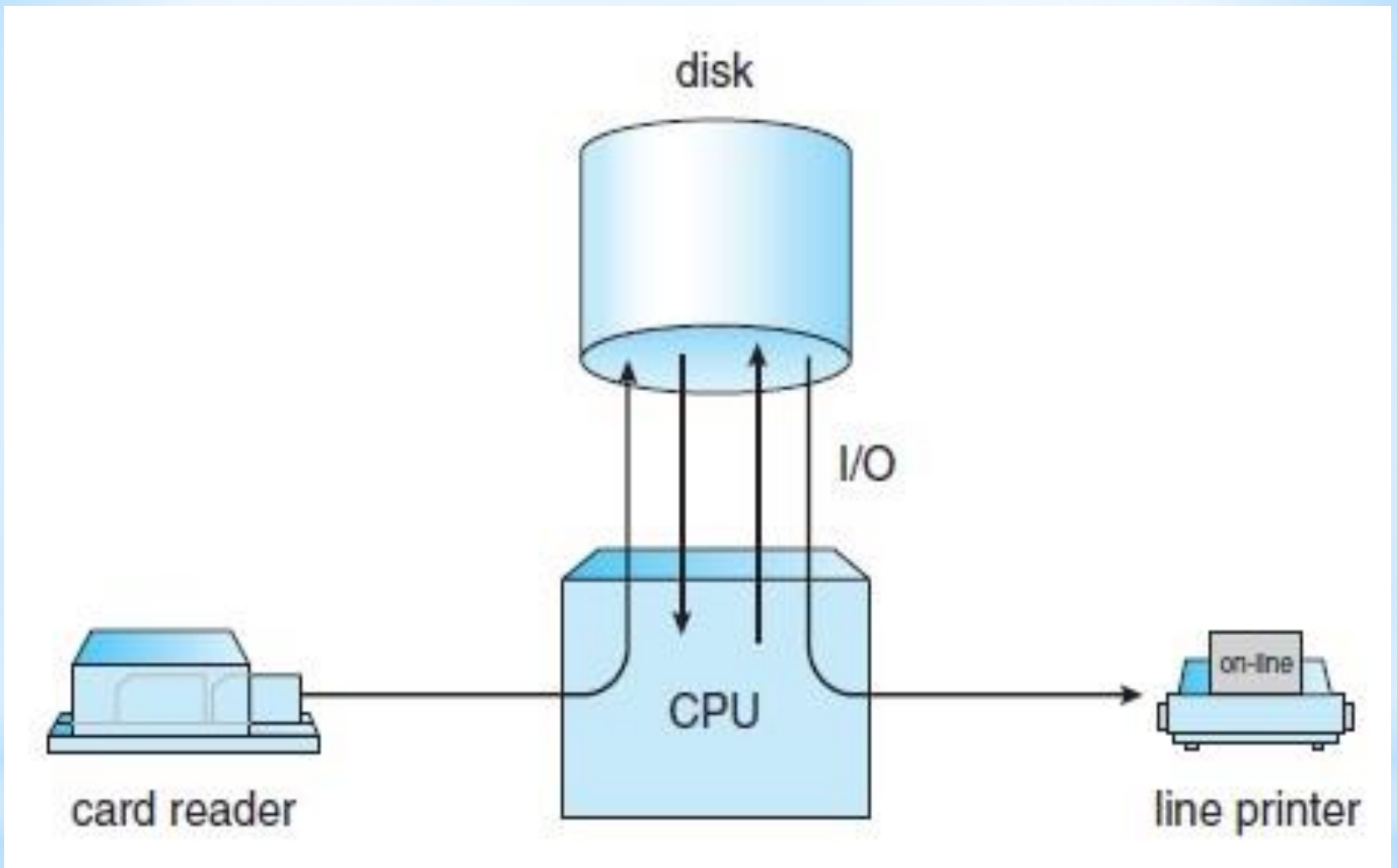
Figure 3: The Spooling Layout

B-Multiprogramming batch system

In a multiprogramming system there are one or more programs loaded in main memory which are ready to execute. Only one job at a time is able to get the CPU for executing its instructions while all the others are waiting their turn. The main idea of multiprogramming is to maximize the use of CPU time. In this system when the job may have wait for any reason, the OS simply switches to executes another job, when the second job need to wait the CPU is switches to another job and so on. Then the CPU will never be idle.
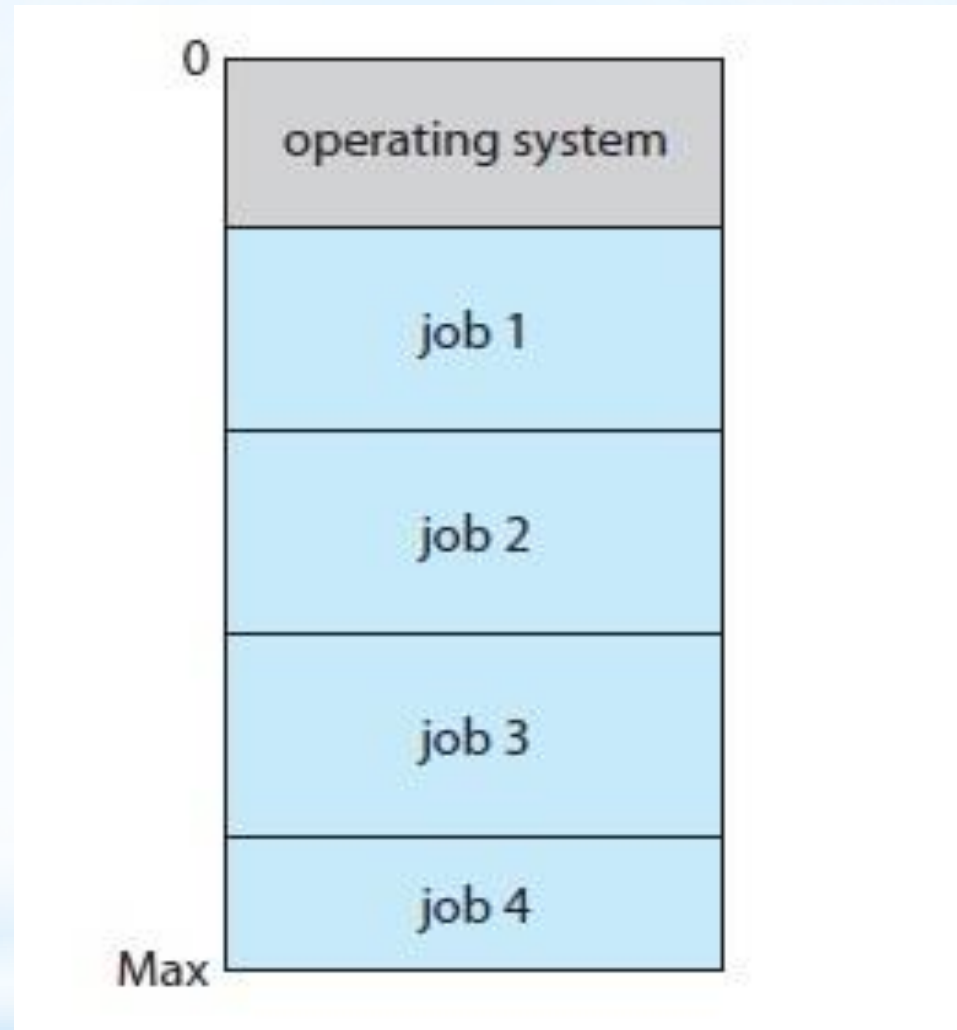
Figure 4: Memory Layout in Multiprogramming Environment

2.Time Sharing System

* This type of OS provides on-line communication between the user and the system, where the user will give instruction to O.S directly (usually from terminal) and receive an immediate response, therefore some time called an interactive system.

* The time sharing system allows many users to share the computer resources simultaneously, where little CPU time is needed for each user.

* For example a mainframe computer that has many users logged on to it. Each user uses the resources of the mainframe i.e. memory, CPU etc. The users feel that they are exclusive user of the CPU, even though this is not possible with one CPU i.e. shared among different users.

* Advantage: reduce the CPU idle time.

* Disadvantage: more complex.

Terminals

Central Storage

Central Computer

Shared Printers
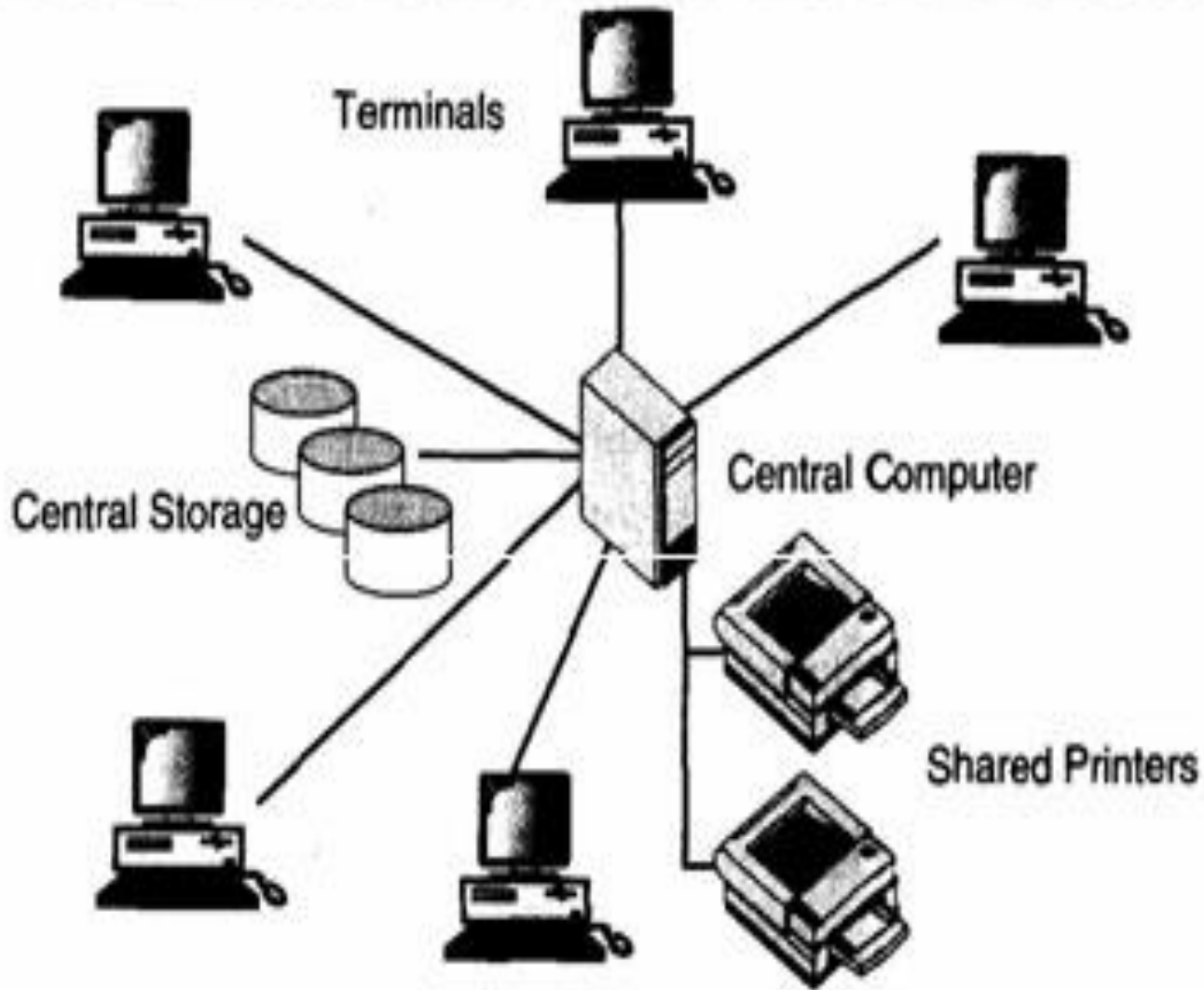
Time-sharing Environment

*3. Parallel System

*Most systems previously were simple processor systems that is they have one main CPU.

*There is a trend to have multiprocessor system, where such systems have more than one processor in close communication sharing the computer Bus, the clock, and some memory and peripheral devices.

*Parallel operating systems are break large tasks into smaller pieces that are done at the same time in different places and by different mechanisms. They are sometimes also described as "multi-core" processors.
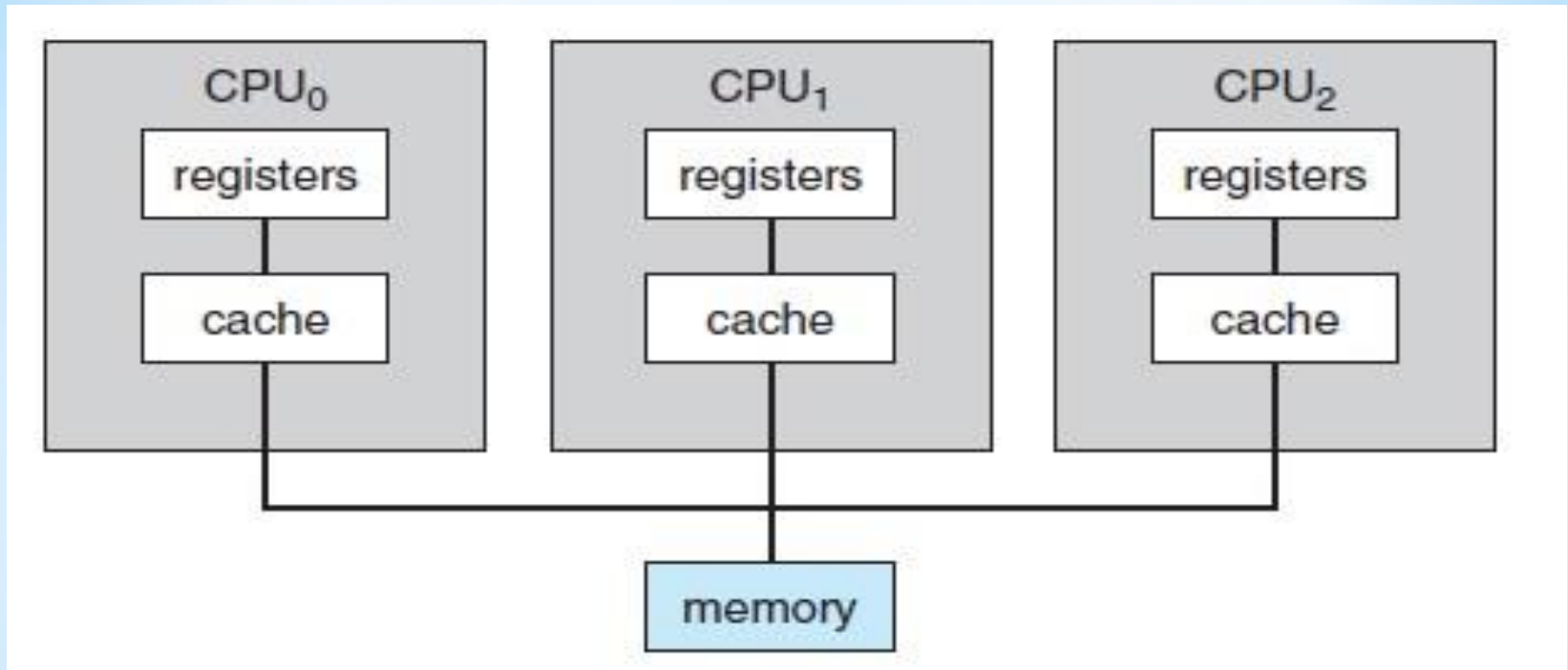
The advantages of this type of systems are:

*Increase throughput.

*The cost.

*Increase reliability.

There are two types of processors in multiprocessors systems:

1. **Asymmetric multiprocessor:** in which each processor is assigned a specific task. A boss processor controls the system; the other processors either look to the boss for instruction or have predefined tasks. This scheme defines a boss–worker relationship. The boss processor schedules and allocates work to the worker processors.

2. **Symmetric multiprocessor (SMP):** in which each processor performs all tasks within the operating system. SMP means that all processors are peers; no boss-worker relationship exists between processors.

4. Distributed Systems *

*A distributed operating system is an operating system that runs on several machines whose purpose is to provide a useful set of services. The processors communicate with one another through various communication lines (such as high-speed buses or telephone lines) these are called distributed systems.
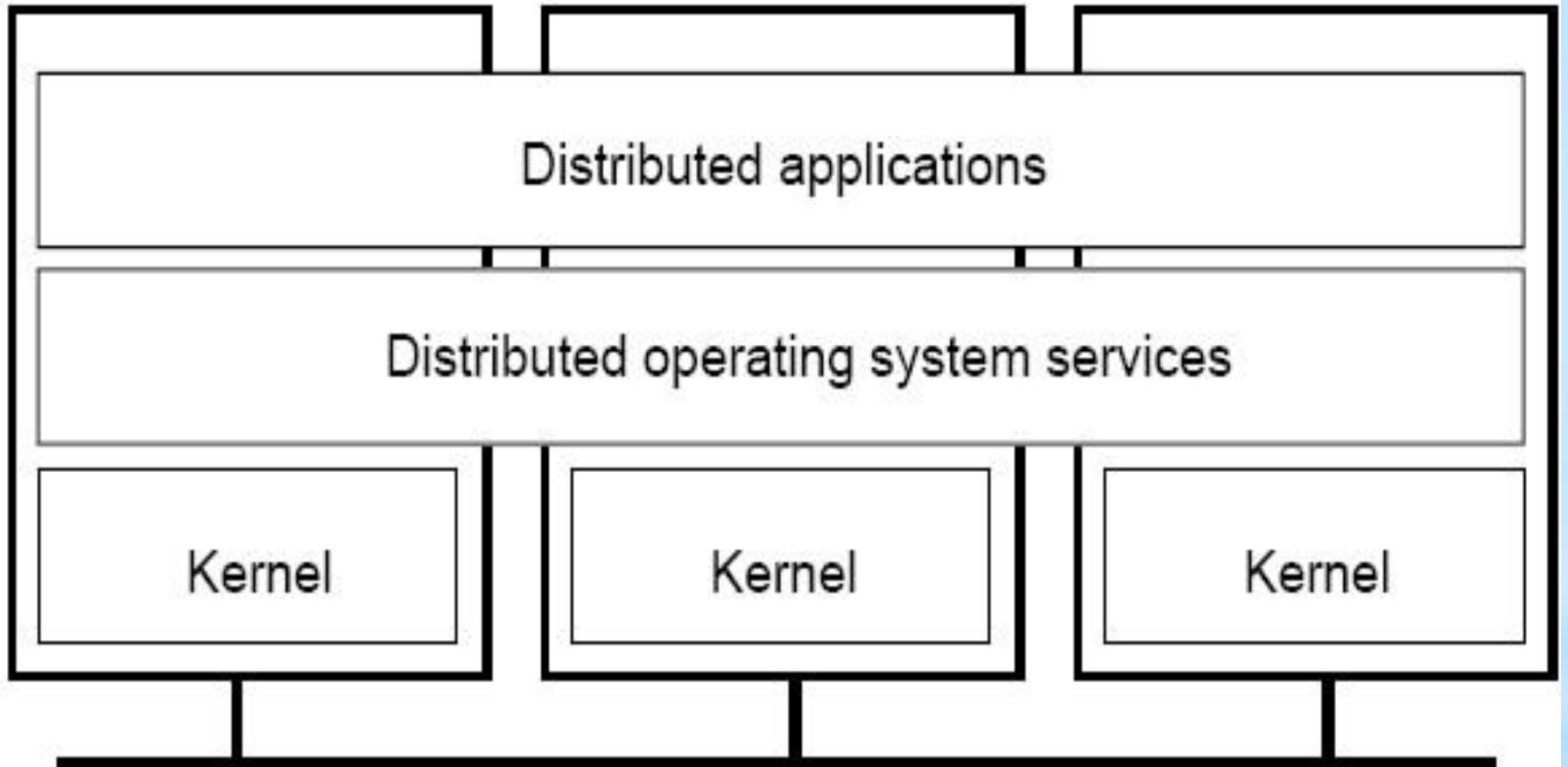
5. Real Time System

*Real-time systems are used when there are rigid time requirements on the operation of a processor or the flow of data. A real-time operating system guarantees that critical tasks complete on time .the secondary storage of any sort is usualy limited ,data instead being stored in short term memory (ROM).

*There are two categories of real time system:

*1- hard real time systems

*2- soft real time system

*End of chapter one