KOLEJ KOMUNITI PAYA BESAR

KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

KOLEJ KOMUNITI PAYA BESAR
CAWANGAN MARAN

Computer Operating System

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HAFIZAH BINTI ISMAIL

Computer

Operating System

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SYNOPSIS

This e-book is a note and exercise resource for students taking the Certificate in Information Technology course at the Community College level.

This e-book contains 4 topics that are part of the Operating System syllabus. It utilizes concise, compact, and engaging concepts to assist students in understanding the details of operating systems.

Each topic contains related notes and exercises, and there are also topics linked to suitable learning videos from YouTube.

It is hoped that through this e-book, students will have a better understanding of operating systems.

Thank You

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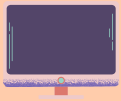

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PLEASE CLICK ON THE TOPIC

TOPIC 1 :

INTRODUCTION TO OPERATING SYSTEM

AN OPERATING SYSTEM (OS)

An operating system acts as an intermediary between the user of a computer and the computer hardware.

The purpose of an operating system is to provide an environment in which a user can execute programs in a convenient and efficient manner.

An operating system is a software that manages the computer hardware.

The hardware must provide appropriate mechanisms to ensure the correct operation of the computer system and to prevent user programs from interfering with the proper operation of the system.

FUNDAMENTALS CONCEPT OF OPERATING SYSTEM

1. Operating System Environment
2. Basic Function OS
3. Architecture OS
4. Components & Interfaces OS

FUNDAMENTALS CONCEPT OF OPERATING SYSTEM

1 Operating System Environment

01 System software that runs on computer (any electronic devices)

02 Manage and coordinate computer resources (software & hardware)

03 Medium to communicate to computer (binary language)

04 Run the user tasks. (Memory and Process Managements) - scheduling use to avoid conflict & interference between programs.

FUNDAMENTALS CONCEPT OF OPERATING SYSTEM

2 Basic Function OS

A program that acts as an intermediary between a user of a computer and the computer hardware.

1. it is an interface between the user and a hardware
2. It is the first software that runs when the computer boots up
3. Its provides a platform for the user to run the applications
4. Is a program that manages the computer hardware.

Basic Function OS

The purpose of operating system :

to provide an environment in which user can execute program in a convenient & efficient manner.

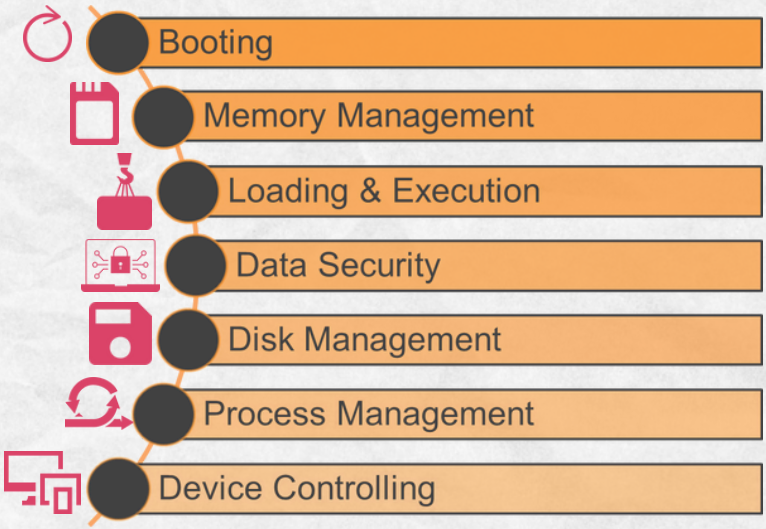
(Providing the system interface)

Operating system goals:

1) Execute user program and make solving user problems easier.
2) Make the computer system convenient to use.

FUNDAMENTALS CONCEPT OF OPERATING SYSTEM

2 Basic Function OS



Batch OS
large computing time without the need for user interaction or participation.

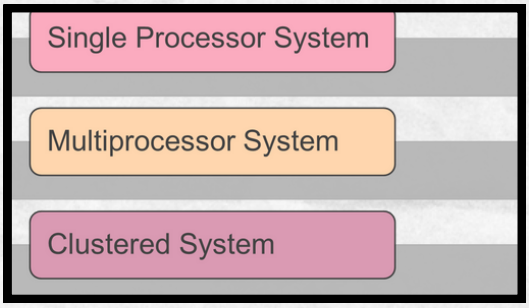
Multiprogramming OS
Multiprogramming has significant potential to improve system performance and resource utilization
- Multitasking OS
- Multiuser OS
- Time Sharing System
- Real Time System

Network OS
allow a set of stand-alone computers that are interconnected by a network of computers to be used together conveniently and cost-effectively.

Distributed OS
an ordinary centralized operating system but runs on several independent CPUs.

FUNDAMENTALS CONCEPT OF OPERATING SYSTEM

3 Architecture OS



Single Processing Unit

The system that **execute one process at the time** and the next job when process is completed it is called the single process system. They have only one main CPU.

- A computer system that has a single central processing unit
- Only one process can run or execute at a time
- Other processes must wait until the processor becomes free
- All processing tasks share a single CPU

3 Architecture OS

Multiprocessor system

•Have **more than 1 processor** in close communication, **sharing the computer bus, the clock, memory and peripheral devices.**
•Advantages ; Increased throughput, Economy of scale, Increased reliability.

Multiprocessor System refers to the use of two or more central processing units (CPU) within a single computer system.

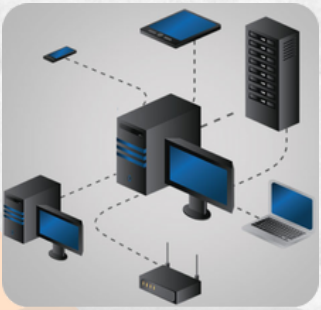
These multiple CPUs are in a close communication sharing the computer bus, memory and other peripheral devices.

These systems are referred as ***tightly coupled systems***.

3 Architecture OS

Clustered system

- **Share storage** and are closely linked via LAN Networking.
- Provide high availability
- **Asymmetric clustering** – one machine is in hot standby mode, the other is running the application
- **Symmetric mode** – two or more hosts are running application and monitoring each other.



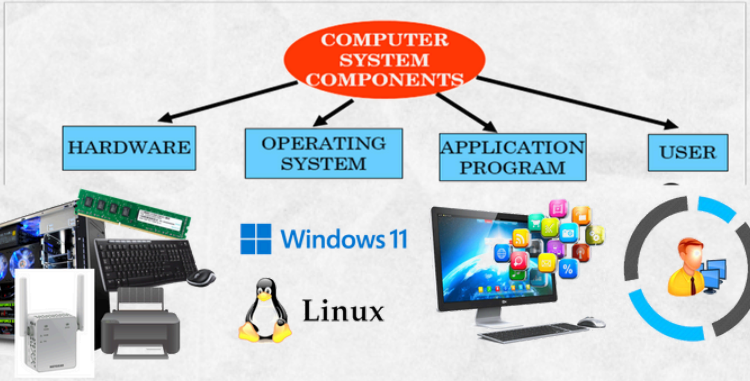
A clustered system uses multiple CPUs to complete a task.

In a computer system, a cluster is a group of servers and other resources that act like a single system

Clustering allows two or more systems to share storage

FUNDAMENTALS CONCEPT OF OPERATING SYSTEM

4 Components & Interfaces OS

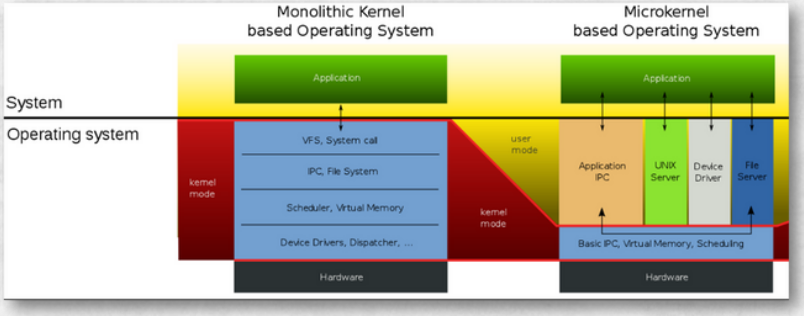


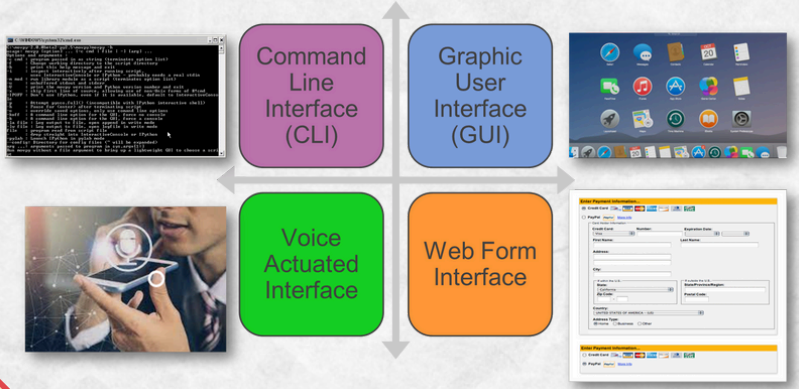
Components & Interfaces OS

Operating System Structures

- The core software components of an operating system are collectively known as the **kernel**.

- The kernel **has unrestricted access to all of the resources on the system.**





EXERCISE TOPIC 1

Click here to get the answer

Please answer true or false:

- Multiprocessor System have more than 1 processor in close communication, sharing the computer bus, the clock, memory and peripheral devices.

  True False

- The kernel has restricted access to all of the resources on the system

  True False

- An operating system acts as an intermediary between application software and computer hardware.

  True False

- The primary function of an operating system is to manage computer hardware resources.

  True False

- Multitasking refers to the ability of an operating system to execute multiple tasks simultaneously.

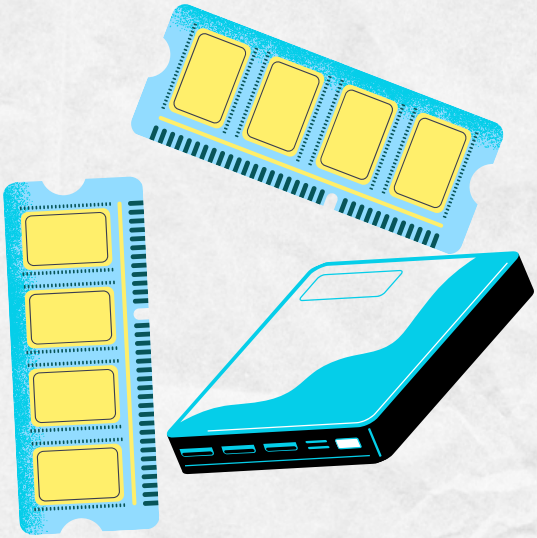
  True False

- Device drivers are software components that allow the operating system to communicate with hardware devices such as printers and keyboards.

  True False

TOPIC 2 :

MEMORY & PROCESS MANAGEMENT



MEMORY & PROCESS MANAGEMENT

DEFINITION

1

Memory Management is the **process of controlling and coordinating computer memory,** assigning portions known as blocks to various running programs to optimize the overall performance of the system.

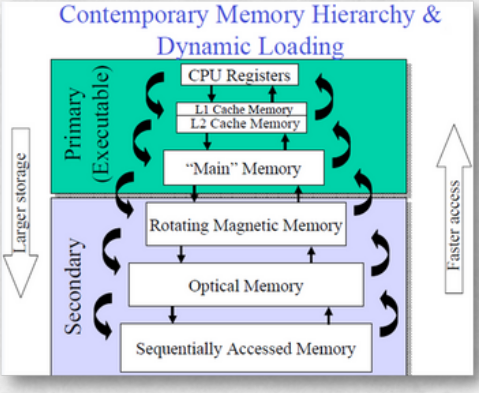
2

In order to execute program, it should be mapped to absolute addresses and loaded inside the memory

FUNCTIONS OF MEMORY & PROCESS MANAGEMENT

- Help to keep track of primary memory.
- Determine what part of it are in use by whom, what part is not in use.
- OS takes a decision about which process will get memory and how much.
- Allocates the memory when a process requests.
- It also de-allocates the memory when a process is no longer requires or has been terminated.

Hierarchy of memory organization



There are 4 major **storage levels.**

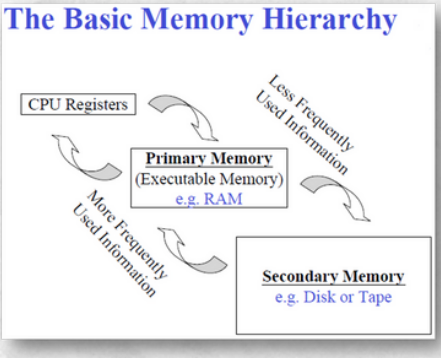
Internal – Processor registers and cache.

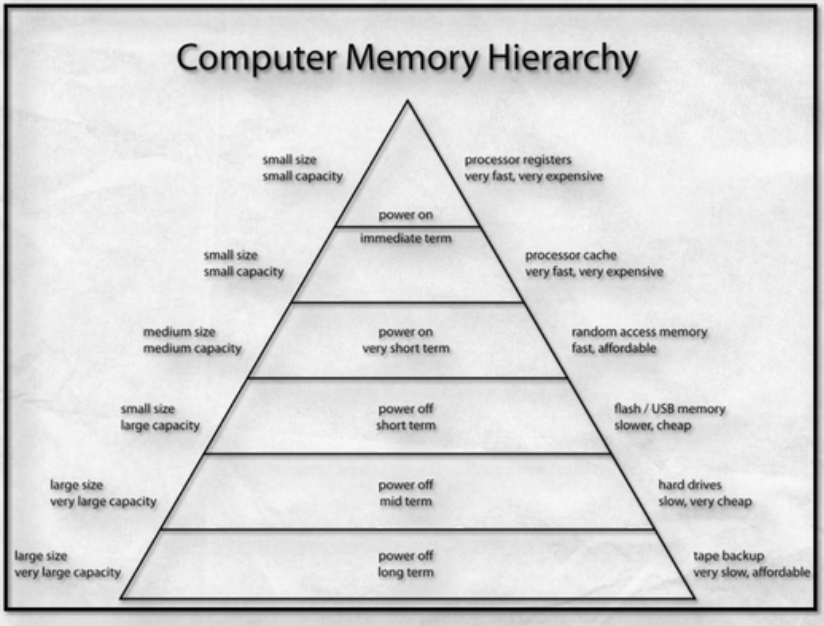
Main – the system RAM and controller cards.

On-line mass storage – Secondary storage.

Off-line bulk storage – Tertiary and Off-line storage.

Hierarchy of memory organization





Hierarchy of memory organization

Video Source :
Content creator perlu storage laju? Apa beza HDD, SSD & NVMe? - YouTube

Click to watch the video

MEMORY MANAGEMENT STRATEGIES

The memory manager is responsible for allocating primary memory to processes and for assisting the programmer in loading and storing the contents of the primary memory.

Nutt (1997)

GOAL

> **Managing the sharing of primary memory**

> **Minimizing memory access time**

Nutt, G. (1997), *Operating Systems: A Modern Perspective*, First Edition, Addison-Wesley, Reading, MA.

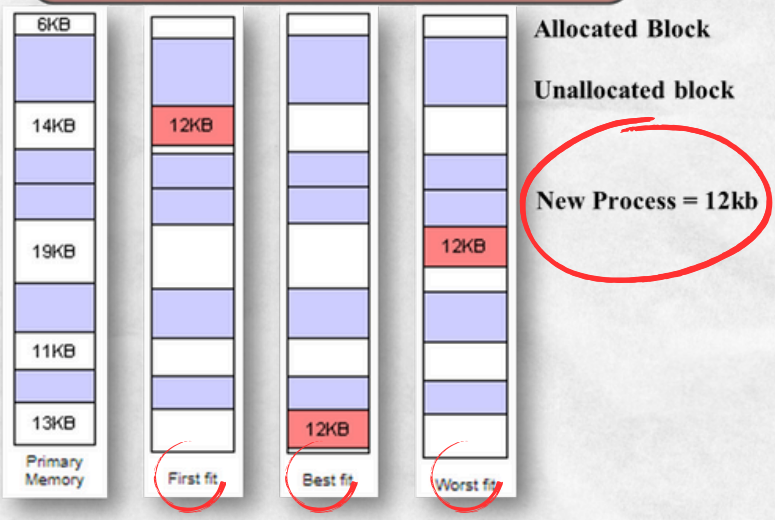
Memory manager – responsible to manage the process in efficiency manner.

Every process must have some amount of primary memory in order to execute, the performance of the memory manager is crucial to the performance of the entire system.

MEMORY MANAGEMENT STRATEGIES

Memory manager must keep track of which processes are running in which memory locations.

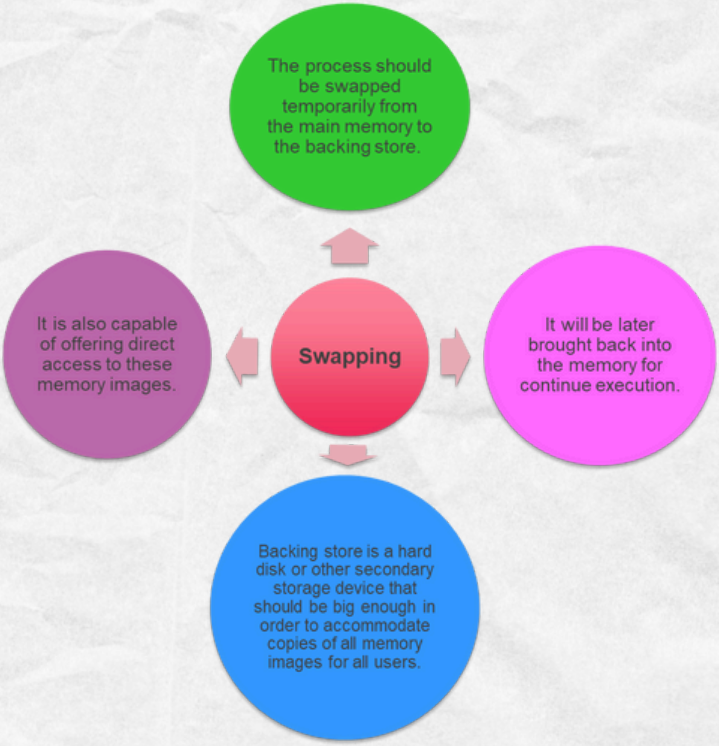
It also determine how to allocate and deallocate available memory when new processes are created and when old processes complete execution.

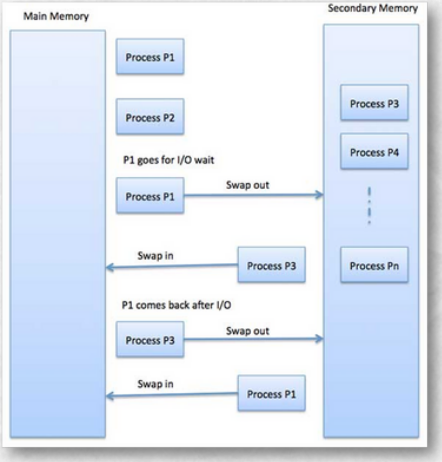


MEMORY MANAGEMENT STRATEGIES

Memory Management Strategies	Advantages	Disadvantages
First Fit	Fastest algorithm because it searches as little as possible.	It wastes a lot of memory space.
Best Fit	Memory efficient. Allocates the job minimum possible space in the memory	It is slower and may even tend to fill. Checking the whole memory for each job makes the working of the operating system very slow. up memory with tiny useless holes.
Worst Fit	Reduces the rate of production of small gaps.	Slow process because it traverses all the partitions in the memory and then selects the largest partition among all the partitions
Next Fit	Very fast searching algorithm. Start search for the free portion of parts not from the start of the memory, but from where it ends last time.	Experiments over the algorithm have shown that the next fit is not better then the first fit. So, it is not being used these days in most of the cases.

MEMORY SWAPPING TECHNIQUE DURING SYSTEM PROCESSING



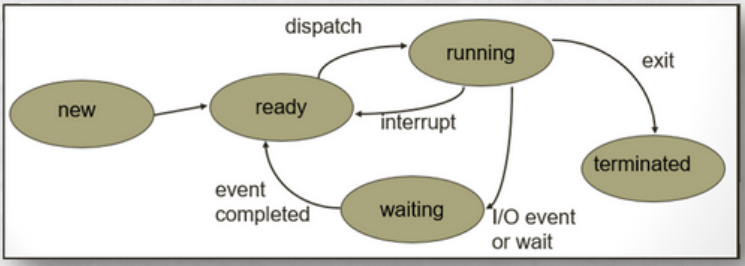


PROCESS MANAGEMENT SYSTEM OF OPERATING SYSTEM

Process State

As a process executes, it change state.

State of a process is defined in part by the current activity of that process.



Remarks:

New - The process is being created

Ready - The process is waiting to be assigned to a processor

Running - Instructions are being executed

Waiting - The process is waiting for some event to occur (such as I/O completion or reception of a signal)

Terminated -The process has finished execution

PROCESS MANAGEMENT SYSTEM OF OPERATING SYSTEM

Process Management

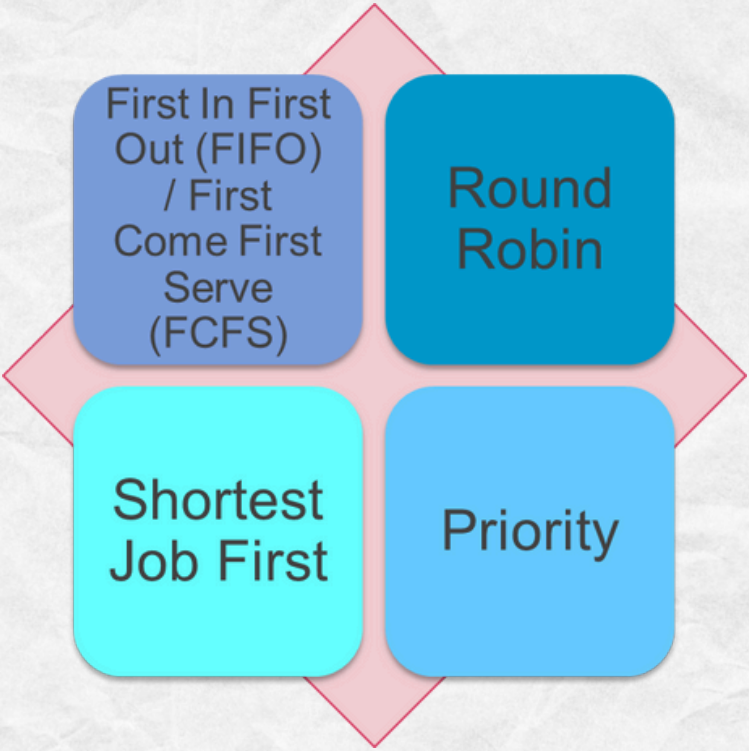
- A **process** is a program in execution.
- A process is an ‘active’ entity, instead of a program, which is considered a ‘passive’ entity.
- A single program can create many processes when run multiple times.
- Process management involves various tasks like **creation, scheduling, termination of processes, and a dead lock.**

For example, when we write a program in C or C++ and compile it, the compiler creates binary code. The original code and binary code are both programs. When we actually run the binary code, it becomes a process.

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Scheduling Algorithms

- A **scheduling algorithm** is the method by which threads, processes or data flows are given access to system resources.
- CPU can apply different scheduling algorithms to schedule processes.



SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Scheduling Process

- Arrange processes of different states like ready, waiting, and running.
- Process scheduling maximizes the number of interactive users, within acceptable response times.
- Process scheduling allows OS to allocate a time interval of CPU execution for each process.
- Important reason for using a process scheduling system is that it keeps the CPU busy all the time.
- This allows you to get the minimum response time for programs.

Comparison among Scheduler

S.N.	Long-Term Scheduler	Short-Term Scheduler	Medium-Term Scheduler
1	It is a job scheduler	It is a CPU scheduler	It is a process swapping scheduler.
2	Speed is lesser than short term scheduler	Speed is fastest among other two	Speed is in between both short and long term scheduler.
3	It controls the degree of multiprogramming	It provides lesser control over degree of multiprogramming	It reduces the degree of multiprogramming.
4	It is almost absent or minimal in time sharing system	It is also minimal in time sharing system	It is a part of Time sharing systems.
5	It selects processes from pool and loads them into memory for execution	It selects those processes which are ready to execute	It can re-introduce the process into memory and execution can be continued.

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

First Come First Serve (FCFS) Scheduling

- In the "**First come first serve**" scheduling algorithm, as the name suggests, **the process which arrives first, gets executed first**, or we can say that the process which requests the CPU first, gets the CPU allocated first.

- First Come First Serve, is just like FIFO(First in First out) queue data structure, where the data element which is added to the queue first, is the one who leaves the queue first.

- This is used in Batch Systems.

- It's easy to understand and implement programmatically, using a Queue data structure, where a new process enters through the tail of the queue, and the scheduler selects process from the head of the queue.

- A perfect real life example of FCFS scheduling is buying tickets at ticket counter.

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

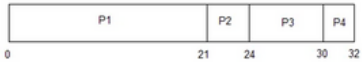
First Come First Serve (FCFS) Scheduling

Example question :

Consider the processes P1, P2, P3, P4 given in the below table, arrives for execution in the same order, with **Arrival Time** 0, and given **Burst Time**, let's find the average waiting time using the FCFS scheduling algorithm.

PROCESS	BURST TIME
P1	21
P2	3
P3	6
P4	2

The average waiting time will be = (0 + 21 + 24 + 30)/4 = 18.75 ms



This is the GANTT chart for the above processes

How to get the answer : Refer Video below

CLICK HERE

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Shortest Job First (SJF) Scheduling

- Shortest Job First scheduling works on the process with **the shortest burst time or duration first.**
- This is the best approach to minimize waiting time.
- This is used in Batch Systems.
- It is of 2 types:
  1. Non Pre-emptive
  2. Pre-emptive
- To successfully implement it, the burst time/duration time of the processes should be known to the processor in advance, which is practically not feasible all the time.
- This scheduling algorithm is optimal if all the jobs/processes are available at the same time. (either Arrival time is 0 for all, or Arrival time is same for all)

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Shortest Job First (SJF) Scheduling

Example question :

PROCESS	BURST TIME
P1	21
P2	3
P3	6
P4	2

In Shortest Job First Scheduling, the shortest Process is executed first.

Hence the GANTT chart will be following :

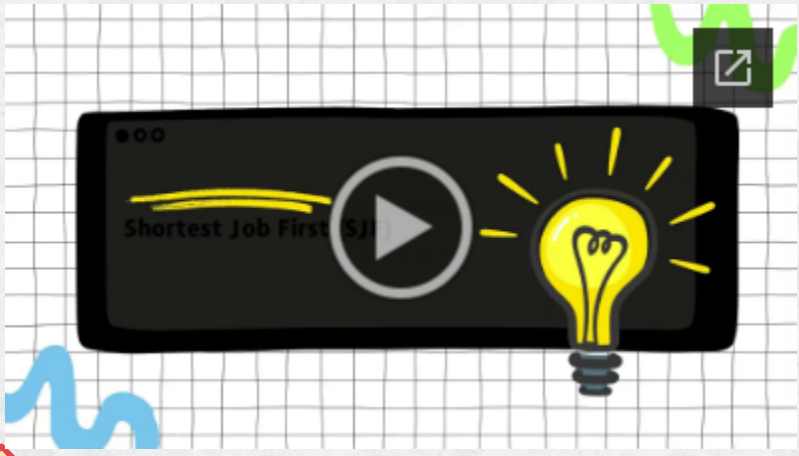
Now, the average waiting time will be = (0 + 2 + 5 + 11)/4 = 4.5 ms

As you can see in the **GANTT chart** above, the process **P4** will be picked up first as it has the shortest burst time, then **P2**, followed by **P3** and at last **P1**.

We scheduled the same set of processes using the First come first serve algorithm in the previous tutorial, and got average waiting time to be `18.75 ms`, whereas with SJF, the average waiting time comes out `4.5 ms`.

How to get the answer : Refer Video below

CLICK HERE



SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Round Robin (RR) Scheduling

- The Round Robin scheduling algorithm is one of the CPU scheduling algorithms in which **every process gets a fixed amount of time quantum to execute the process.**

- In this algorithm, **every process gets executed cyclically**. This means that processes that have their burst time remaining after the expiration of the time quantum are sent back to the ready state and wait for their next turn to complete the execution until it terminates.

- This processing is done in FIFO order which suggests that processes are executed on a first-come, first-serve basis.

- Round Robin(RR) scheduling algorithm is mainly designed for time-sharing systems. This algorithm is similar to FCFS scheduling, but in Round Robin(RR) scheduling, preemption is added which enables the system to switch between processes.

- A **fixed time is allotted to each process, called a quantum**, for execution.

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Round Robin (RR) Scheduling

1.Completion Time

- It is the time at which any process completes its execution.

2.Turn Around Time

- This mainly indicates the time Difference between completion time and arrival time. The formula to calculate the same is: Turn Around Time = Completion Time – Arrival Time

3.Waiting Time(W.T):

- It indicates the time Difference between turn around time and burst time.
- And is calculated as Waiting Time = Turn Around Time – Burst Time

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Round Robin (RR) Scheduling

How does the Round Robin Algorithm work?

1.All the processes are added to the ready queue.

2.At first, the **burst time of every process is compared to the time quantum of the CPU**.

3.If the burst time of the process is **less than or equal** to the time quantum in the round-robin scheduling algorithm, the process is executed to its burst time.

4.If the burst time of the process is **greater than** the time quantum, the process is executed up to the time quantum (TQ).

5.When the time quantum expires, it checks if the process is executed completely or not.
On completion, the process terminates.
Otherwise, it goes back again to the *ready state*.

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Round Robin (RR) Scheduling

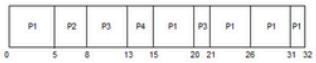
Example question :

Let us now cover an example for the same:

Quantum=5

PROCESS	BURST TIME
P1	21
P2	3
P3	6
P4	2

The GANTT chart for round robin scheduling will be,



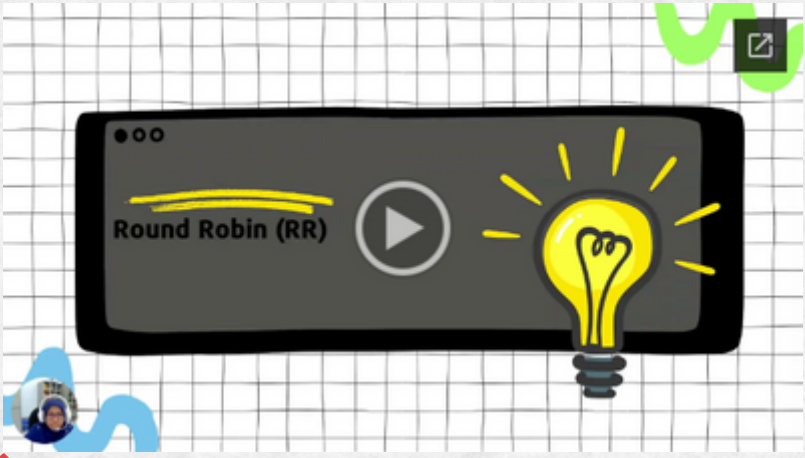
The average waiting time will be, 11 ms.

In the above diagram, arrival time is not mentioned so it is taken as 0 for all processes.

Note: If arrival time is not given for any problem statement then it is taken as 0 for all processes; if it is given then the problem can be solved accordingly.

How to get the answer : Refer Video below

CLICK HERE



SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Priority Scheduling

- In case of priority scheduling the priority is not always set as the inverse of the CPU burst time, rather it can be internally or externally set, but yes the scheduling is done on the basis of **priority of the process where the process which is most urgent is processed first, followed by the ones with lesser priority in order.**
- Processes with same priority are executed in FCFS manner.
- The priority of process, when internally defined, can be decided based on memory requirements, time limits ,number of open files, ratio of I/O burst to CPU burst etc.

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Priority Scheduling

Types of Priority Scheduling Algorithm

Priority scheduling can be of 2 types:

1.**Preemptive Priority Scheduling**: If the new process arrived at the ready queue has a higher priority than the currently running process, the CPU is preempted, which means the processing of the current process is stopped and the incoming new process with higher priority gets the CPU for its execution.

2.**Non-Preemptive Priority Scheduling**: In case of non-preemptive priority scheduling algorithm if a new process arrives with a higher priority than the current running process, the incoming process is put at the head of the ready queue, which means after the execution of the current process it will be processed.

SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Priority Scheduling

Example question :

Consider the below table fo processes with their respective CPU burst times and the priorities.

PROCESS	BURST TIME	PRIORITY
P1	21	2
P2	3	1
P3	6	4
P4	2	3

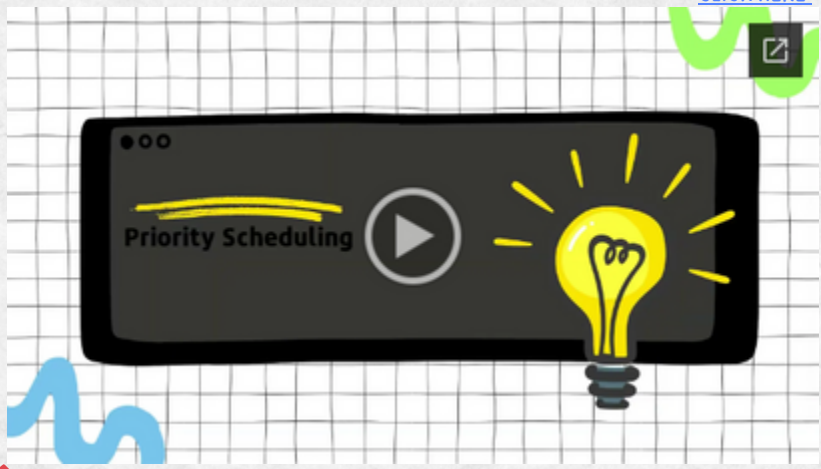
The GANTT chart for following processes based on Priority scheduling will be.

The average waiting time will be, (0 + 3 + 24 + 26)/4 = 13.25 ms

As you can see in the GANTT chart that the processes are given CPU time just on the basis of the priorities.

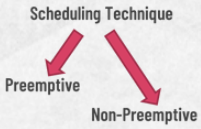
How to get the answer : Refer Video below

CLICK HERE



SCHEDULING PROCESS IS PERFORMED BY AN OPERATING SYSTEM

Scheduling Criteria



Turn-around Time

Waiting Time

Response Time

Burst Time

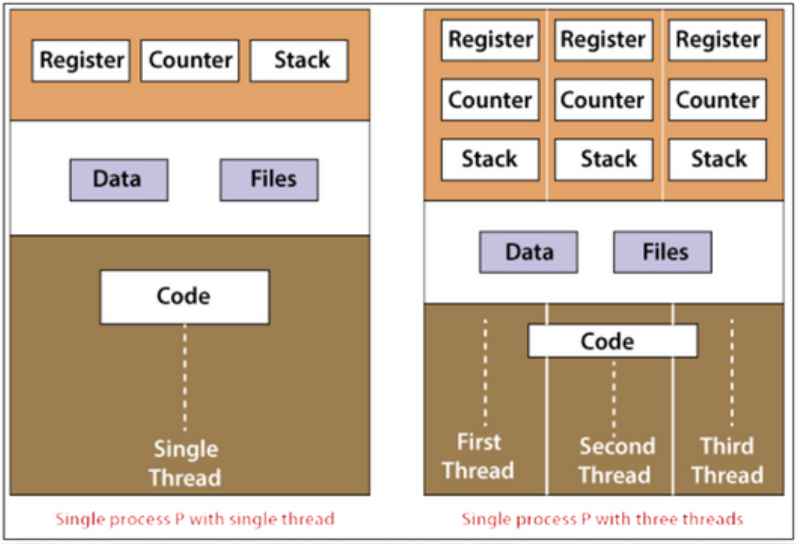
Completion Time

Exit Time

Arrival Time

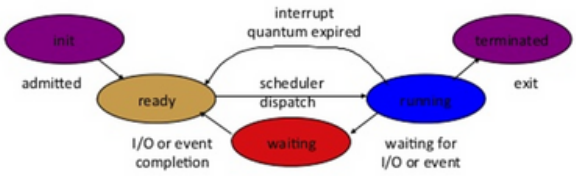
Throughput

THREAD

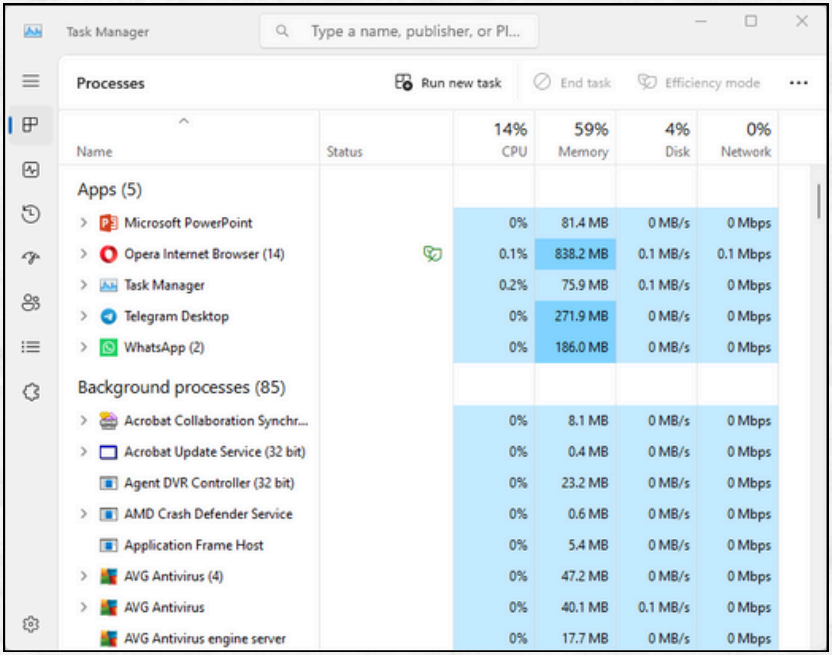


Windows - Thread States

- **Init**: The thread is being created.
- **Ready**: The thread is waiting to be assigned to a CPU.
- **Running**: The thread's instructions are being executed.
- **Waiting**: The thread is waiting for some event to occur.
- **Terminated**: The thread has finished execution.

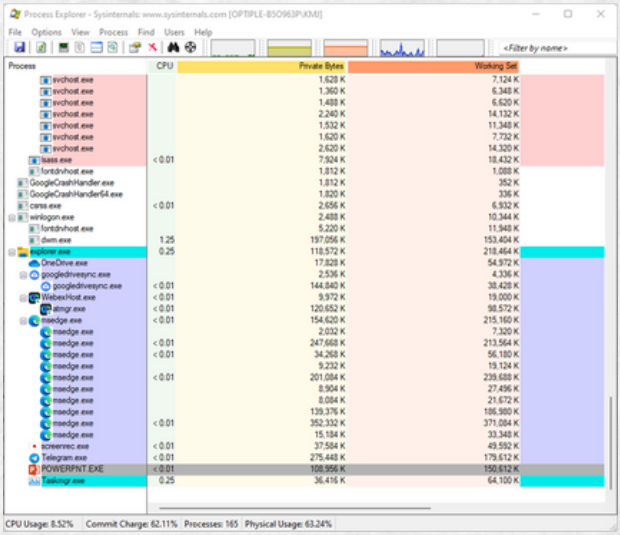


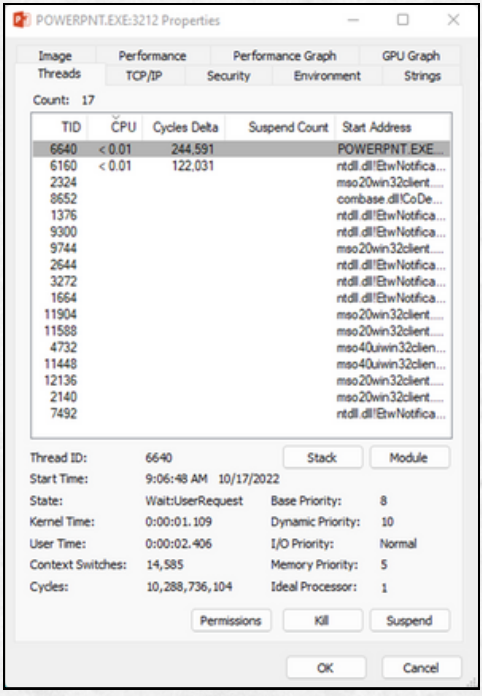
Task Manager and Process Explorer



Using Process Explorer software,
we can see thread (sub process) of process happening in memory.

Task Manager and Process Explorer

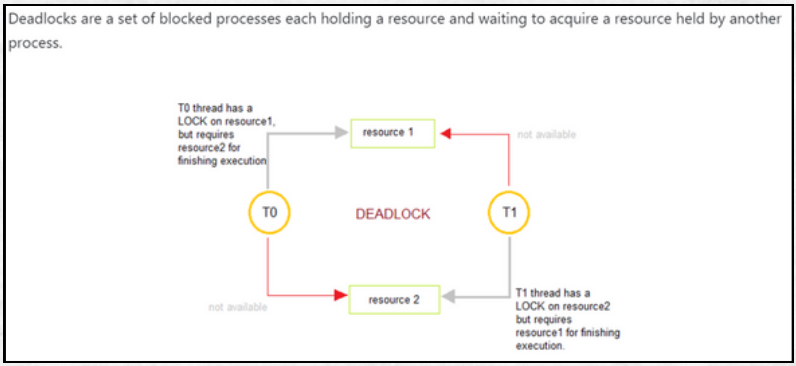




DEADLOCK

An **operating system deadlock** refers to a situation where **two or more processes are unable to proceed because each is waiting for the other to release a resource,** creating a cyclic dependency. This results in a stalemate where none of the processes can move forward, potentially leading to system instability or unresponsiveness.

Deadlocks typically occur in systems with limited resources that are being contended for by multiple processes, and they can be challenging to detect and resolve.

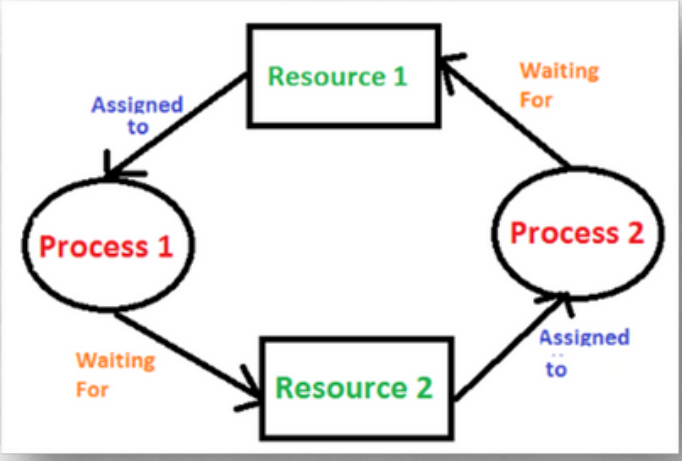


In the above figure, process T0 has resource1, it requires resource2 in order to finish its execution. Similarly, process T1 has resource2 and it also needs to acquire resource1 to finish its execution. In this way, T0 and T1 are in a deadlock because each of them needs the resource of others to complete their execution but neither of them is willing to give up their resources.

DEADLOCK

Example :

Process-1 requests the printer, gets it
Process-2 requests the tape unit, gets it
Process-1 requests the tape unit, waits
Process-2 are requests the printer, waits



In general, a process must request a resource before using it and it must release the resource after using it. And any process can request as many resources as it requires in order to complete its designated task. And there is a condition that the number of resources requested may not exceed the total number of resources available in the system.

DEADLOCK

Basically in the Normal mode of Operation utilization of resources by a process is in the following sequence:

1. Request:
Firstly, the process requests the resource. In a case, if the request cannot be granted immediately (e.g: resource is being used by any other process), then the requesting process must wait until it can acquire the resource.

2. Use:
The process can operate on the resource (e.g: if the resource is a printer then in that case process can print on the printer).

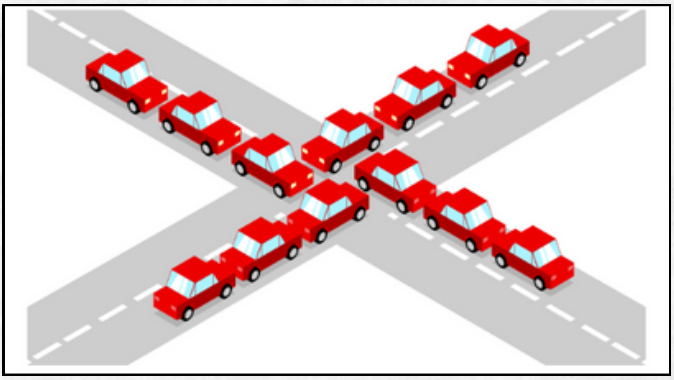
3. Release:
The process releases the resource.

DEADLOCK

Deadlock characteristic

Deadlock can arise if the following 4 conditions hold simultaneously (necessary conditions)

All of these 4 must happen simultaneously for a deadlock to occur:



Mutual Exclusion: One or more than one resource are non-shareable (Only one process can use at a time)

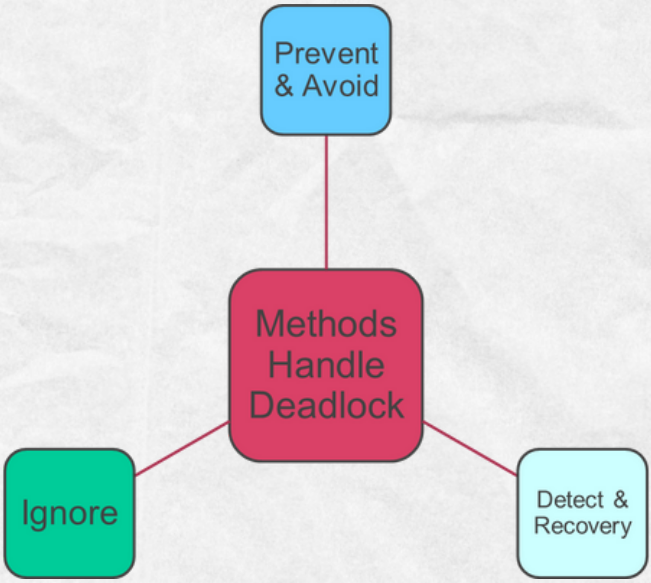
Hold and Wait: A process is holding at least one resource and waiting for resources.

No Preemption: A resource cannot be taken from a process unless the process releases the resource.

Circular Wait: A set of processes are waiting for each other in circular form.

Methods For Handling Deadlock

- Not let the system into a deadlock state **Prevent**
- Avoidance is kind of futuristic in nature **Assumption**
  (Prepare all the resources needed.



- If deadlock is very rare, then let it happen and reboot the system.
- This is the approach that both Windows and UNIX take.

- Let deadlock occur, then do preemption to handle it once occurred.

EXERCISE TOPIC 2

1. New process is 7 KB, determine memory location based on first fit, best fit and worst fit.

Click here to get the answer

2. Given the schedule below:

Process	Burst Time
P1	9
P2	8
P3	3
P4	8

Click here to get the answer

A.Draw the Gantt chart using **FCFS** algorithm.
B.Calculate the average waiting time (FCFS).
C.Draw the Gantt chart using **SJF** algorithm.
D.Calculate the average waiting time (SJF).

EXERCISE TOPIC 2

3. Given the schedule below:

Process	Burst Time
P1	6
P2	4
P3	5

Click here to get the answer

A. Draw the Gantt chart using **Round Robin (RR)** quantum=2 algorithm.

B. Calculate the average waiting time (RR).

EXERCISE TOPIC 2

4. Given the schedule below:

Process	Burst Time	Priority
P1	10	4
P2	1	2
P3	2	3
P4	1	5
P5	5	1

A.Draw the Gantt chart using **Priority scheduling** algorithm.
B.Calculate the average waiting time (Priority).

TOPIC 3 :

FILE MANAGEMENT

FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

File management is defined as the **process of manipulating files in computer system**, it management includes the process of **creating, modifying and deleting the files.**

A file is a collection of related information that is recorded on secondary storage. **File** is a collection of logically related entities.

Collection of files is a **file directory**. The directory contains information about the files, including attributes, location and ownership.

File system is a method and data structure that the operating system controls how data is stored and retrieved.

File Operations: This includes creating, reading, writing, updating, and deleting files. These operations are crucial for managing data within the system.

Directory Structure: Directories (folders) provide a way to organize and group related files together. They help users navigate through the file system efficiently.

FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

File Attributes: Files have associated attributes such as name, size, type, location, permissions, and timestamps. These attributes help in managing and securing files.

Access Control: Operating systems implement access control mechanisms to ensure that only authorized users can access and modify files. This helps maintain data security and integrity.

Effective file management is essential for organizing data, ensuring data integrity, and optimizing storage resources within an operating system.

FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE DIRECTORY

Information contained in a device directory

Operation performed on directory

Advantages of maintaining directories

Efficiency: A file can be located more quickly.

Naming: It becomes convenient for users as two users can have same name for different files or may have different name for same file.

Grouping: Logical grouping of files can be done by properties e.g. all java programs, all games etc.

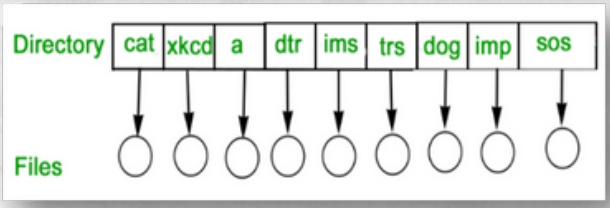
FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE DIRECTORY

SINGLE-LEVEL DIRECTORY

In this a single directory is maintained for all the users.

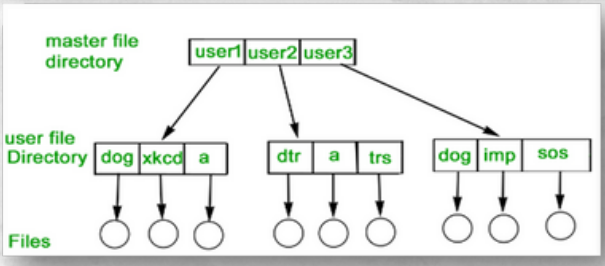
- **Naming problem:** Users cannot have same name for two files.
- **Grouping problem:** Users cannot group files according to their need.



TWO-LEVEL DIRECTORY

In this separate directories for each user is maintained.

- Path name:Due to two levels there is a path name for every file to locate that file.
- Now,we can have same file name for different user.
- Searching is efficient in this method.

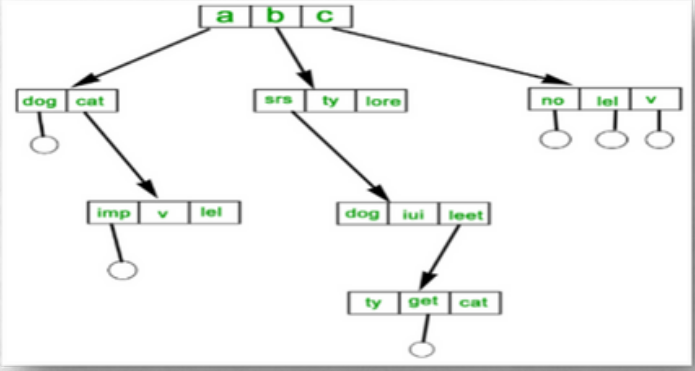


FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE DIRECTORY

TREE-STRUCTURED DIRECTORY :

Directory is maintained in the form of a tree. Searching is efficient and also there is grouping capability. We have absolute or relative path name for a file.

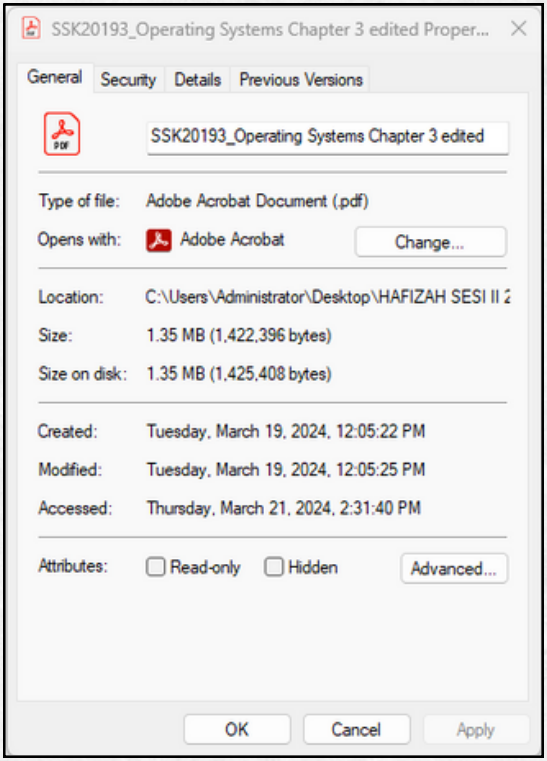


FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE SYSTEM

Attributes of a file system

a. File name
b. Rights (ownership)
c. Date & Time
d. Size
e. Access protection control level
f. Type
g. Location



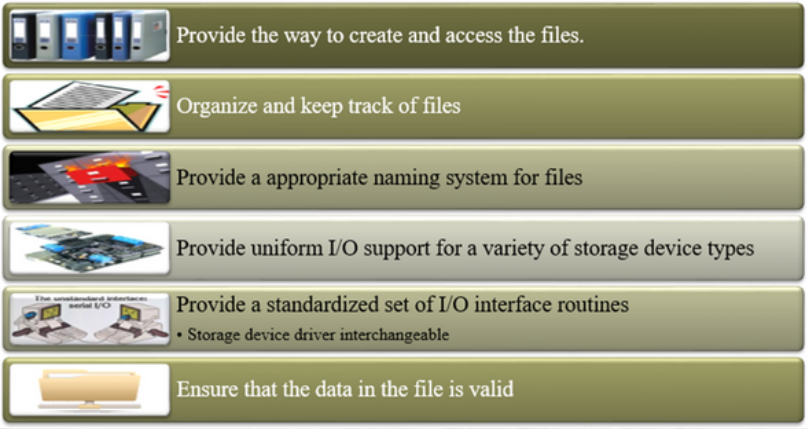
FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE SYSTEM

•File systems are the **structures behind how your computer stores and organizes data**.

•Everything you install, save, edit or create on your computer comprises the trillions of bits of data a file system stores, organizes and allows access to on a daily basis for computer users.

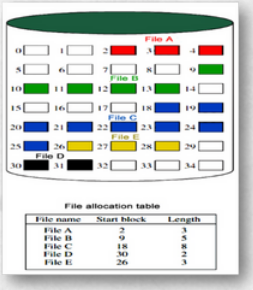
•Hard drives, CD-ROMs, DVD-ROMs and servers are all types of file systems that allow you access to data.



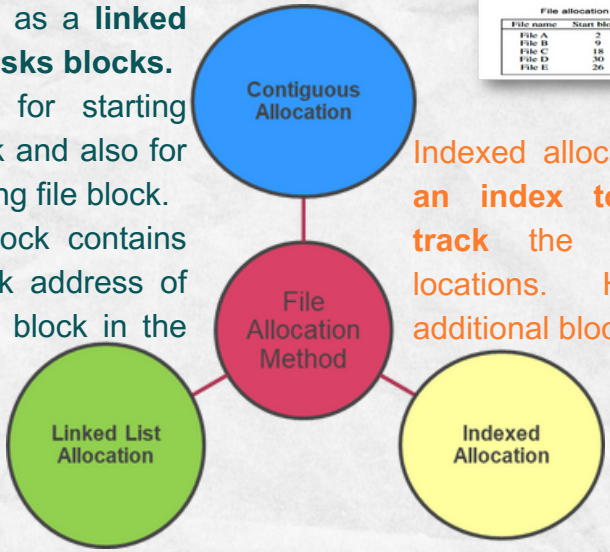
FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE ORGANIZATION TECHNIQUE

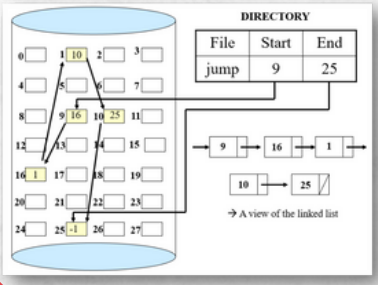
Contiguous allocation is one of the most used methods for allocation. Allocate the block in the **contiguous physical block**.

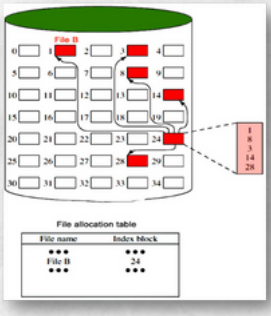


•Treated as a **linked list of disks blocks.**
•Pointer for starting file block and also for the ending file block.
•Data block contains the block address of the next block in the file



Indexed allocation **uses an index to directly track** the file block locations. Have an additional block.



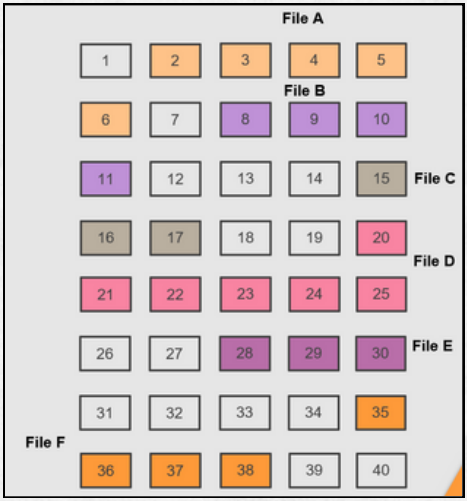


FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE ORGANIZATION TECHNIQUE

Example for Contiguous Allocation :

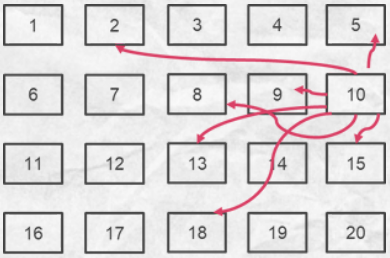
File	Start	Length
A	2	5
B	8	4
C	15	3
D	20	6
E	28	3
F	35	4



Example for Index Allocation :

Assume file “test” is allocated in blocks in the following order : **2,5,8,9,13,15,18**

Show the blocks allocation assuming Index allocation with **index block = 10**



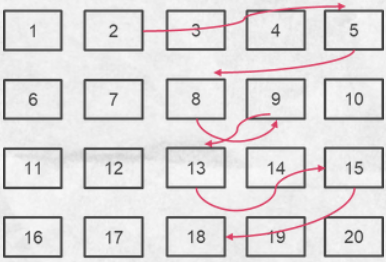
FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

FILE ORGANIZATION TECHNIQUE

Example for Linked List Allocation :

Assume file “test” is allocated in blocks in the following order : **2,5,8,9,13,15,18**

Show the blocks allocation assuming linked allocation



COMPARISON OF FILE ALLOCATION METHOD

File Allocation Method	Advantages	Disadvantages
Contiguous File Allocation	➢ Excellent performance for sequential accesses. ➢ Simple to calculate random addresses.	➢ External fragmentation. ➢ Number of disk space needed for a file. ➢ Problems with files that grow. ➢ Space is wasted.
Linked List Allocation	➢ No external fragmentation. ➢ File can be easily grown with no limit.	➢ Cannot calculate random addresses without reading previous blocks. ➢ Sequential bandwidth may not be good.
Indexed File Allocation	➢ No external fragmentation. ➢ Support random access	➢ Large overhead for meta-data ; - waste space for unneeded pointers. ➢ Inefficient for small files.

FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

PROTECTION OF FILE IN OPERATING SYSTEM

OBJECTIVE

Keep safe the data of the user from the improper access to the system

ACCESS CONTROL

Access-Control List (ACL) which specify the names of the users and the types of access associate with each of the user.

Owner –
Owner is the user who has created the file.

Group –
A group is a set of members who has similar needs and they are sharing the same file.

Universe –
In the system, all other users are under the category called universe.

- The files which have direct access of the any user have the need of protection.
- The files which are not accessible to other users doesn't require any kind of protection.
- It provide the facility of the controlled access by just limiting the types of access to the file.
- Access can be given or not given to any user depends on several factors.

FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

PROTECTION OF FILE IN OPERATING SYSTEM

SIX TYPE OF ACCESS IN FILE PROTECTION AS BELOW :

Read - Reading from a file
Membaca dari fail.

Write - Writing or rewriting the file
Menulis atau menulis semula fail.

Execute - Loading the file and after loading the execution process starts.
Memuatkan fail dan selepas memuatkan proses pelaksanaan bermula.

Append - Writing the new information to the already existing file, editing must be end at the end of the existing file.
Menulis maklumat baru ke dalam fail yang sudah ada, penyuntingan mesti berakhir di hujung fail sedia ada

Delete - Deleting the file which is of no use and using its space for the another data.
Menghapuskan fail yang tidak digunakan dan menggunakan ruangnya untuk data yang lain.

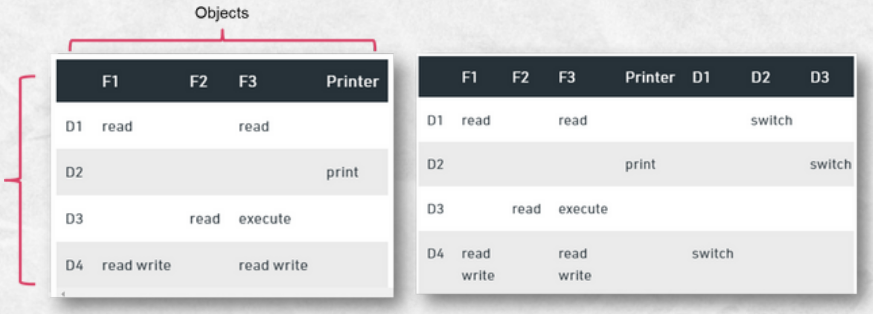
List - List the name and attributes of the file.
Senaraikan nama dan atribut fail

FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

PROTECTION OF FILE IN OPERATING SYSTEM

ACCESS CONTROL MATRIX

- Access Matrix is a **security model** of protection state in computer system.
- It is represented as a matrix.
- Access matrix is used to **define the rights of each process executing** in the domain with respect to each object.
- The rows of matrix represent domains and columns represent objects.
- Each cell of matrix represents **set of access rights** which are given to the processes of domain



FILE MANAGEMENT SYSTEM IN OPERATING SYSTEM

PROTECTION OF FILE IN OPERATING SYSTEM

ACCESS CONTROL MATRIX EXAMPLE

	Silberchatz	Galvin	Gagne	Stallings
File 1	r w x	r - -	r - -	- - -
File 2	r - -	r w x	r - -	r w x
File 3	r - -	- - -	r w x	r w x
File 4	- - -	r - -	r - -	r - -

Silberchatz can read, write and execute for File 1.
Silberchatz can only read File 2 and File 3.
Silberchatz cannot do anything on File 4.

Galvin can read, write and execute for File 2.
Galvin can only read File 1 and File 4.
Galvin cannot do anything on File 3.

EXERCISE TOPIC 3

1. Suppose you have a disk with 100 blocks and you want to store files on it using contiguous allocation. The File Allocation Table (FAT) contains the following information:

   File A: Size 40 blocks, starting at block 20.
   File B: Size 25 blocks, starting at block 60.
   File C: Size 15 blocks, starting at block 3.
   File D: Size 10 blocks, starting at block 90.

   Draw the disk layout after allocating space for these files using **contiguous allocation**.

2. Assume file “os.pdf” is allocated in blocks in the following order : 4,8,10,11,2,3

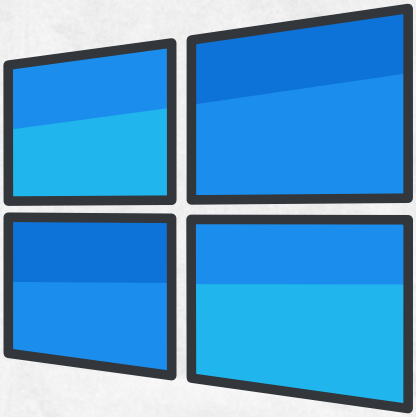
   Show the blocks allocation assuming **linked allocation**

3. Assume file “os.pdf” is allocated in blocks in the following order : 4,5,6,7,2 and file “dbms.doc” is allocated in blocks in following order : 9,12,13,14,11

   Show the blocks allocation assuming **Index allocation** with index block for os.pdf = 8 and dbmd.doc=10

TOPIC 4 :

WINDOWS OPERATING SYSTEM



WINDOWS OPERATING SYSTEM

Windows operating system is a **computer program that manages all computer resources and provides services to applications that run on top of it**. This operating system was developed by Microsoft and released in 1985 under the name Windows 1.0.

Microsoft created Windows, a graphical operating system. It lets users view and save files, run applications, play games, watch videos, as well as connect to the internet. It was made available for both personal and professional use.

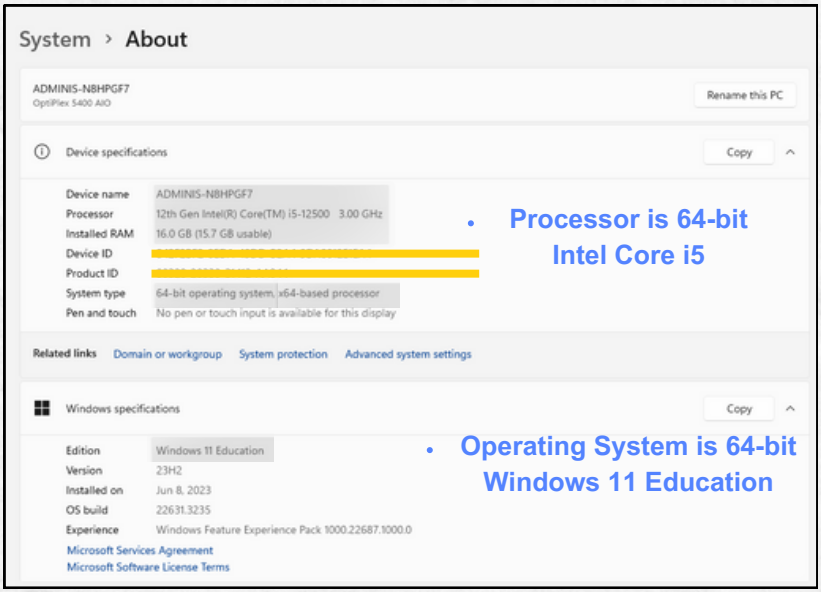
WINDOWS (32 BITS) AND WINDOWS (64 BITS)

Check your computer operating system, 32-bit or 64-bit ?

Start > Settings > System > About > Device specifications > System type.

To install a 64-bit version of Windows, you need a CPU that's capable of running a 64-bit version of Windows. The benefits of using a 64-bit operating system are most apparent when you have a large amount of Random Access Memory (RAM) installed on your computer, typically 4 GB of RAM or more.

In such cases, because a 64-bit operating system can handle large amounts of memory more efficiently than a 32-bit operating system, a 64-bit system can be more responsive when running several programs at the same time and switching between them frequently.



During Windows Installation:

a. On Windows Setup, you will click **Upgrade** button if you want to keep all files in current hard disk.

b. On Windows Setup, custom, you will click **Format** button if you want to clean all files in current hard disk.

c. On Windows Setup, custom, you just select unallocated space to continue install.

WINDOWS OPERATING SYSTEM

If you have problem on your Windows Operating System, you can choose **Reset PC** option first.

Setting > System > Recovery > Reset PC

If you are using Hard Disk and want to change to SSD, you may use cloning technique.
It will clone Windows and files.

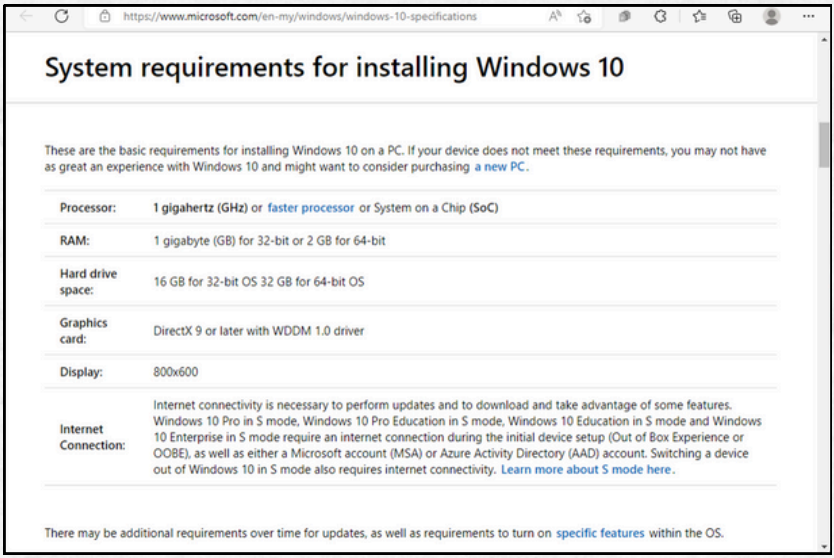
Source : (2) Ganti Harddisk Laptop Jadi SSD: Tutorial Step-by-Step, Feat. Orico External Drive Enclosure - YouTube

Click to watch the video

WINDOWS OPERATING SYSTEM

Note: Before you install Windows 10,
check to make sure your PC meets the system requirements for Windows 10.

Click to check your PC system requirement



WINDOWS OPERATING SYSTEM

INSTALL WINDOWS ON A COMPUTER USING :

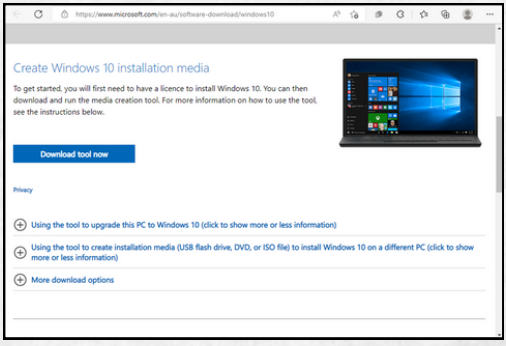
A. NEW METHOD
B. MULTIBOOT METHOD

A. New method

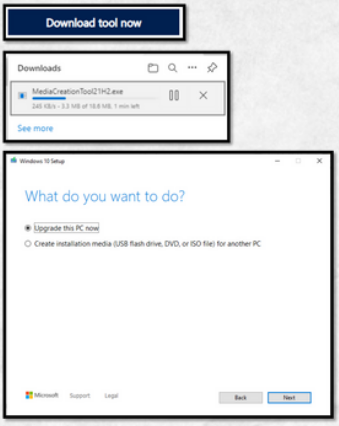
1. Upgrade

Video source :
Cara mudah UPDATE kepada Windows 11 (FREE je!) - YouTube

Click to watch the video



Source : Download Windows 10 (microsoft.com)



2. USB Flash Drive

Video source :
Cara format komputer mudah - 5 minit je saya tunjuk - YouTube

Click to watch the video

3. Virtual Machine

Video source :
How to install Windows 10 in VirtualBox 2022 - YouTube

Click to watch the video

B. Multiboot

Install 2 operating systems in the same PC :

- Windows 10 and Linux (such as Ubuntu)
- Windows 8 and Windows 10
- Windows 10 and Windows 11

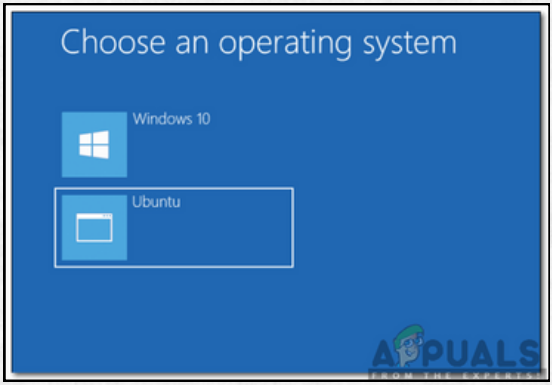
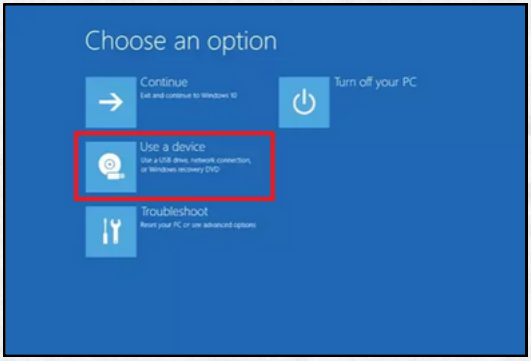
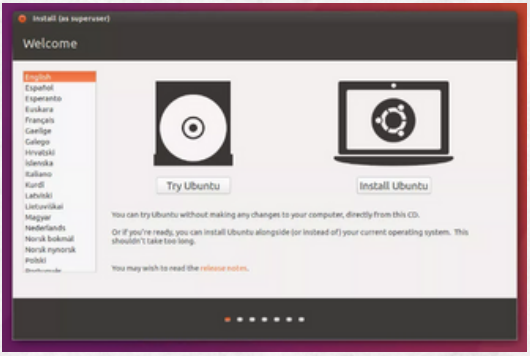
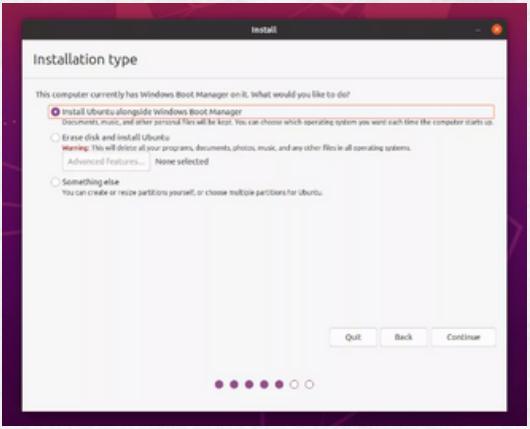


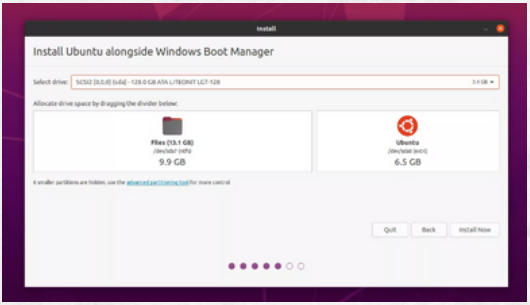
Image source :
How to Create a Dual Boot for Windows and Ubuntu - Appuals.com

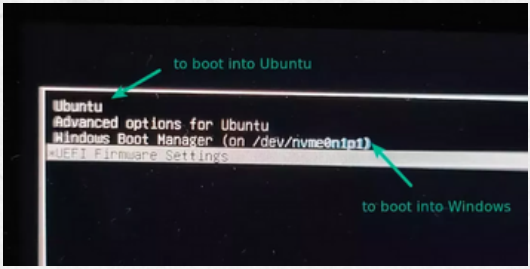


WINDOWS OPERATING SYSTEM









Source : Dual Booting: Windows and Ubuntu | TechSpot

The general simplistic procedure for **dual booting** then is as follows:

1. Install the first OS.
It is highly recommended to start with Windows, since grub can easily recognize Windows, while the Windows Boot Manager is optimized to work just for Windows.

2. Partition the disk.
Split up your disk to provide storage space for each OS separately.

3. Install the second OS.
In this case, that would be a Linux distribution such as Ubuntu.

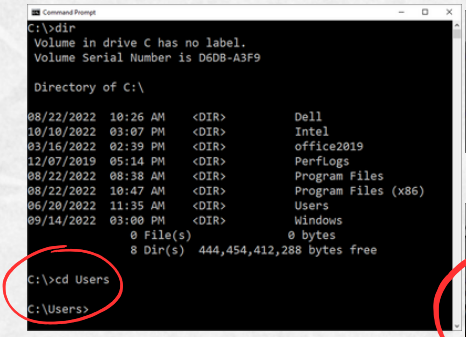
Source : Dual Booting: Windows and Ubuntu | TechSpot

Implement instructions in Windows:

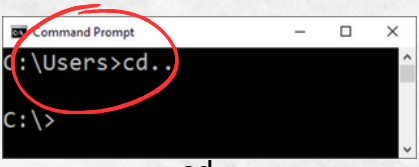
a. cd
b. cls
c. copy
d. del
e. dir
f. mkdir
g. move

a. cd
Change directory

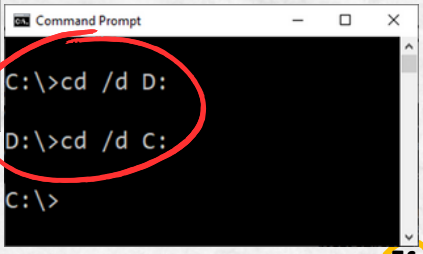
cd..	is for change to parent directory
cd [Path]	is for change to specific folder
cd /d [Path]	is for change to other drive



cd [Path]

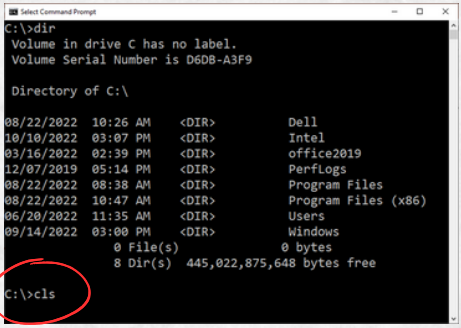


cd ..

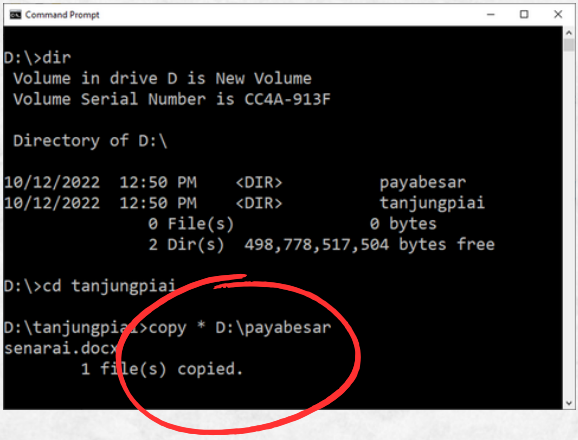


cd /d [Path]

b. cls
Clear screen

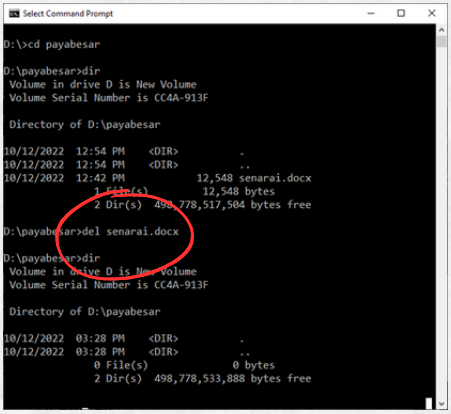


c. copy
Copy files from folder to folder

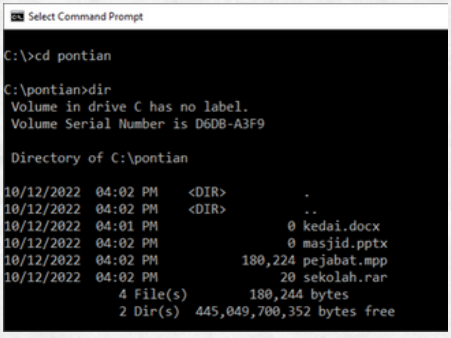


d. del
Delete

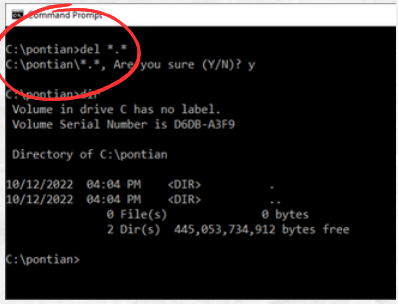
del filename is for deleting specific file
dir *.* is for deleting everything



- **Delete 1 file :**
  > del filename

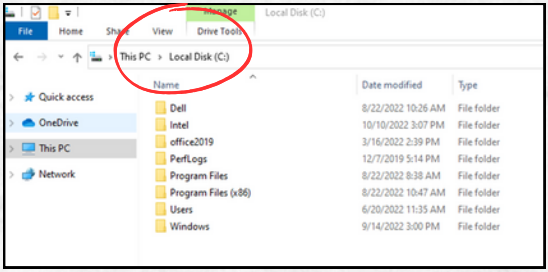


- **Delete more than 1 file :**
  > del *.*

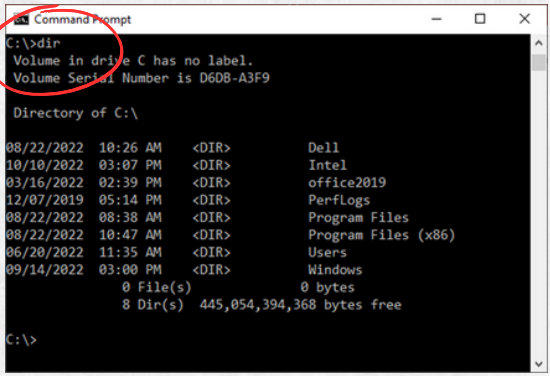


e. dir
Directory

dir	**is for display a list of files and folders**
dir /a	**is for show hidden files and folders**
dir /a:d	**is for show folders**

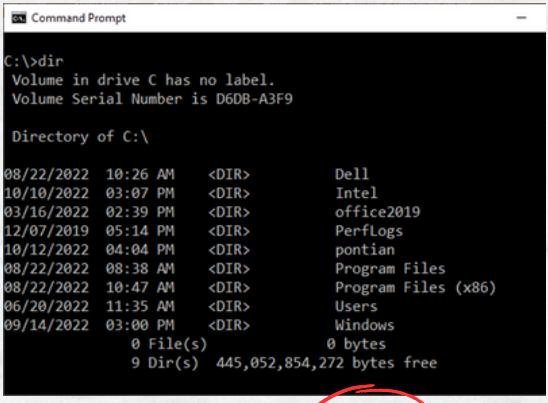


8 folder



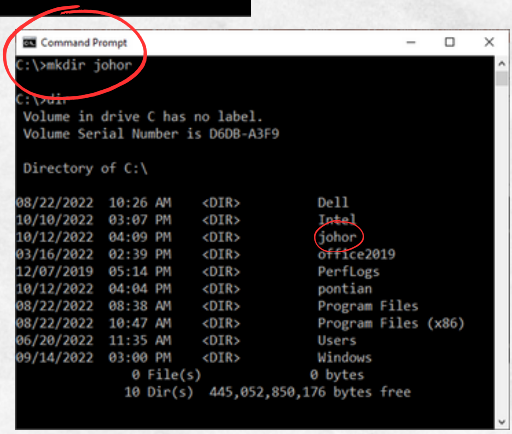
8 dir

f. mkdir or md
Make Directory

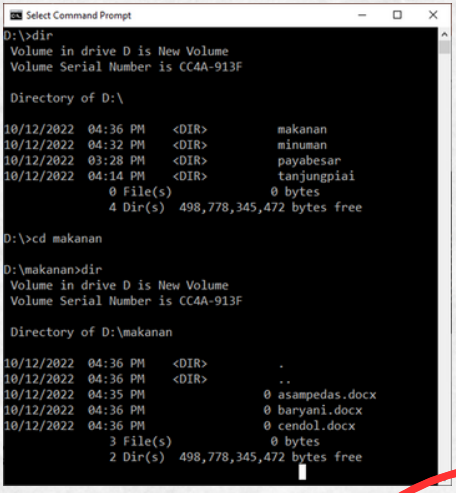


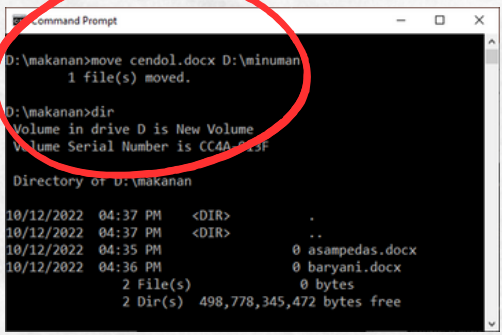
- 9 dir

- create dir johor
- total dir is 10



g. move
Move file and folders

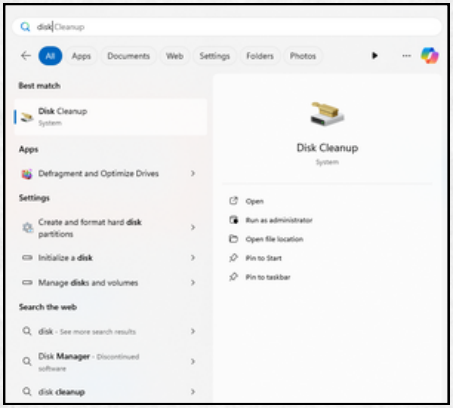




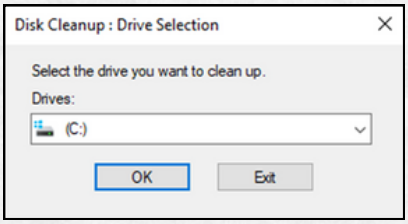
Utilities program that compatible with Windows

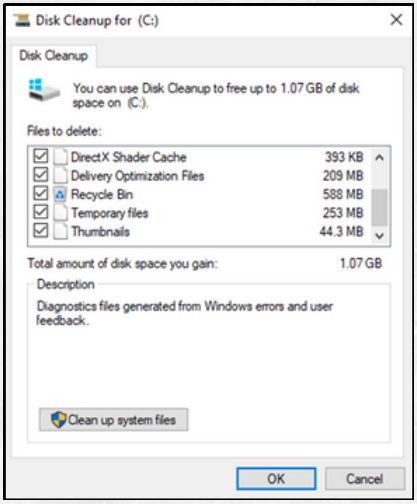
a. Disk cleanup

to free up space so you can keep your PC up to date and running smoothly



Search >
Disk Clean Up





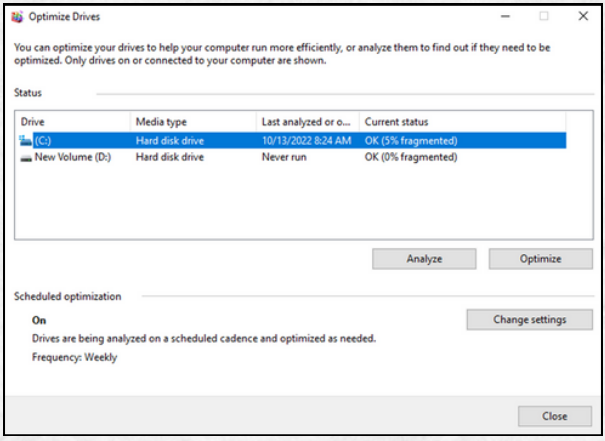
Utilities program that compatible with Windows

b. Defragment and Optimize Drives

Rearranges fragmented data, so your disks and drives can work more efficiently

- To determine if the disk needs to be defragmented or not, click **Analyze disk**.
- Once Windows is finished analyzing the disk, you can check the percentage of fragmentation on the disk.
- If the number is above 10%, you should defragment the disk.
- Source : https://support.microsoft.com/

Search >
Defragment and optimize drives

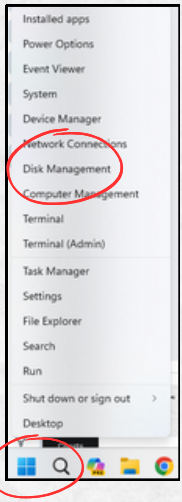


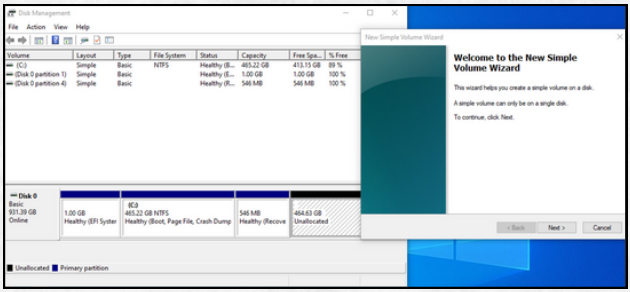
Does C: need to be optimize ?

Utilities program that compatible with Windows

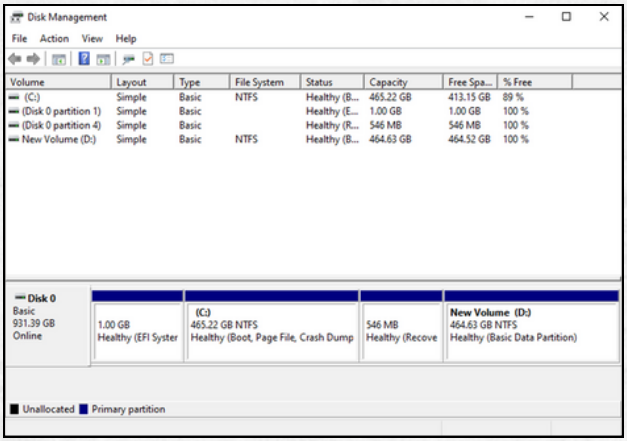
c. Disk Management

Create and format hard disk partition



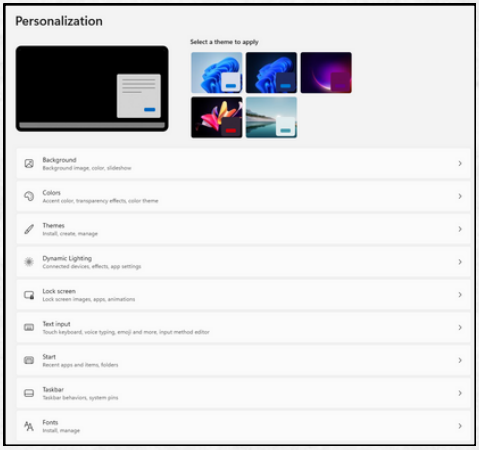


Right click on Windows start up



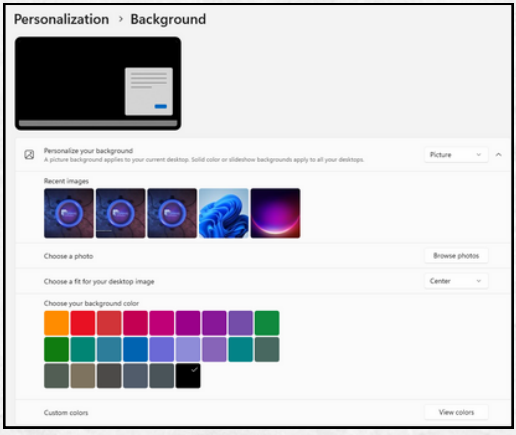
Personalization and Themes that available in Windows

a. Change background
b. Change themes
c. Customize lock screen



Right-click on the desktop screen > Personalize

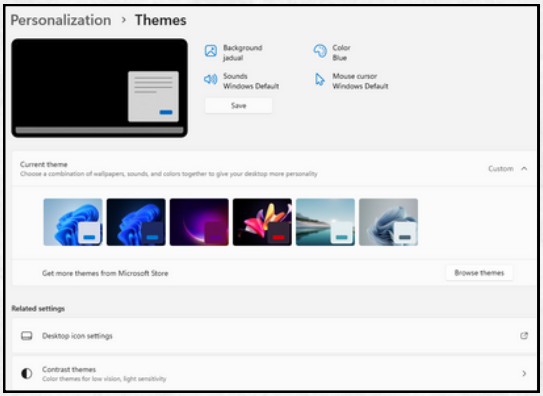
a. Change background



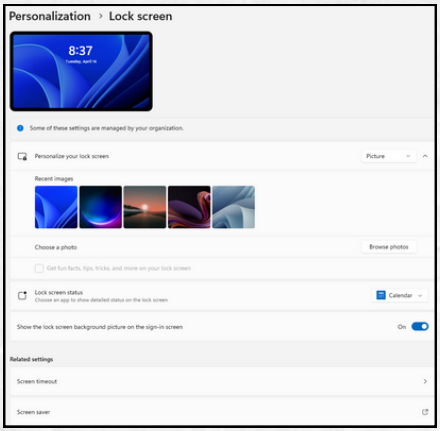
Personalization and Themes that available in Windows

a. Change background
b. Change themes
c. Customize lock screen

b. Change theme



c. Customize lock screen



EXERCISE TOPIC 4

INSTRUCTION : ANSWER ALL THE QUESTIONS

1. Which section in Windows Settings allows you to change the desktop background and apply themes?
   a) Display
   b) Personalization
   c) System
   d) Devices

2. What is the file format commonly used for desktop background images in Windows?
   a) JPG
   b) GIF
   c) PNG
   d) BMP

3. Which term refers to a collection of desktop backgrounds, accent colors, sounds, and mouse cursors bundled together in Windows?
   a) Pack
   b) Bundle
   c) Theme
   d) Set

EXERCISE TOPIC 4

4. Which tool in Windows Settings enables you to create your own custom themes by combining different background images, colors, and sounds?
   a) Theme Builder
   b) Customizer
   c) Creator Studio
   d) Theme Editor

5. What is the primary purpose of the "Desktop Icon Settings" section in Windows?
   a) To adjust the size and spacing of desktop icons
   b) To change the desktop wallpaper
   c) To manage desktop shortcuts
   d) To customize the taskbar appearance

6. Which shortcut key combination in Windows allows you to quickly open the Personalization section in Windows Settings?
   a) Win + P
   b) Win + S
   c) Win + I
   d) Win + D

EXERCISE TOPIC 4

7. Which command is used to display the current directory in Command Prompt?
   a) dir
   b) cd
   c) cls
   d) pwd

8. Which command is used to create a new directory in Command Prompt?
   a) mkdir
   b) rd
   c) rmdir
   d) dir

9. What is the syntax for copying a file named "file1.txt" from the current directory to a directory named "backup"?
   a) copy file1.txt backup\
   b) copy file1.txt C:\backup
   c) copy file1.txt backup
   d) copy backup file1.txt

EXERCISE TOPIC 4

10. Which command is used to delete a file in Command Prompt?
    a) rm
    b) delete
    c) del
    d) erase

Reference

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Thank You