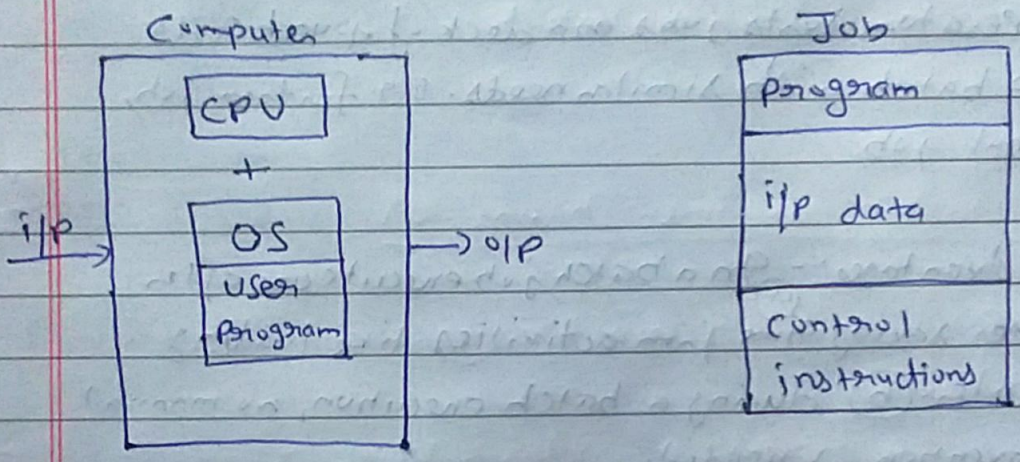
In 1960s, in the mainframe computers

→ common I/O devices were card readers and tape drives.

→ user prepare a job which consisted of the program, input data, and control instructions.



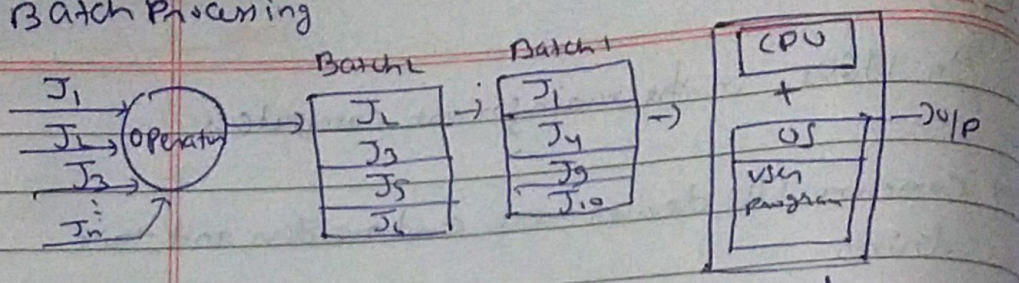
→ input job is given in the form of punch cards and result also appear in form of punch card after processing.

→ So, OS was very simple and always present in memory. Its major task is to transfer the control from one job to another.

→ Due to very small memory size, the input to CPU was always dependending on I/O devices. So, such systems were very slow.

Page No.:
Date: / /

Batch Processing



→ Jobs with similar needs are batched together and executed through the processor as a group

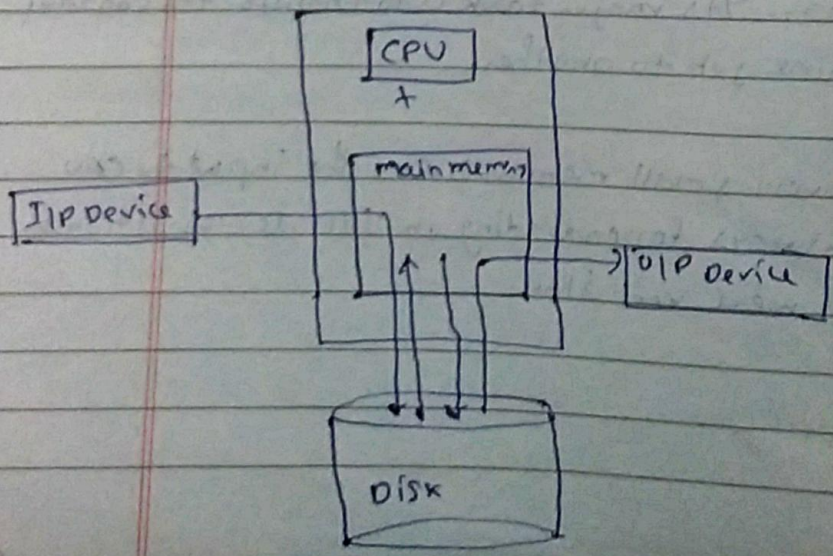
→ operator sorts jobs as a deck of punch cards into batch with similar needs. E.g. fortran job, Cobol job

→ Advantages:- (a) on a batch, job execute one after another saving time from activities like loading compiler. (b) during a batch execution, no manual intervention is needed.

Disadvantage:- (a) memory limitation

(b) interact of I/O devices directly with CPU.

Spooling - Simultaneous Peripheral operations Online



Page No.:
Date: / /

→ I/O devices are relatively slow compare to CPU (digital)

→ In spooling, data is stored ~~first~~ first into the disk and than CPU interact with disk via main memory.

→ multiple i/p device can store data to disk simultaneously.

→ Spooling is capable of overlapping I/O operations for one job with CPU operations of other jobs.

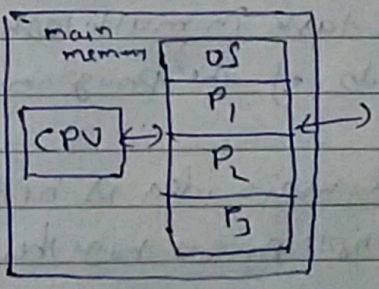
Advantage :- (a) no interaction of I/O devices with CPU
(b) CPU utilisation is more as CPU is busy most of the time.

Disadvantage :- It was uniprogramming.

Multiprogramming OS

→ Maximize CPU utilization

→ Multiprogramming means more than one process in main memory which ~~are~~ are ready to execute.



→ Process generally CPU time and I/O time. So, if a running process perform I/O or some event which do not require CPU then instead of ~~CPU~~ sitting idle, CPU make a context switch and picks some other process and this will continue.

→ CPU never sit idle unless there is no process ready to execute on at the time of context switch.

Page No.:
Date: / /

Advantage:- (a) high CPU utilization
(b) less waiting time, response time
(c) may be extended to multiple users
(d) useful when load is more

Disadvantage:- (a) Difficult scheduling
(b) main memory management is required
(c) memory fragmentation
(d)

multitasking or time-sharing OS

→ multitasking is multiprogramming with time-sharing
→ only one CPU but switches between processes so quickly that it gives illusion that all executing at same time

→ the task in multitasking may refer to multiple threads of the same program.

→ the main idea is better response time and executing multiple process together.

Page No.:
Date: / /

multiprocessing OS

→ Two or more CPU with a single computer in close communication sharing the system bus, memory & other I/O devices.

→ Different processes may run on different CPU, true parallel execution

→ Symmetric multiprocessing :- one OS controls all CPU, each CPU has equal rights.

→ ~~Asymmetric~~ Asymmetric multiprocessing :- master/slave architecture, system task on one processor and application on other. i.e. tasks of each CPU is not same.

Advantage :- (a) Increase throughput
(b) increase reliability
(c) cost saving (i.e. no need to multiple computers)
(d) true parallel processing

Disadvantage :- (a) more complex (b) large main memory.