2C30319

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12/01/24

Internals - I

Module - 1

1.a) Operating system is a system software that acts as an intermediatory between an user and the hardware resources of a computer.

Services of operating system:

user and other system programs

GUI	Batch	Command-line

User Interface

System calls

Protection	Resource Allocation	Communication	I/O operations
Accounting	Error detection	Program execution	File System manipulation

User Interface

Operating system services

Operating System

Hardware

With respect to user, services are:

1. User Interface: • It is a means to issue the commands to system
   - It is of three types:
     1. Graphical User Interface (GUI)
     2. Batch command system
     3. Command - line interface

2. Program execution:
   - The OS have to load the programs into RAM, run it and execute it either normally or abnormally

3. I/o Operations:

- The OS is responsible for data transfer to and from the I/o devices.
- In some cases, the OS gives special function to some particular I/o devices like keyboard, terminal, file and partitions.

4. File system manipulation:

- The OS is responsible for file operations which includes creating or deleting a file, listing the contents of a file, read, write, open or close, changing file permissions are set and retrieved by OS.

5. Communication:

- The OS follows inter-process communications in special cases like -
  between processes running on same processor and
  between processes running on different processor.
- To implement these, it can ~~&~~ be done through message passing and shared memory models.

6. Error detection:

- Both the hardware and software sets contains errors, which must be detected and decoded by the O.S.
- The errors can be in CPU, memory hardware, I/O devices and user programs as well

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With respect to efficient working of OS, the services are:

7. Protection and Security:
- Protection involves ensuring the access of system resources of processes.
- Security is achieved by giving a means of password.

8. Accounting:
- There are services in O.S which keeps a track of system usage, memory space, disk space either in chart form or statistical format to represent

9. Resource Allocation:
- There are services in O.S which makes the resources like CPU, main memory, Storage Space and I/o devices by allocating with multiple users and multiple jobs at the same time.

1.b) i)	Multiprocessor systems:	Clustered systems
Information model	Shared memory model	Message passing model
Fault tolerance	It ~~has~~ is more prone to single point of failures	Greater fault tolerance
Communication	High bandwidth, low-latency communication	Low bandwith due to network connectivity.

Q 1b)i)

Synchronisation	Involves inter process communication mechanism	Involves synchronization mechanisms like mutexes and semaphores.
Cost	It is expensive due to tightly integrated systems.	It is cost effective due to commidity hardware usage.
Performance	Potentially higher performance due to tightly coupled systems.	Relatively lower performance due to ~~shared variable~~ network connectivity.

eg

1b) ii)	Multi-programming :	Multitasking :
1.	It is a type of programming which allows multiple programs to utilise CPU simultaneously	1. It is a supplementary of multiprogramming which allows for user interaction.
2.	Mechanism is based on context switching.	2. Mechanism is based on time-sharing switching
3.	It is useful in reducing the CPU's idle time and increasing throughput	3. It is useful in running the multiple processes at the same time to increase CPU utilization and throughput.

1b)ii)

4. Time consuming.	4. Execution is faster
5. CPU switches between the multiple programs or processes.	5. CPU switches between the processes of various programs.

→ eg.

Module - 2:

3. a) Inter process communication is a mechanism which is responsible for two process to co-operate and synchronize their data with each other.

There are two types of processes:

→ Independent process:
Process which cannot affect other process or cannot be affected by others

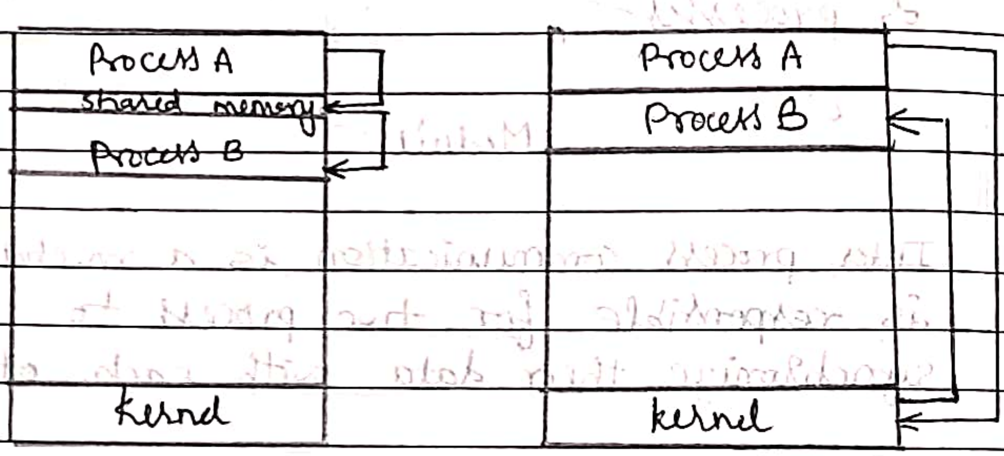
→ Co-operating process:
Process which can be affected by other process or affects the other process

→ Co-operations are allowed between two process for the following reasons.

1. Information Sharing
2. Computation speedup
3. Modularity.
4. Convience

In order to implement the co-operating models, it can be done through models like –

1. Shared memory
2. Message passing.



1. Shared memory 2. Message passing

1. Shared memory model:

- It is difficult to implement.
- But the message is communicated faster relatively due to less system calls.
- System calls is used for only creating the shared memory.
- It is appropriate for larger amounts of data to communicate.
- It is expensive too.

Based on System calls, buffering is classified into two types:

1. Bounded Buffer : The memory size is limited
2. Unbounded Buffer : The memory size can vary

2. Message passing,

- It is easier and simpler to implement.
- It is appropriate for small amounts of data.
- It is cost effective model.
- System calls are generated for each read and write operations which makes the transfer of message slower.

- It is based on three structures:

1. Direct or Indirect communication:

a) In direct communication, the sender and receiver names are known explicitly.
Example: send (A, message);
Receive (B, message);

b) In-direct communication:
The names are not known, must use the mailbox
Example: Send (A, message);
receive (A, message);
→ Sends the message to shared mailbox A and receives the message from mailbox A.

2. Synchronous or Asynchronous:
The communication between the receiver and the sender can be in blocking or non-blocking state.
a) Synchronous send (Blocking)
b) Asynchronous send (Non-Blocking)
c) Synchronous receive (Blocking) and vice-versa.

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3. Buffering:

a) Zero capacity : The buffer does not exist where sender blocks until receiver accept messages.

b) Bounded Capacity : The buffer is fixed and the sender blocks receiver.

c) Unbounded capacity : The sender never blocks the receiver.

3. b) Multi-threading models:

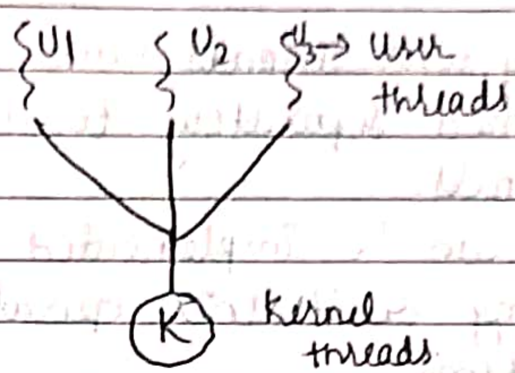
- In a system, there are two types of ~~m~~ threads, namely:
  a) User threads
  b) Kernel threads

- User threads are the threads created by the programmer who puts into programs.
- It can be supported without kernel.

- Kernel threads are the threads which exist under kernel in the O.S
- It is supported with kernel.
- In modern OS, kernel threads are supported to allow kernel to perform multiple tasks at a time.

- User threads needs to be mapped with kernel threads ~~b~~ in special cases, which can be done through models like :

1. Many to one :



★ Many user threads are connected to one kernel thread.

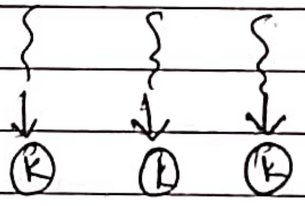
★ The number of user threads cannot run parallel on multiprocessor due to one kernel thread.

★ Only one user thread can access kernel thread at a time and communicate.

★ Blocking system calls by one of the user threads causes the other user threads to stop getting executed.

★ It can be implemented in Green Model of Solaris

2. One to one :



★ Every user thread is assigned to separate kernel thread.

★ It overcomes the blocking system calls problem from above model.

★ Processes can be split into multiple process and slow down the system

★ It can be implemented in Linux and Windows.

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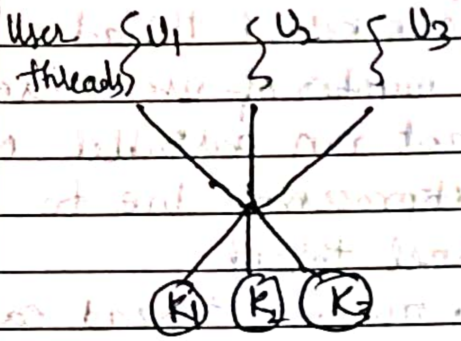
3. Many to many :



★ Many user threads have been assigned separately to many other kernels.

★ It can be implemented by using tru64 Unix operating systems.

★ It is a faster process relatively.

Quiz

1. a) fork

2. a) when process is scheduled to run after some execution.

3. b) communication between two ~~threads of~~ process.

4. b) Program counter.

5. b) 5