



FUNDAMENTALS OF OPERATING SYSTEM

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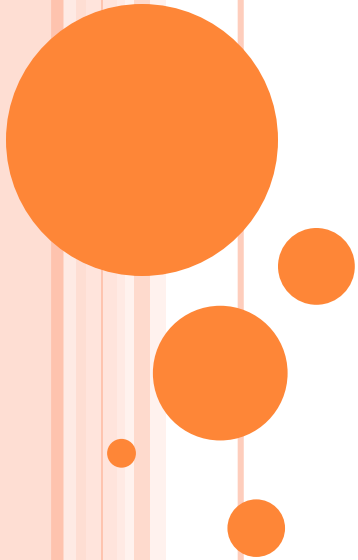
Unit – 1

Introduction of Operating Systems, File Systems and Management



What is Operating System ?.

- *The software layer, nearest to hardware, which facilitates launching all the software utilities and applications is called the operating system.*
- *An Operating System is a program that acts as an intermediary between the user of a computer and the computer hardware.*



PURPOSE OF OS

- To provide an environment in which user can execute programs in a convenient and efficient manner.

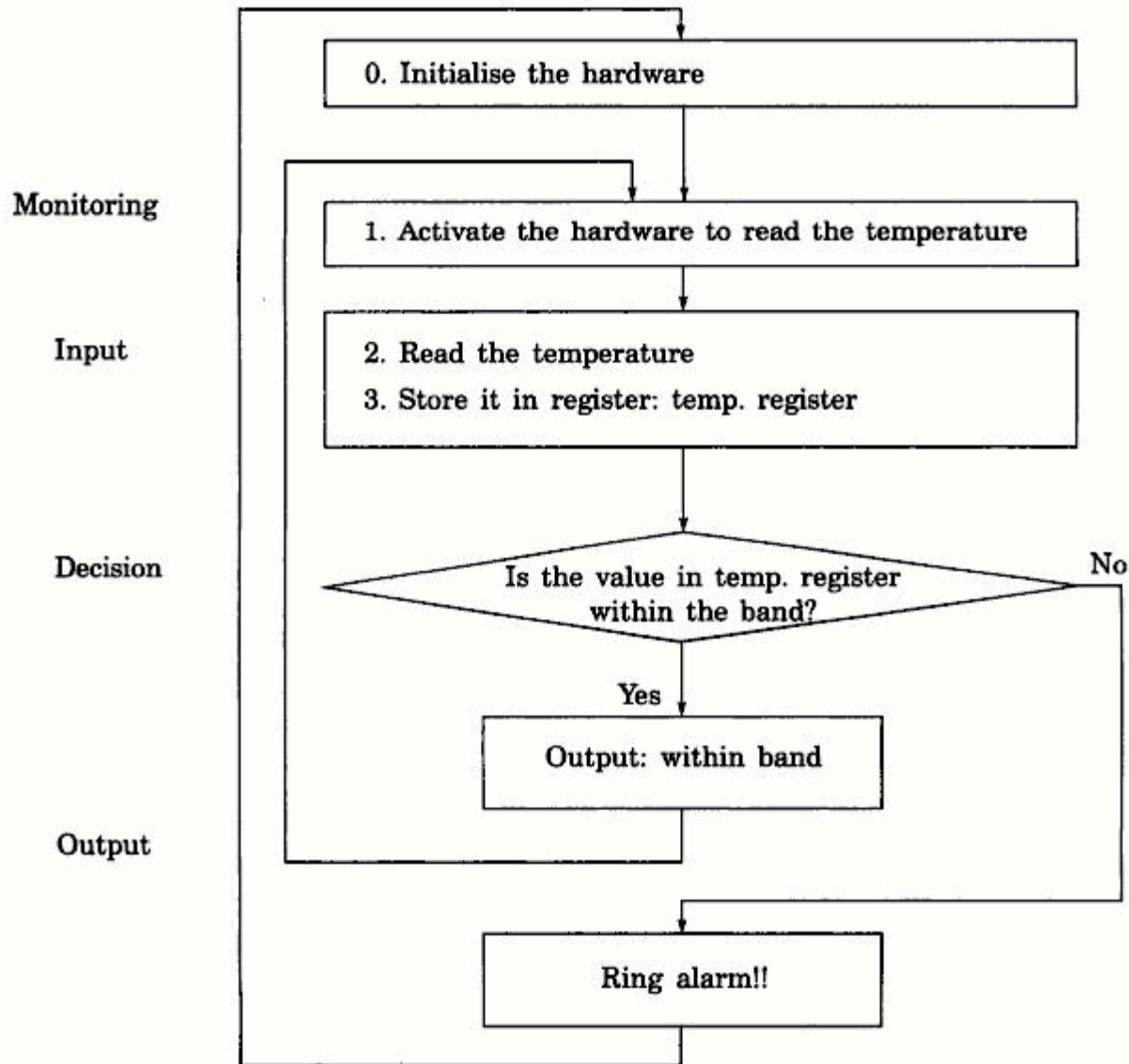


FUNCTIONALITIES OF OS

- It offers a very wide range of general data services to input , output, store and process information in a computer system.
- To achieve this OS manages devices such as keyboard, display unit, processor, memory and other devices of i/p and o/p.

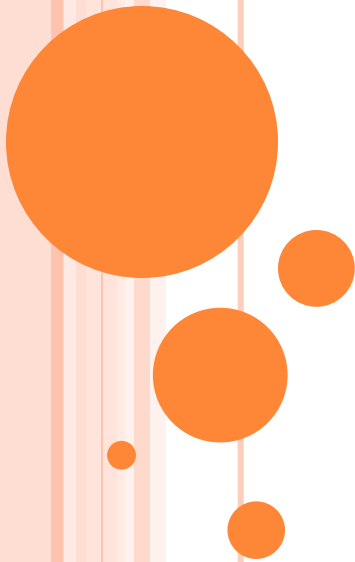


A real time control application:-



A Real Time Control Application (cont..)

- Above supervisory program has one task to accept input information by reading out a sensor periodically.
- The next task of this program is to process this data.
- The final task is to prepare an output.

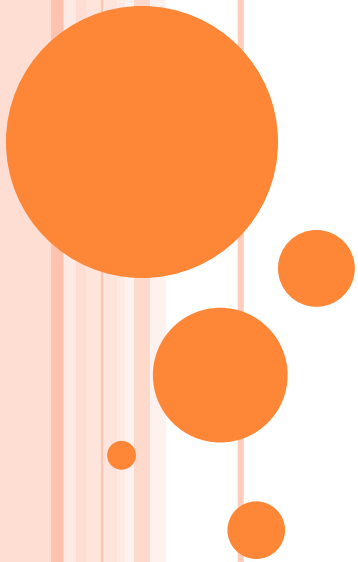


A REAL TIME CONTROL APPLICATION (CONT..)

- The cycle of operation is repeated in the following sequence:
 1. Input task
 2. Process data
 3. Output task



- OS provide that software layer, in a computer system which schedules all the operations and manages all the computing resources as well.



What does an OS provides?

- **User access to the system**
- **Storage and management of information including protection against an accidental or intentional misuse.**
- **Support for data processing activity**
- **Communication with a variety of IO devices.**
- **Management of all the activities in a transparent manner in multi-user operating system. Users are unaware of the presence of other users.**

WHAT DOES AN OS DO ?

- On power-on, the OS makes sure that the system has a certain initial set-up.
- On a request from a user application, for a resource or for IO, the OS makes appropriate access checks & the requested facility or service is either made available or denied.
- Since multiple-user applications are supported at any time of operation, the OS makes sure that each user, or application, gets the resources they require. This means that OS must schedule the demands on system resources.



WHAT DOES AN OS DO ? (CONT..)

- In case an error occurs during an operation, it should be logged & recorded. Basically, the OS records the sequence of events that lead to the error condition.
- The OS supports operations & services that require communication over a network.
- (Optional) The OS supports some deadlines so that safety critical operations run & fail gracefully.




AN OPERATIONAL OVERVIEW

- To understand the management functions provided within an OS, to manage various resources.
- Primary resources are :-
 - processor
 - memory
 - I/O devices



AN OPERATIONAL OVERVIEW (CONT..)

Processor

- OS ensures that each user gets sufficient processor time.
 - Processor time needs to be shared.
 - To schedule & allocate processor time for every user & for every running application.
 - A computer executes programs & accesses data from its main memory.
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AN OPERATIONAL OVERVIEW (CONT..)

Memory

- A computer executes programs & accesses data from main memory.
- Main memory (Volatile).
- Another level of storage(secondary memory)-disk & tapes.
- They are Non-volatile.



AN OPERATIONAL OVERVIEW (CONT..)

Memory (cont..)

- For enhancing throughput is to have an intermediate storage which can take up different rates or timings of Input/Output.
- A processor access registers at a speed which is far in excess of the main memory access.
- Therefore, one choose to place cache at an intermediate level of storage between CPU & main memory.



AN OPERATIONAL OVERVIEW (CONT..)

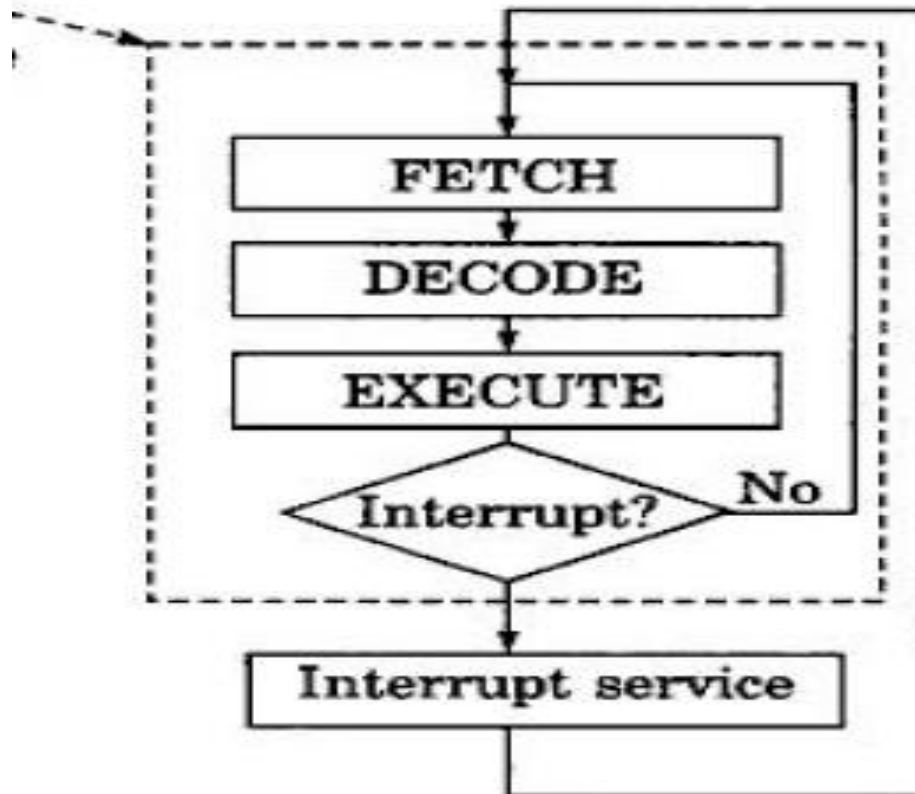
I/O devices

- User interaction takes place through an I/O device.
- OS provide utilities for all the required communication with I/O devices.



AN OPERATIONAL OVERVIEW (CONT..)

I/O devices (cont..)



AN OPERATIONAL OVERVIEW (CONT..)

I/O devices (cont..)

- Interrupt mode of data transfer is used wherever a user, or a critical application, requires immediate attention.
- Interrupts are not used to handle large amount of data transfers.
- Solution to problem, used DMA(Direct Memory Access) mode.



AN OPERATIONAL OVERVIEW (CONT..)

I/O devices (cont..)

- 2 Stages of DMA mode of data transfer :-
 - Data transfer requirement – setup(how much data to transfer & where it is located)
 - After setup, device & processor compete with each other to seek memory access.



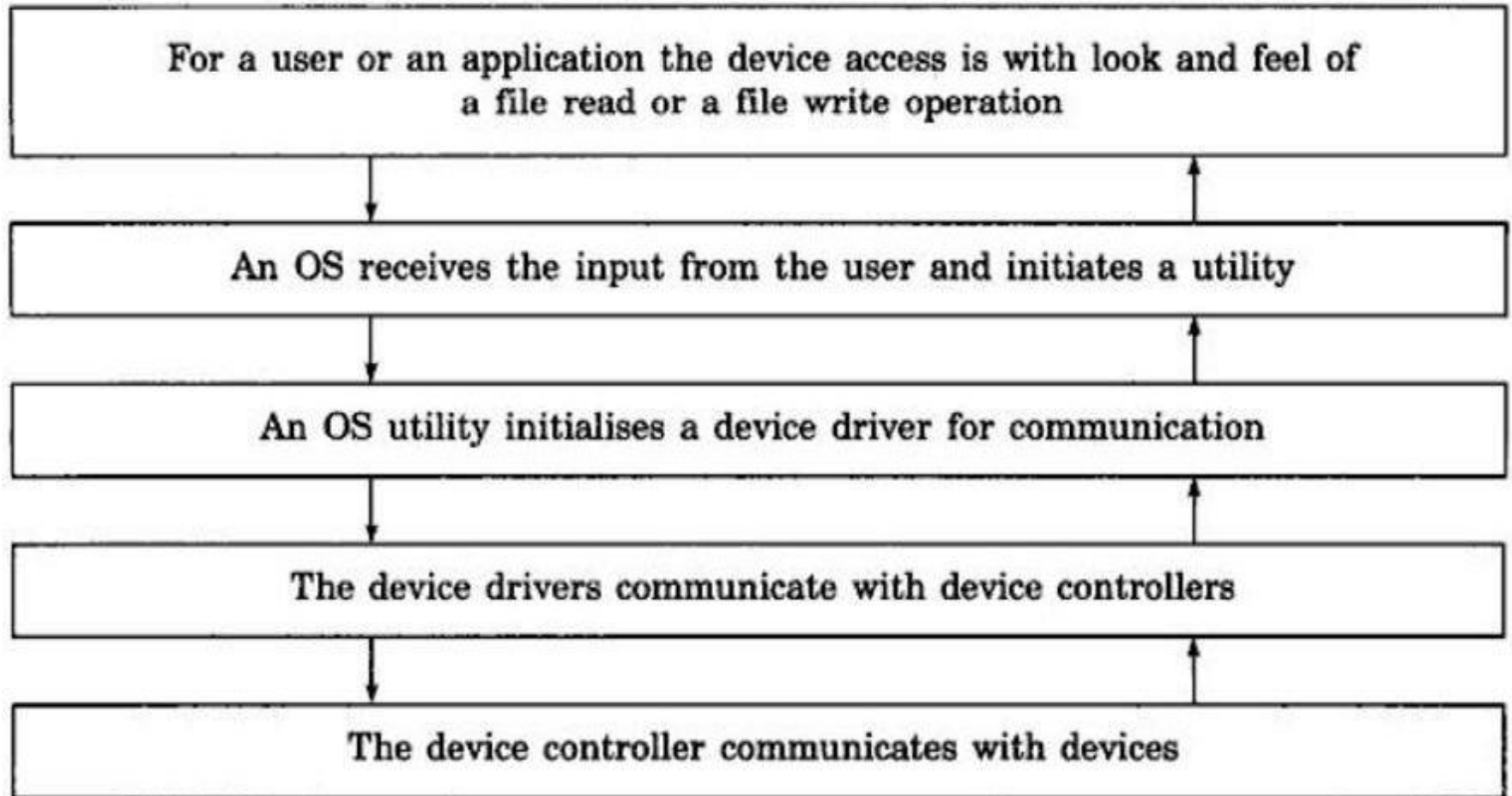
AN OPERATIONAL OVERVIEW (CONT..)

Communication with devices :-

- A computer may be connected to variety of devices(keyboard, monitor, printer, modem)
- OS provide device service utilities – that cater requirements of individual device characteristics.
- Utilities supported by OS – execute a sequence of instructions stored in a device driver.



AN OPERATIONAL OVERVIEW (CONT..)



AN OPERATIONAL OVERVIEW (CONT..)

Mutual Exclusion

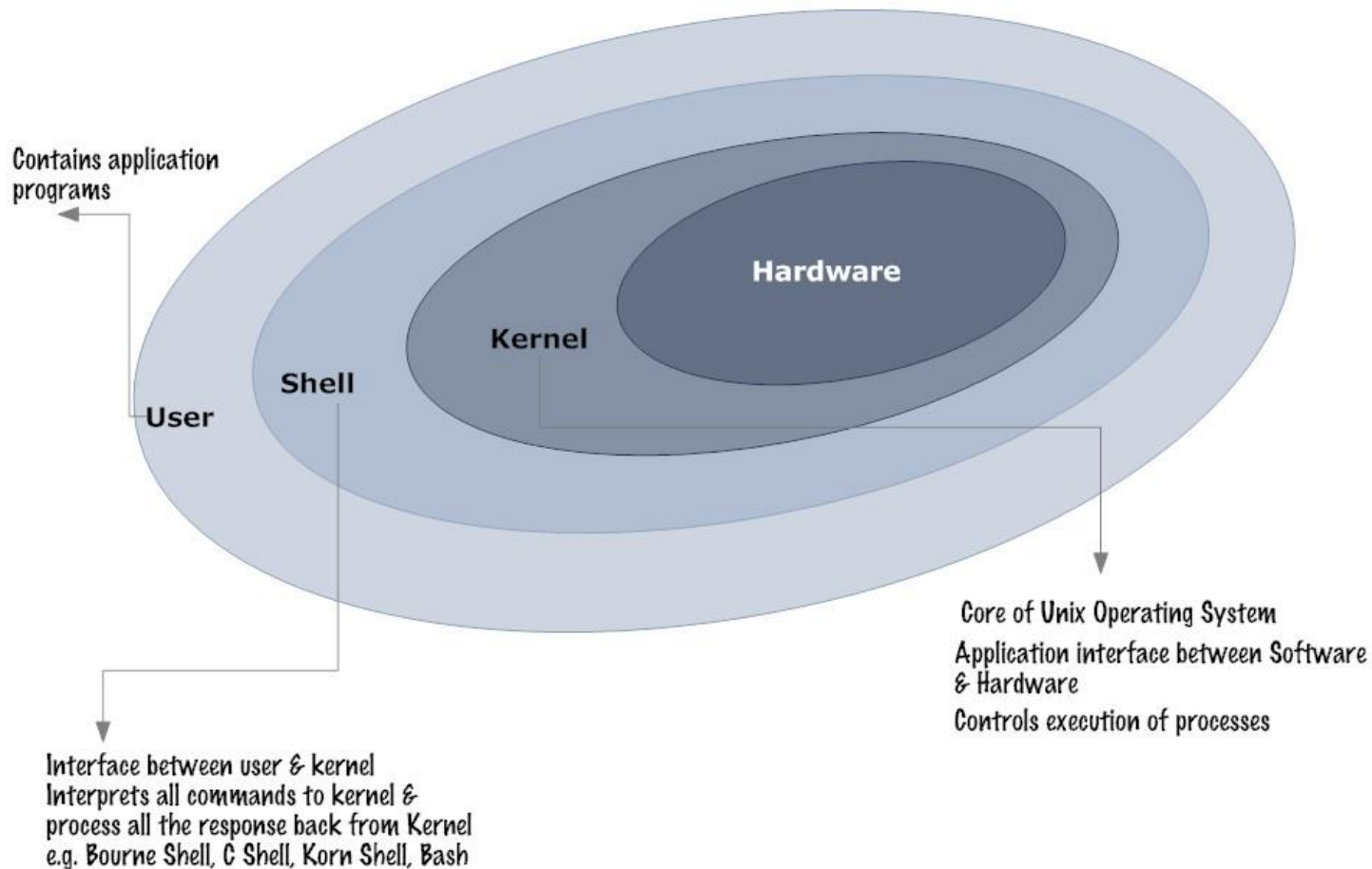
- Problem posed by devices is mutual exclusion.
- Two users want to output on printer which shared then may both documents content is interleaved.
- So OS need to schedule the use of shared resources.



AN OPERATIONAL OVERVIEW (CONT..)

Elements of Unix Operating System

Unix Architecture Layers



AN OPERATIONAL OVERVIEW (CONT..)

Shell of an OS

- A user never communicates directly with the OS service routines.
- OS service routines are resident in a kernel which cannot be directly accessed by a user program or by an application.
- OS services are sought by a user via a command interpreter provided by a shell around a kernel.

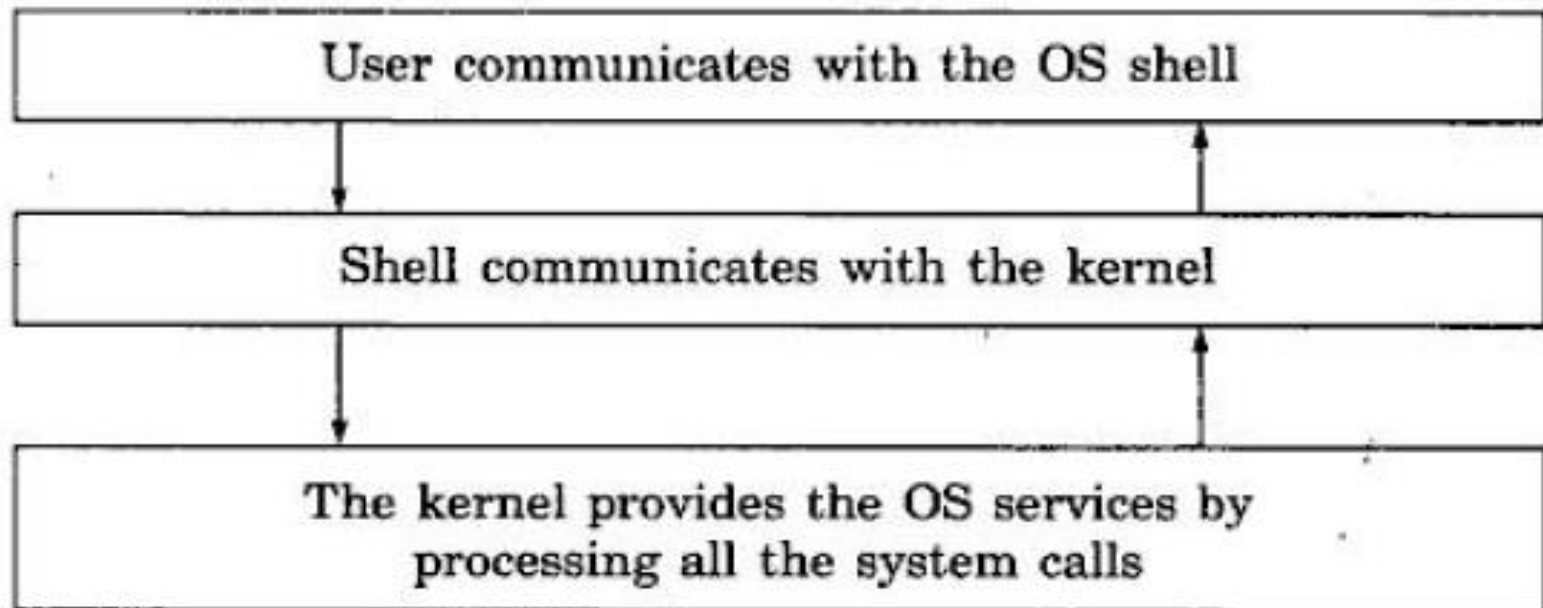


AN OPERATIONAL OVERVIEW (CONT..)

- The shell interprets the OS commands & elicits OS services by communicating with the kernel.
- Thus a shell protects the system service routines



AN OPERATIONAL OVERVIEW (CONT..)



Shell acts as a command interpreter. The kernel is protected from direct user access.



AN OPERATIONAL OVERVIEW (CONT..)

HCI(Human Computer Interface)

- Notice that we have a set of icons presented in Windows or Unix operational environment.
- This icons invite user to launch the application.
- Unix users operate in command driven environment.



PROCESSES & TOOLS

Processes

- A program in execution – known as process.
- With multiple applications active at the same time there are many processes that are active.
- OS needs to manage all processes.
- Often applications may create processes that need to communicate with each other. This is called interprocess communication.



PROCESSES & TOOLS (CONT..)

Processes

- In network one machine seeking services called the client machine & machine offering services called server.



PROCESSES & TOOLS (CONT..)

Tools

- Most OS provide many other general purpose utilities – as a set of packaged tools.
- Tools- helps to think in terms of higher level of operations.
- In absence of tools & toolkits we required to write fresh program each time to accomplish the task.



PROCESSES & TOOLS (CONT..)

Tools

- Sort utility in Unix
- Zip tools in windows environment

