Evolution of operating syst

1) Serial processing

In the earliest computers of 1940's to 1950's the programmers interact directly with the comp. h/w. At that time there was no operating system

→ Programs in m/c code were loaded through the i/p device & the error conditions were indicated by lights. The programmer examines the registers & main memory to determine the cause of error. After the completion of program the output appeared on the printer.

→ Here the mode of operation is serial processing i.e the user accessed the computer one by one.

Disadvantages

1) The user had to sign up for a certain period of time. At that time other users had to wait

2) If the user had finished earlier, then CPU remains idle

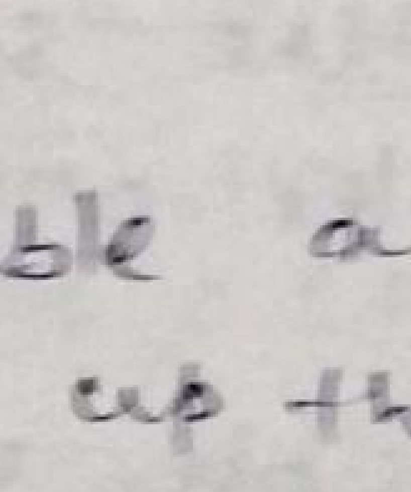
3) If the user would not finish the job in the alloted time, then user had to stop forcefully.

4) Considerable amount of time was spent in setting up the environment for each job.

2) Simple Batch Systems (Ex – IBM OS – 360)

To reduce the wastage time of cpu in serial Processing, batch processing was introduced.

→ A piece of s/w called monitor plays an important role here due to which the programmer had to no longer interact with the m/c directly



→ The user submits the job to a computer op
The operator batches the similar jobs toge
as a group & places the entire batch on an input device, for the use by monitor.

→ The monitor is a program that resides in the m.m (main memory) & controls execution. It reads 1st job from the i/p device, execute it & print out its result on the printer. Then it immediately reads the next job & repeat these steps until all jobs of the batch are over.

→ The monitor handles the execution with JCL, (Job control language) which is a special type of programming language used to provide instructions to monitor.

Advantages

1) Reduces the idle time of CPU, becoz transition from one job to another didn't require operator interference

2) Environment set up time is reduced due to batching of similar jobs. Ex- If all the FORTRAN jobs are batched together, the system needs to load the FORTRAN compiler once for processing all these jobs.

Disadv

1) No interaction is possible with the user during program execution.

3) Multiprogramming :- (Ex- Windows, Unix, Linux)

There are two types of jobs

1) CPU-bound jobs 2) I/O bound jobs

CPU-bound jobs - These jobs heavily utilize CPU by performing numerical calculations & performs very little I/O operations.

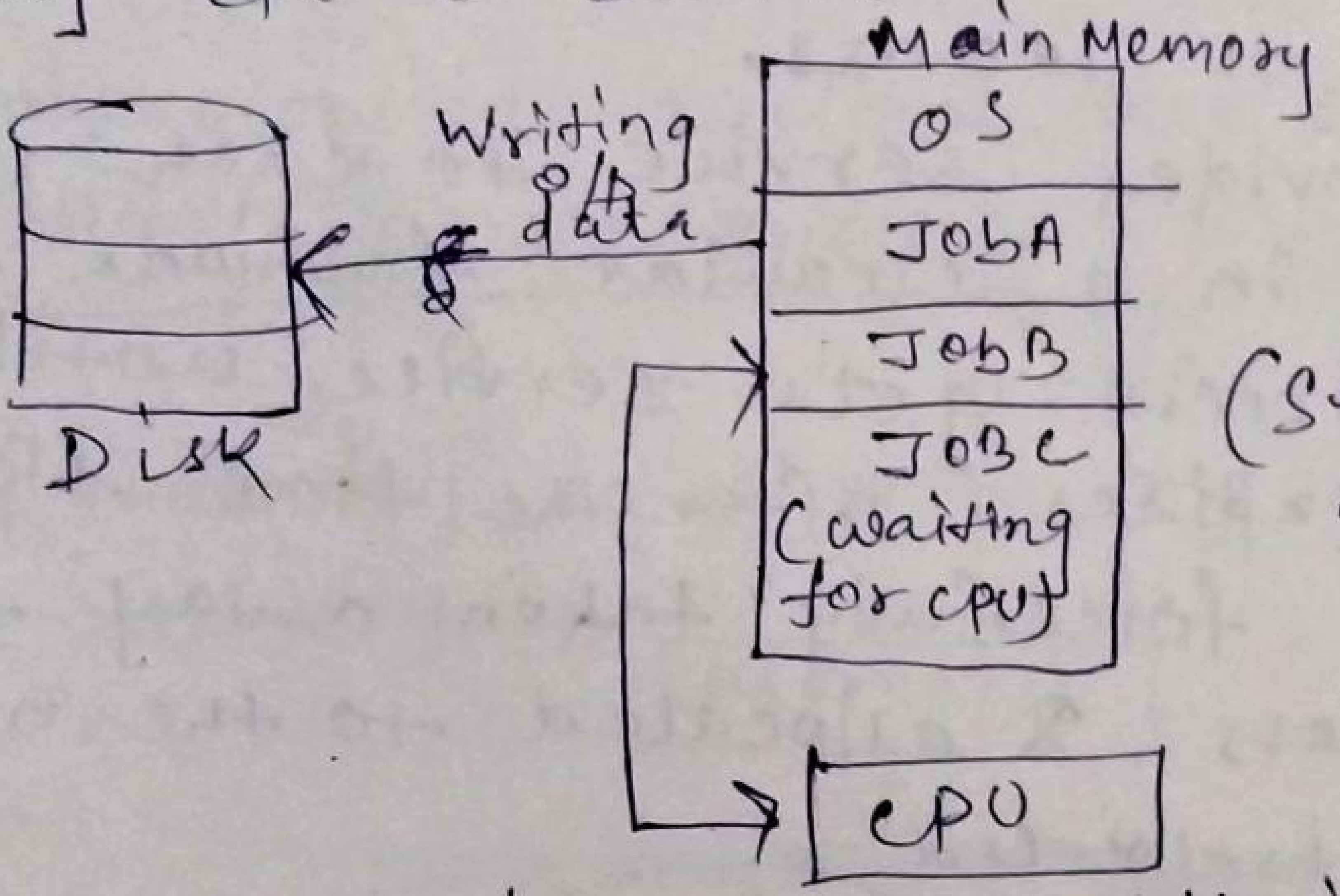
o bound jobs - These jobs perform very little (3) computations & most of the time they perform I/o operations. Hence their cpu utilization is very low.

→ Multiprogramming refers to the interleaved execution of two or more different programs by the computer.

→ A no. of programs are available in the main memory & can use the cpu.

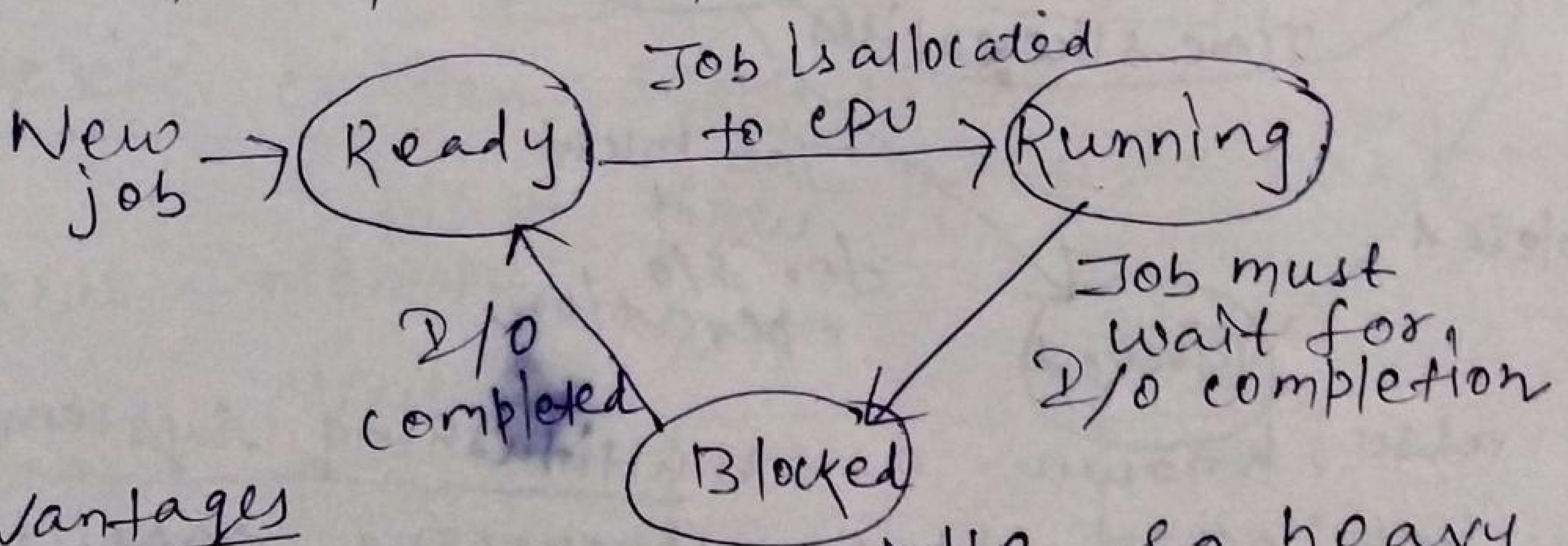
How operation takes place

→ When an user program that was currently executing, starts performing I/o operations, the cpu is allocated to another user program in the main memory, that is ready to use cpu, instead of allowing cpu to be idle.



(Scenario of jobs in a multiprogramming system)

While Job A is not utilizing cpu & busy in I/o operation, CPU is allocated to Job B



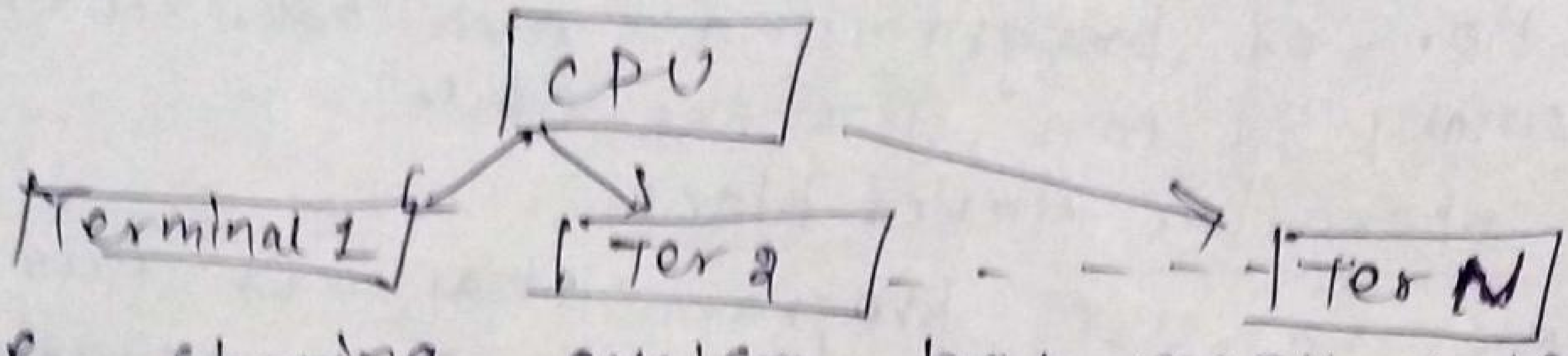
Advantages
1) cpu never becomes idle, so heavy cpu utilization
2) Better throughput 3) Efficient memory utilizⁿ

Disadv
1) Proper Memory Mgt. is needed
2) Proper scheduling algⁿ is needed to select one job out of many jobs to run on cpu.

(4) Interactive / Time Sharing / Multitasking Systems :- [Unix & Linux Multics

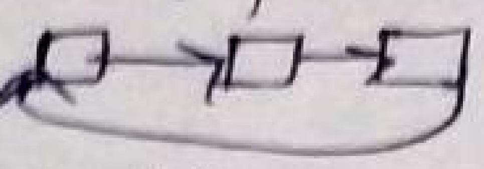
It is a mechanism in which several users can use computer system simultaneously for performing their task.

→ Each user is given an impression that he/she is using his own computer.

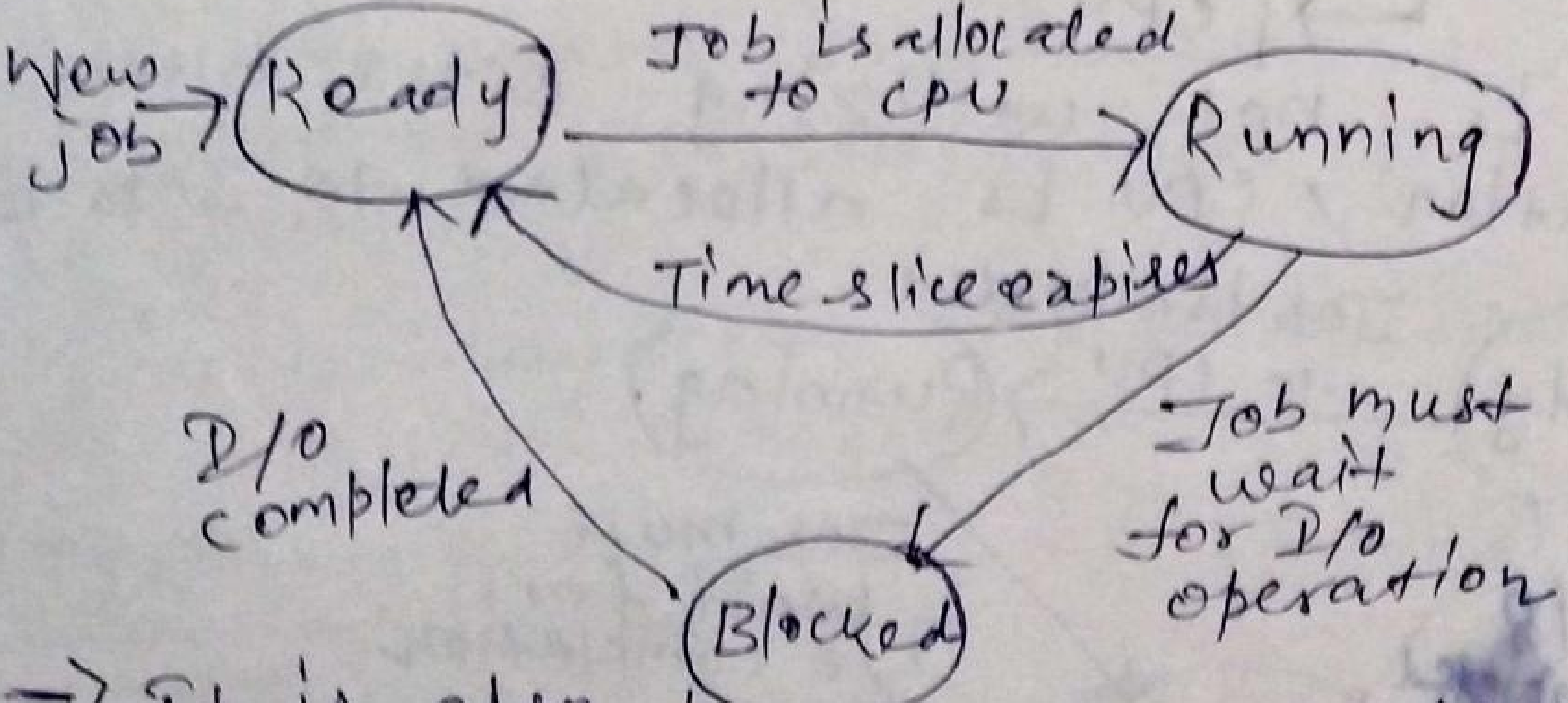


→ A time sharing system has many user terminals simultaneously connected to the server.

→ Here each user process is allocated a very short period of time called time slice/slot. which is 10 to 100ms.

→ The CPU provides service to each user process one by one in a circular fashion. 

→ Each user process gets service until the time slice expires. After the time slice expired, the CPU is forcefully taken away from the running process & allocated to the next one.



→ It is also known as multitasking system because the OS supports concurrent execution of multiple tasks in a multiprogramming environment.

Adv

1) Reduces CPU idle time
2) Provides quick response to all users
3) User interaction is possible during execution.
4) Offers good computing facility to small users

) Multiprocessing systems :-

The systems that can have more than one processor which shares the computer bus, clock, sometimes memory & ~~other~~ peripheral devices & other resources is known as multiprocessing systems.

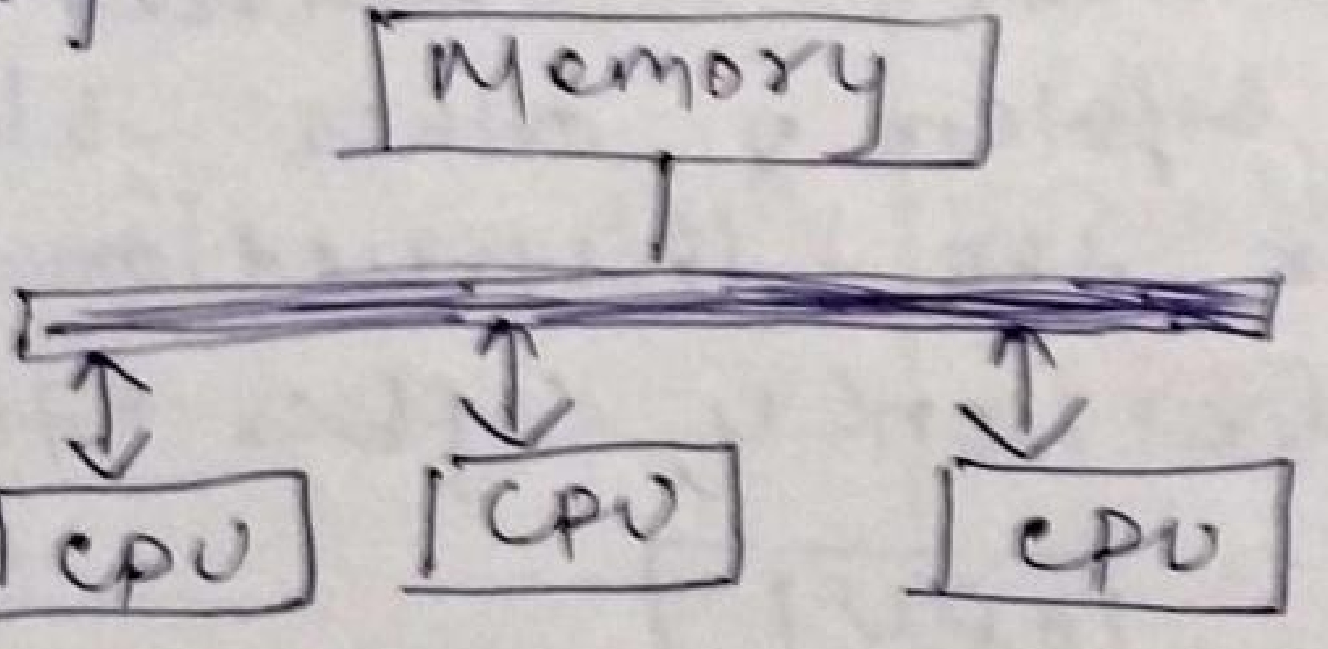
→ The term multiprocessing describes the interconnected computers with more than one cpu having the ability to simultaneously execute several programs.

→ Different & independent programs can be processed simultaneously by different CPUs or the CPU may simultaneously execute different parts of the same program.

→ Multiprocessing systems are of 2 types.

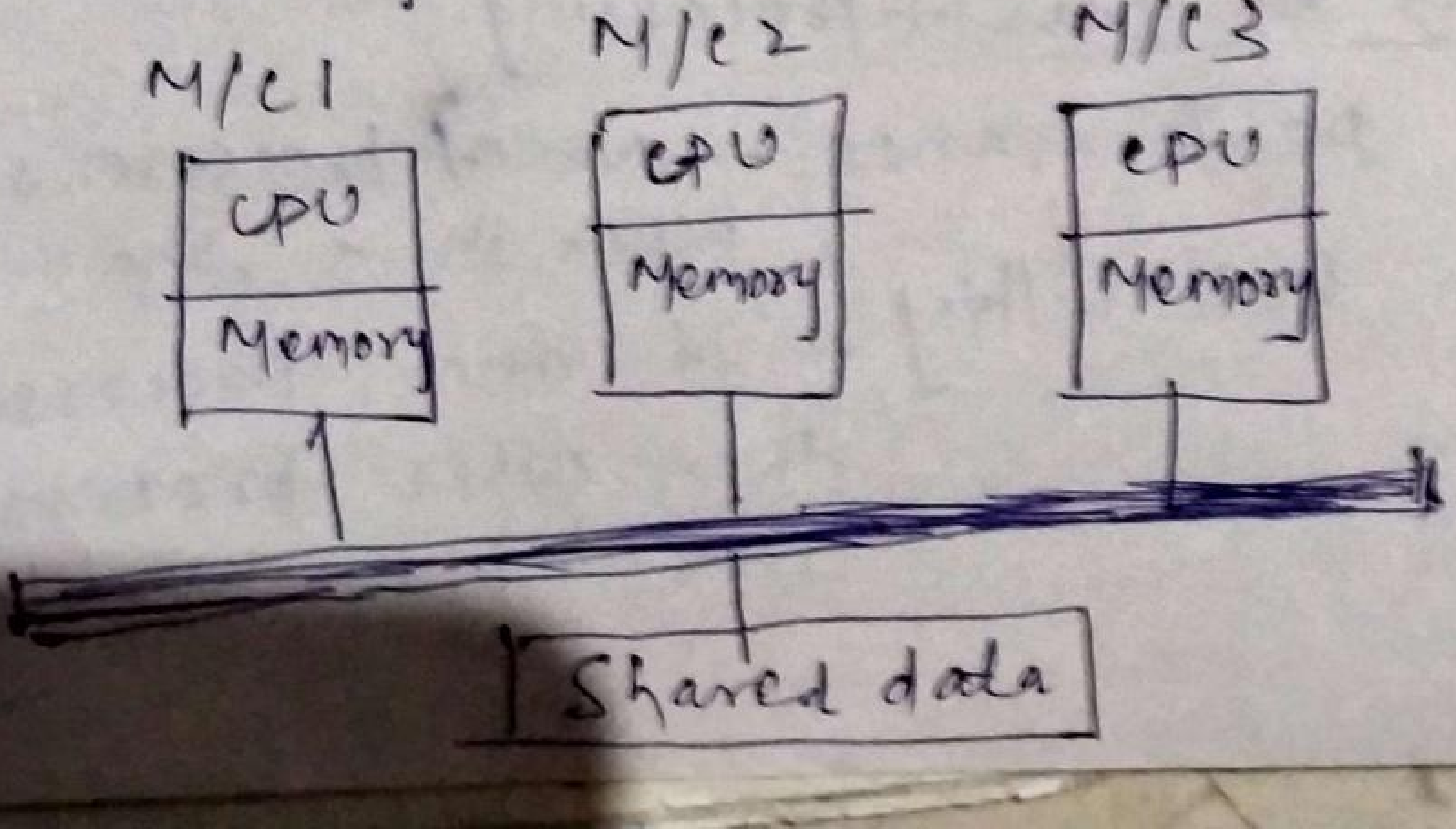
(1) Tighty coupled systems :-

Here a single system wide primary memory is shared by all processors called shared memory.



(2) Loosely coupled systems :-

Here each processor has its own local memory.



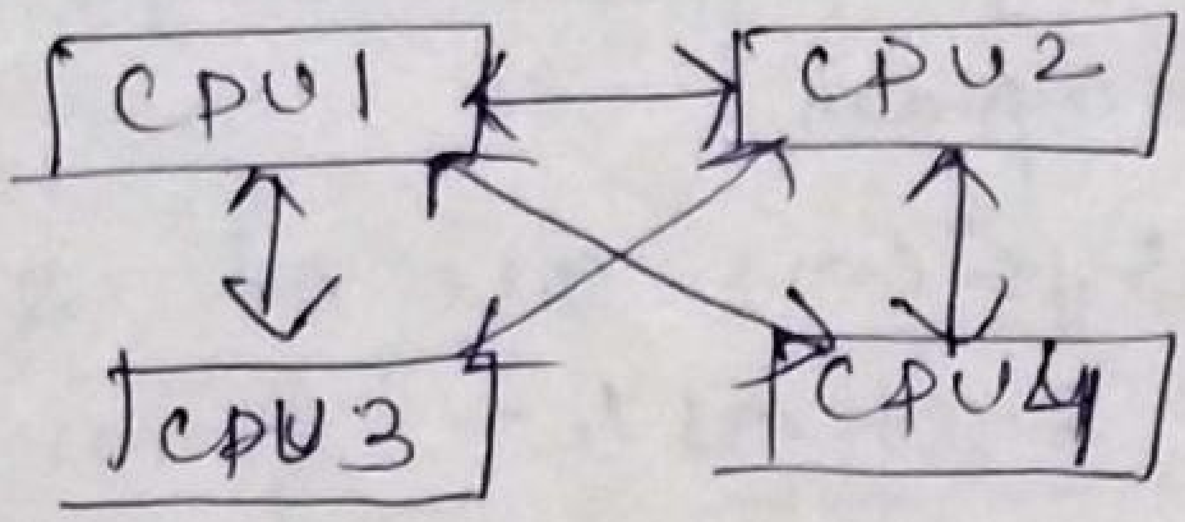
→ The OS which is used by these types of systems is known as multiprocessor operating systems.

→ The multiprocessor OS can be either symmetric or asymmetric.

· Symmetric model

In this model each processor runs an identical copy of OS & these copies communicate with one another as needed.

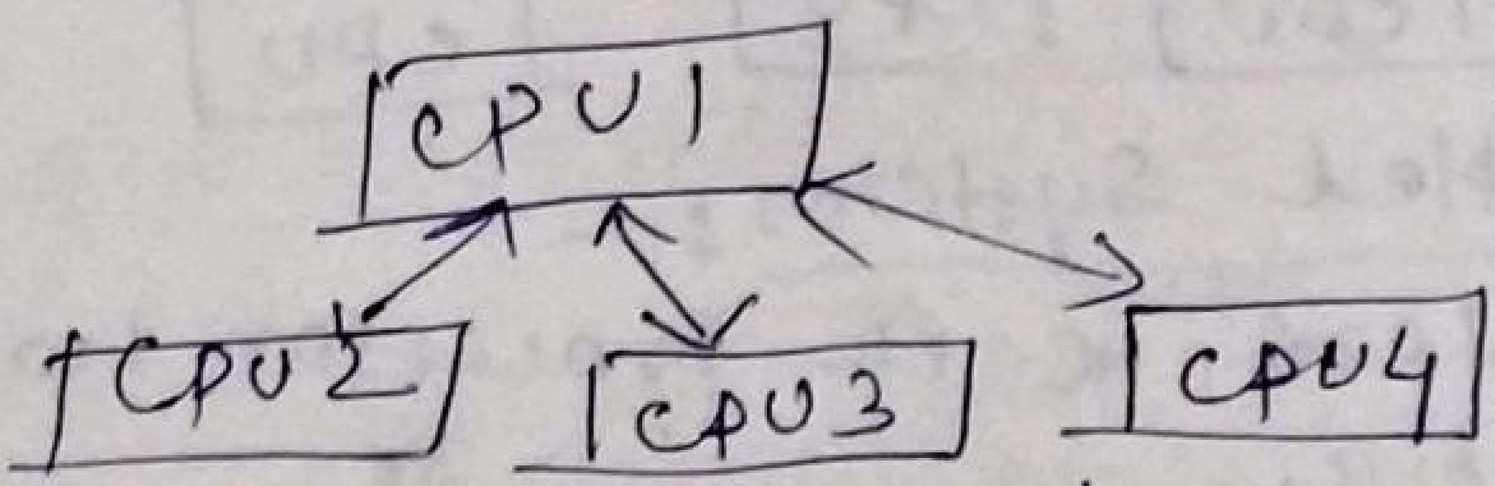
Ex - Encore's version of UNIX for Multimax computers, sun OS version-5



Asymmetric Model

In this model each processor is assigned a specific task. A master processor controls the entire system & other slave processors work as per the instruction of the master

Ex Sun OS. version-4, cyber 170



Advantages of Multiprocessing

1) Better performance - No. of processors can ~~do~~ the work in a shorter period of time

2) Better Reliability - If one processor fails, then other processor can take its workload.

Limitations of Multiprocessing

Requires a sophisticated OS to support multiprocessors

2) Design of OS is more complex & expensive

3) Maintainance is costly

Multiprogramming	Multiprocessing
1) It is the interleaved execution of two or more jobs by a single cpu computer system	1) It is the simultaneous execution of two or more jobs by a computer having more than one cpu.
2) Program segments are executed one after another	2) It makes possible for the system to simultaneously work on several program segments of one or different program
3) Implementation is less costly	3) costly
4) Execution is slower than multiprocessing	4) Here at a particular instance, one can get more no. of outputs. So faster execution is performed here
5) Less reliable than multiprocessing, becoz failure of one cpu, fails the entire system.	5) More reliable, becoz if one cpu fails, its work can be handled by other cpu.
6) Maintainance is less costly	6) Maintainance is costlier
7) Design of this OS is less complicated	7) Requires more sophisticated OS, whose design is complex.

6) Real time systems :-

Another form of special purpose OS is the real time OS.

→ A real time system is used when there are rigid time requirements on the operation of a processor.

→ So a real time OS has a well defined fixed time constraints.

→ Processing must be done within the well defined fixed time limit, otherwise the system will fail.

→ Ex Air Defense system receiving infor^n about aircraft movements from radars, Process control in industry, scientific experiments, robotics, air traffic &c. etc.

→ Such os requires a priority based preemptive scheduling

→ Real time ~~sy~~ os can be of 2 types

a) Hard Real time OS – Here all critical tasks have to be completed strictly within the specified time limits, otherwise undesirable damage can occur

b) Soft Real time OS – Here meeting of deadline is desirable but not mandatory. If the deadline could not be met, then any damage will not occur, but the result will lose its value.

Ex Harmony, Maruti etc

7 Personal computer operating system

The computer system dedicated for a single user is known as PC. The OS used in PC is called PC OS.

→ Its evolution started from DOS to windows. So there has been a lot of change in the design criteria for this OS.

→ Some PC OS emphasizes on user convenience where as some emphasizes on maximizing CPU & peripheral utilization.

Ex Windows 95, 98, XP, 2000, Linux etc.

8 Distributed OS

Distributed OS are the operating systems for a network of autonomous computers connected by a communication network.

→ A distributed OS controls & manages the h/w & s/w resources of a distributed system such that its users view the entire system as a powerful monolithic computer system.

when a program is executed in a distributed system, the user can't know where the program is executed & from where the resources are accessed.

Reasons for building a distributed system are:-

1) Resource sharing - If a no. of different sites are connected to each other, then user at one site may be able to use the resources available at other site.

2) Computation speed up - If a particular computation can be divided into a no. of subcomputation, that can sun simultaneously, then result can be acheived faster.

3) Reliability - Failure of one system doesn't affect the rest. If one site fails, then other sites can ~~continue~~ handle its work.

4) Communication - processes at one system can to exchange data with another system.

5) Flexibility - one of the most important feature of dist. os. Dist. OS is more flexible due to i) ease of modification & ii) ease of enhancement.

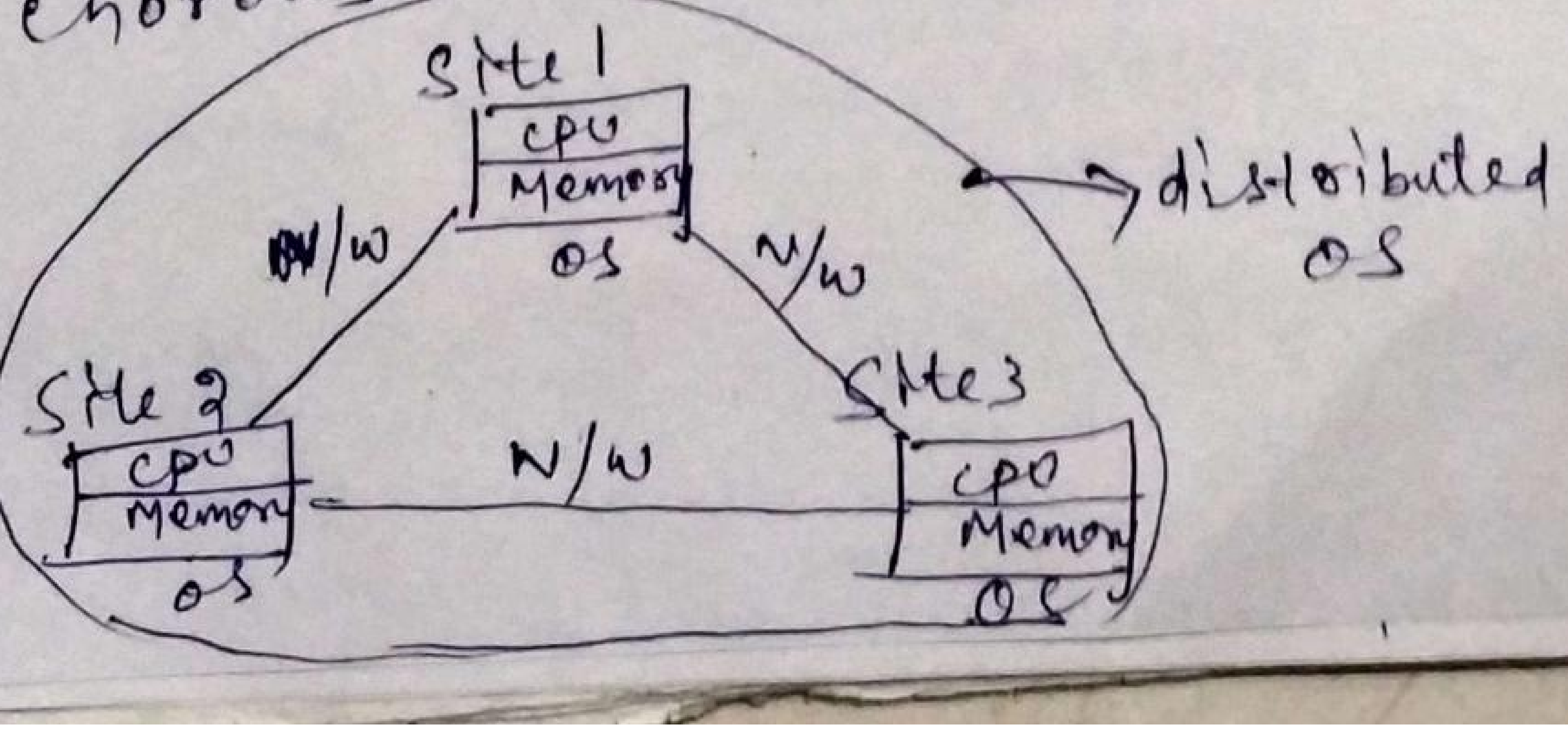
6) Scalability - It refers to the capability od system to handle increased workload. If new sites are added, then OS can handle the new workload exactly.

7) System wide sharing of resources

8) Global naming of resources

9) Accessing remote resources & remote processes.

Ex Amoeba, chorous



Multitasking vs Multiprogramming

1) Multitasking referes to the capability of an OS to support concurrent execution of multiple tasks in a multiprogramming environment.

whereas multiprogramming refers to the capabili of an OS to simultaneously maintain the code & data of several programs in the main memory.
& it requires sophisticated memory managemen
~~2)~~ & protection features.

2) Multitasking is a subset of multiprogramming

3) In both cases CPU & I/O devices are multiplexed among active programs, but in multitasking CPU executes multiple tasks by switching betn them very frequently which gives the illusion of parallelism.

4) Multiprogramming considers I/O interrupt whereas multitasking considers both I/O & timer interrupt.