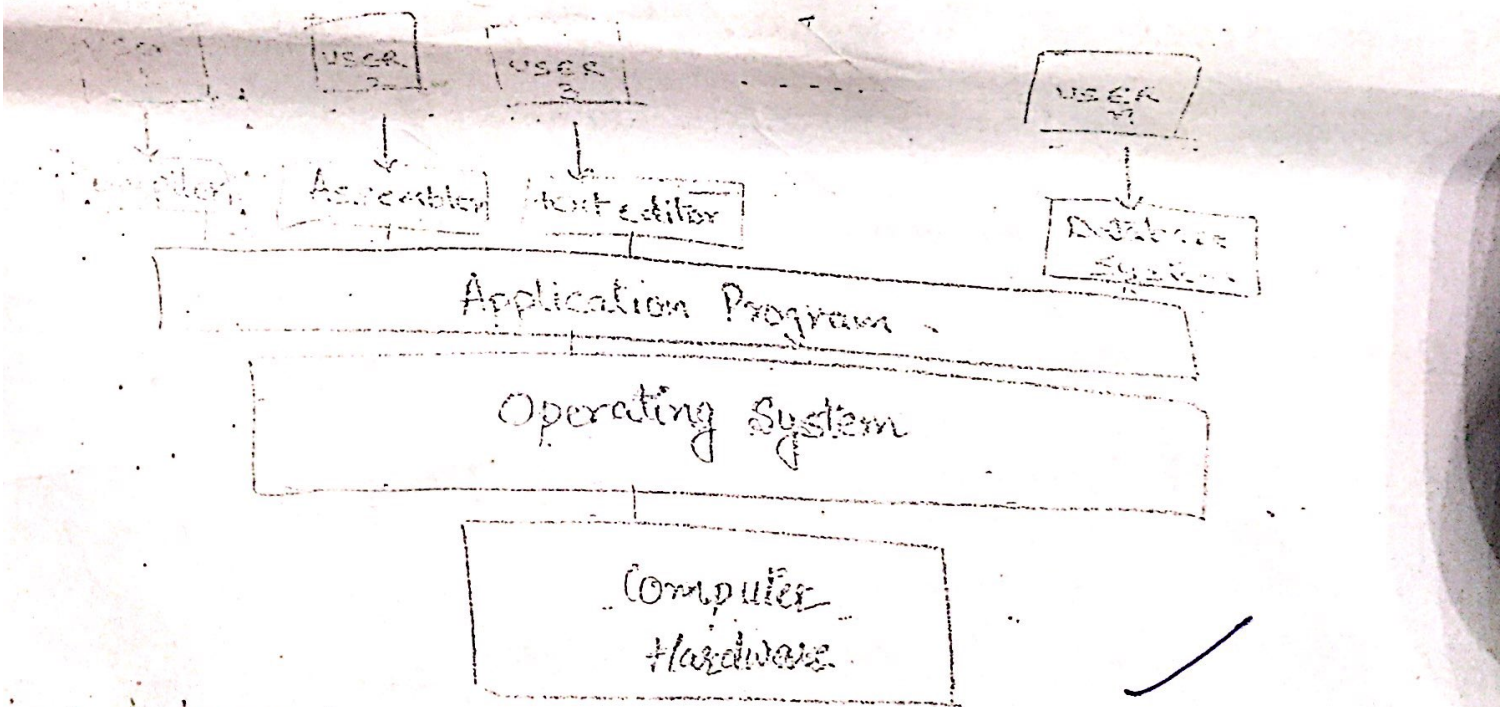
Operating System.

An Operating System is a program that acts as an intermediary between a user of a computer and the computer hardware. It makes computer System Convenient to use in an efficient manner.

Computer System can be divided roughly into four components:
- The Hardware
- The Operating System
- The Application Programs
- The users.



Efficient to use in an Efficient Manner.

The Operating System Controls and Co-ordinates the use of the hardware among the various application programs for the various users//

As a Resource Allocator /

It is a Control program //

: fundamental goal of computer System is to execute user programs and to make solving user problems easier//

ard this goal, Computer Hardware is constructed. Since hardware alone is not particularly easy to use, application programs are developed. These various programs require certain common operations, such as those controlling I/O devices. The common functions of controlling and allocating resources are then brought together a one piece of software: The Operating System.

Operating System is the one program running at all times on the computer, usually called the "kernel."

BATCH SYSTEM.

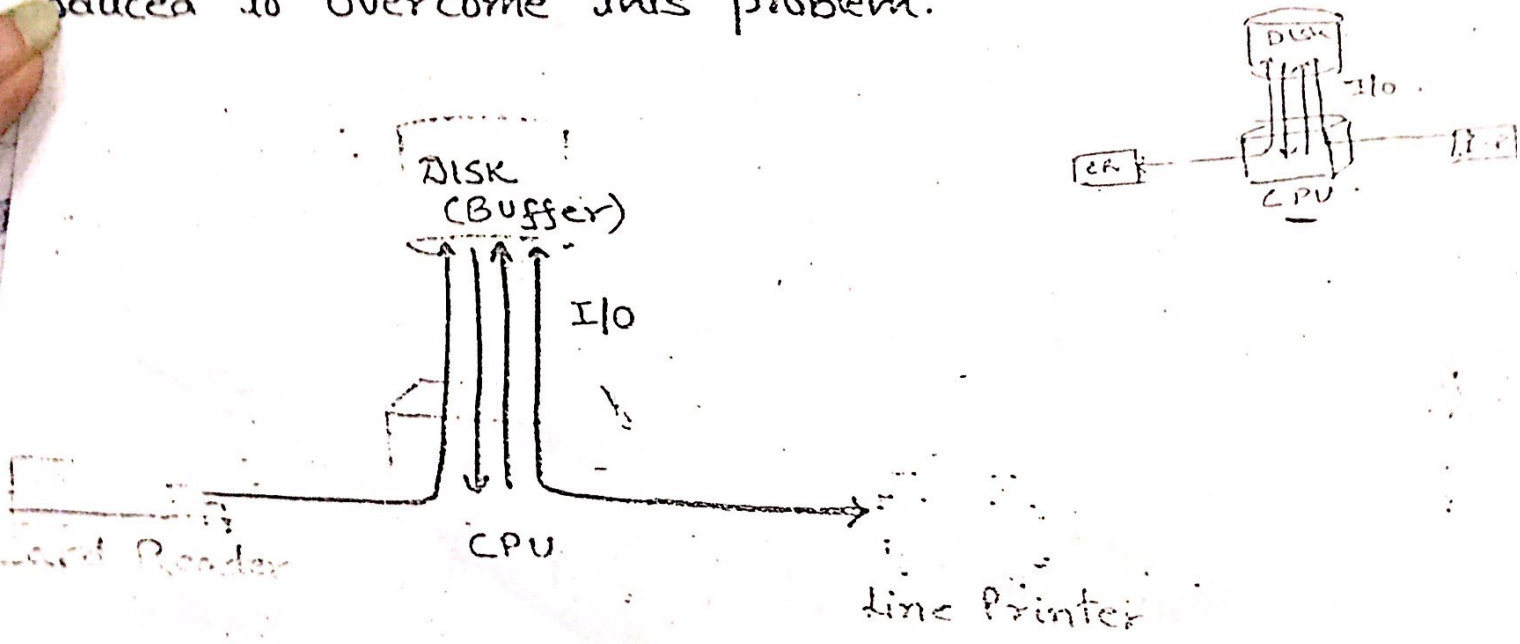
To speed up processing, jobs with similar ...s were batched together and were run through the ...puter as a group.

... programmers would leave their programs with the ...rator. The operator would sort programs into batches ... similar requirements and, as the computer became ...ilable, would run each batch. The output from each ... back to the appropriate programmer.

... definitive feature of a batch system is the lack of ...raction between the user and the job while that job ...cuting.

... delay between job submission and job completion ... turnaround time, may result from the amount ... computing needed, or from delays before the ... operating system starts to process the job.

ring Execution, CPU is often idle because speed of mechanical I/O devices are intrinsically slower than e of electronic devices. So, disk Technology was duced to Overcome this problem.



SPOOLING.

Cards are read directly from the Card reader onto e disk. The location of card images is recorded in a table pt by the O.S. When a job is executed, the O.S. tisfies its requests for card reader input by reading om the disk. Similarly, when the job requests the rinter to output a line, that line is copied into a system uffer and is written to the disk. When the job is completed, the output is actually printed. This form of processing is called SPOOLING.

Simultaneous Peripheral Operation On-Line.

ING has a direct beneficial effect on the performance
System. For the cost of some disk space
a few tables, the computation of one job can
lap with the I/O of other jobs. Thus, spooling can
both the CPU and the I/O devices working at
ich higher rates.

MULTIPROGRAMMED BATCHED SYSTEM.

Jobpool - Several Jobs that have already been read
waiting on disk; ready to run

The O.S. keeps several jobs in memory at a time,
one the subset of the jobs kept in the job pool. The CPU
picks and begins to execute one of the jobs in the memory
mmy, the job may have to wait for some task
h as an I/o operation to complete. Then, the O.S.
ply switches to and execute another job. When that
needs to wait, the CPU is switched to another job,
so on. When the first job finishes waiting and
the CPU back. As long as there is always some job to
ute, the CPU will never be idle.

TIME SHARING SYSTEM.

b. Scheduling -: Selection of a Job from a Job Pool by an O.S.; & loads that job into memory for execution.

> Scheduling increases the CPU Utilization by

inizing jobs such that the CPU always has one to

ute.

ereas If there are several jobs ready to run at same time, the system must choose among

m. Making this decision is CPU Scheduling

TIME SHARING SYSTEM.

Multiprogrammed batched systems provide an
onment where the various system resources
CPU, memory, peripheral devices; are utilized
tively. But the user cannot interact with the job
it is executing. So, A programmer cannot modify
gram as it executes to study its behavior. A long
round time inhibits experimentation with a program.

e Sharing System, or multitasking, is a logical
nsion of multiprogramming. Multiple jobs are
ecuted by the CPU switching between them, but the
itches occurs so frequently that the users may
teract with each program while it is running.
time-shared O.S. allows the many users to share the
mputer simultaneously. Only a little CPU time is needed
each user. As the system switches rapidly from one
er to the next, each user is given the impression
t she has her own computer, whereas actually one
mputer is being shared amg. many users.

PARALLEL SYSTEM.

ultiprocessor Systems : Systems having more than
e processor in close communication, sharing the
mputer bus, the clock and sometimes memory and
eripheral devices. These systems are referred to as
ightly Coupled Systems.

dvantage -: Increased Throughput.

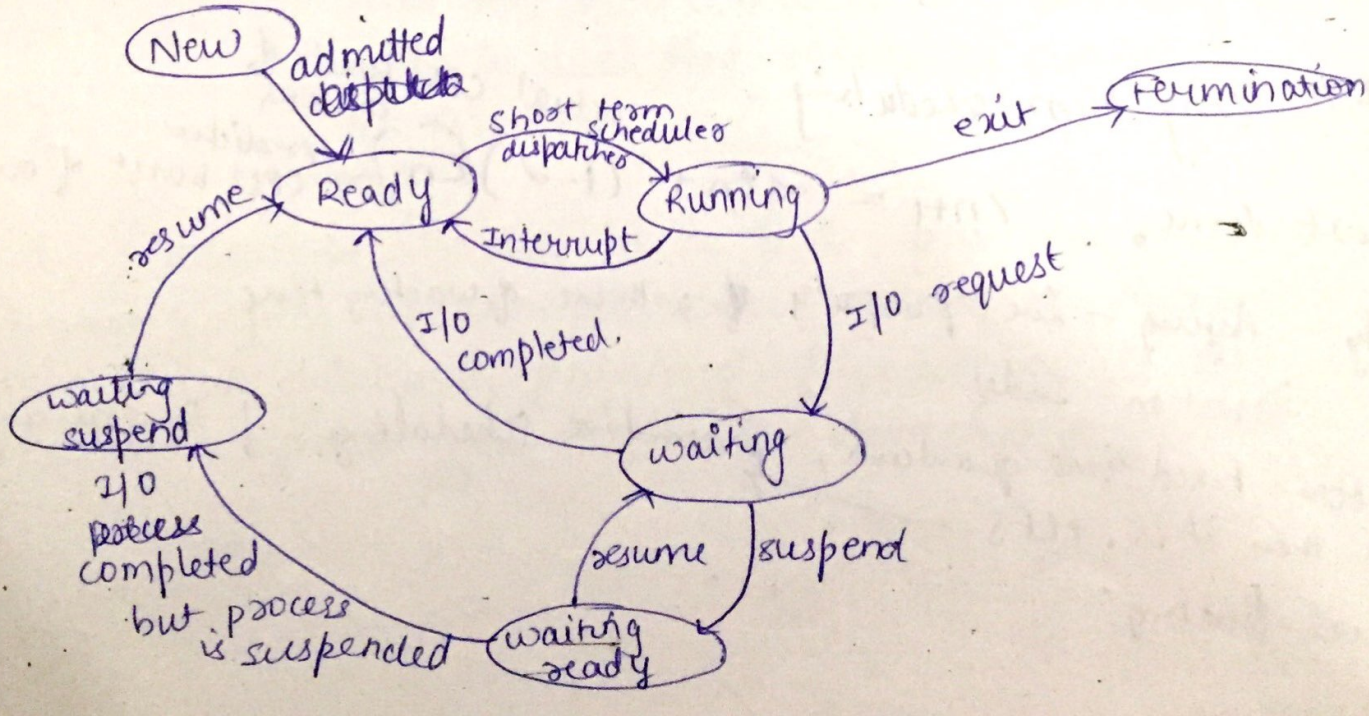
The speed-up ratio with n processors is not n, but
ther is less than n. When multiple processors cooperate
n a task, a certain amount of overhead is incurred
n keeping all the parts working correctly. This overhead, plus
ntention for shared resources, lowers the expected gain
om additional processors. Similarly, a group of n
programmers working closely together does not result in
n times the amount of work being accomplished.

processors can also save money compared to multip
systems because the processors can share
eripherals and power supplies.

Increase Reliability.

functions can be distributed properly among
eral processors, then the failure of one processor
not halt the system, but rather will only slow it down
ability to continue providing service proportional
he level of surviving hardware is called
Graceful Degradation. Systems that are designed for
also
aceful degradation are called fault-tolerant.

Process states:

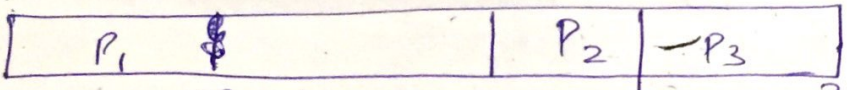


ultiple-Processor Systems use the Symmetric processing model, in which each processor runs an tical copy of the O.S. and these copies communicate h one another as needed.

me Systems use Asymmetric Multiprocessing, which each processor is assigned a specific task. master processor controls the system; the other ocessors either look to the master for instruction have predefined tasks. - Master Slave Relationship

(1) FCFS convoy effect.

Gantt chart



avg. wt = $\frac{0+24+27}{3}$ =

avg tat = $\frac{24+27+30}{3}$ = ____ ms.

(2) SJF: Long term scheduling. actual CPU burst of current

for short term, $\tau_{n+1} = \alpha(t_n) + (1-\alpha)(\tau_n)$ → predicted CPU burst of an

(3) Priority: Aging - Inc priority with inc of waiting time

Starvation - Indef

(4) Round-Robin - Fixed time quantum, preemtive scheduling, if time quantum is fixed then it is FCFS

(5) Multilevel Queing

ibuted System.

Distribute computation among several processor.

, processors do not share memory or clock. Instead,

processor has its own local memory. The processor

unicate with one another through various communication

, such as high speed buses or telephone lines. These systen

sually referred to as Loosely Coupled Systems or

ibuted Systems. These processors are referred to by a

different names, such as sites, computer,

ons for building distributed systems,

rce Sharing :- If a no. of different sites (with differe
capabilities) are connected to one
another, then a user at one site may be
able to use the resources available
at another.
OR

neral, Resource Sharing in a D.S., provides mechani
sharing files at remote sites, processing informatio
distributed database, printing files at remote site,
remote specialized hardware devices & performing
operations.

putation Speed up -: Particular computation can be partitioned into a number of subcomputation that can run concurrently. In addition, if a particular site is currently overloaded with jobs, some of them may be moved to other, lightly loaded, sites. This movement of jobs is known as Load Sharing.

liability : If one site fails, the remaining sites can potentiall ntinue operating. If the system is composed of a no. of small achines, each of which is responsible for some crucial system function, then a single failure may effectively halt e operation of the whole system. In general, if sufficient dundancy exists in the system, (in both data & hardware), e system can continue with its operation, even if some its sites have failed.

Communication : When many sites are connected to ne another by a communication network, the processes at fferent sites have the opportunity to exchange information. mmunicate via electronic mail. (e-mail)

Time System :

A Real time system is used where there are time requirements on the operation of a processor or flow of data, and thus is often used as a control device in dedicated application. A real-time operating system has defined, fixed-time constraints. Processing must be within the defined constraints, or the system will fail.

Scientific Experiments, medical Imaging Systems, Medical Control Systems, Automobile-engine fuel-injection System etc.

A real-time system is considered to function correctly only if it returns the correct result within any time constraints.

Real Time Systems

Real time

uarantees that critical complete on time.

goal requires that all

in the system be bounded,

the retrival of stored data to

time it takes the O.S. to finish

request made of it.

Soft Real Time.

Here critical real time

task gets priority over

other tasks, and retains tha

priority until it completes.

eg Multimedia, advance

Scientific projects

planetary rovers.

→ Major versions of UNIX

Risky to use for industri

Control & Robotics becau

it does not support

deadline scheduling.