SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ITT204 - MICROCONTROLLER AND EMBEDDED SYSTEMS

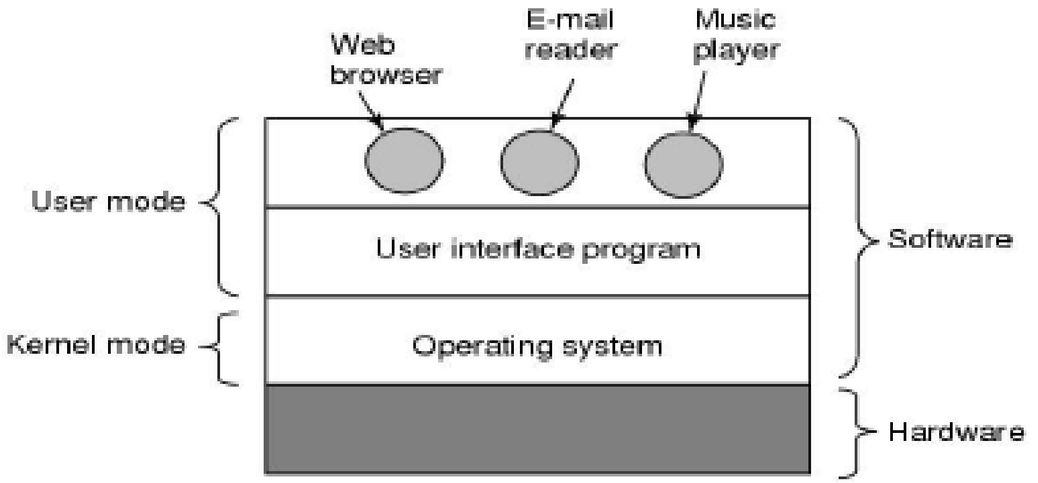
II YEAR/ IV SEMESTER

UNIT IV PROCESSES AND OPERATING SYSTEMS

TOPIC – Operating System Basics

Operating System Basics:

- The Operating System acts as a bridge between the user applications/tasks and the underlying system resources through a set of system functionalities and services
- OS manages the system resources and makes them available to the user applications/tasks on a need basis



- The primary functions of an Operating system is
  - ➢ Make the system convenient to use
  - ➢ Organize and manage the system resources efficiently and correctly

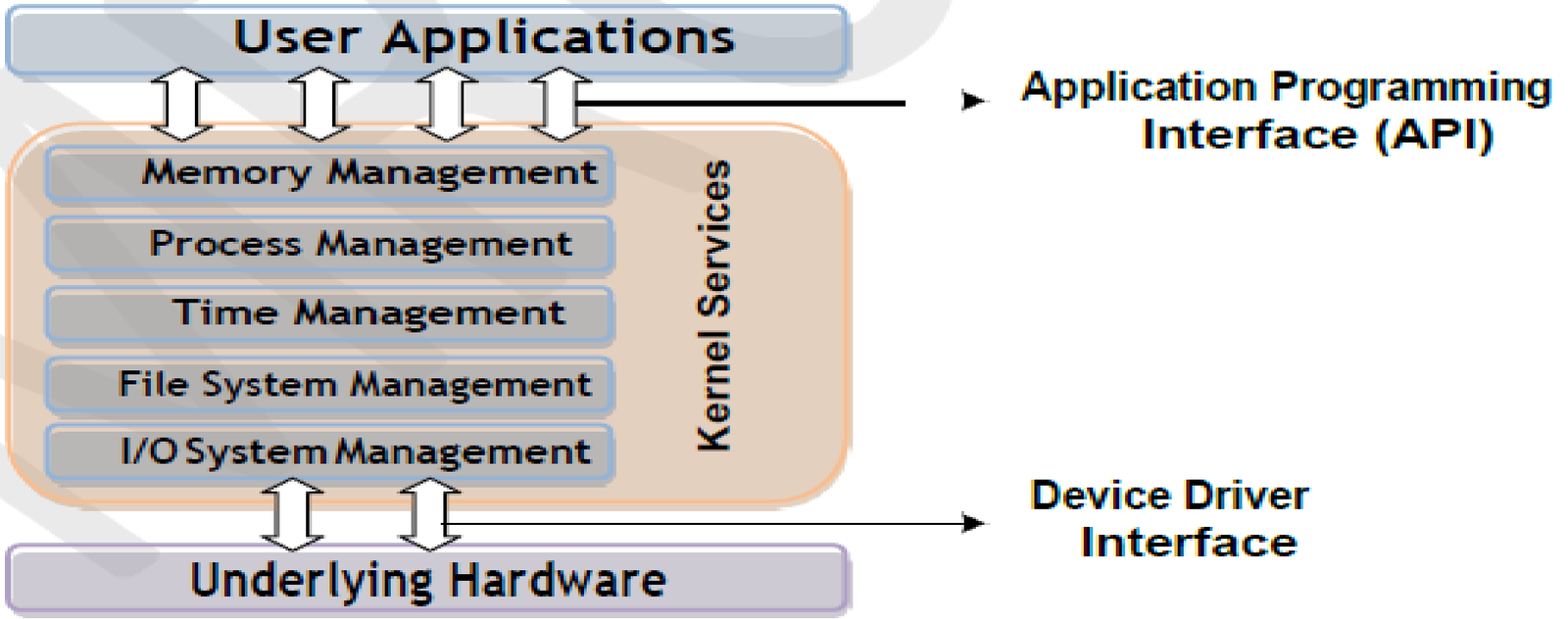


Figure 1: The Architecture of Operating System

The Kernel:

- The kernel is the core of the operating system
- It is responsible for managing the system resources and the communication among the hardware and other system services
- Kernel acts as the abstraction layer between system resources and user applications
- Kernel contains a set of system libraries and services.
- For a general purpose OS, the kernel contains different services like
  - Process Management
  - Primary Memory Management
  - File System management
  - I/O System (Device) Management
  - Secondary Storage Management

- Protection
- Time management
- Interrupt Handling

Kernel Space and User Space:

- The program code corresponding to the kernel applications/services are kept in a contiguous area (OS dependent) of primary (working) memory and is protected from the un-authorized access by user programs/applications
- The memory space at which the kernel code is located is known as '*Kernel Space*'

- All user applications are loaded to a specific area of primary memory and this memory area is referred as '*User Space*'
- The partitioning of memory into kernel and user space is purely Operating System dependent
- An operating system with virtual memory support, loads the user applications into its corresponding virtual memory space with demand paging technique
- Most of the operating systems keep the kernel application code in main memory and it is not swapped out into the secondary memory

Monolithic Kernel:

- All kernel services run in the kernel space
- All kernel modules run within the same memory space under a single kernel thread
- The tight internal integration of kernel modules in monolithic kernel architecture allows the effective utilization of the low-level features of the underlying system
- The major drawback of monolithic kernel is that any error or failure in any one of the kernel modules leads to the crashing of the entire kernel application
- LINUX, SOLARIS, MS-DOS kernels are examples of monolithic kernel

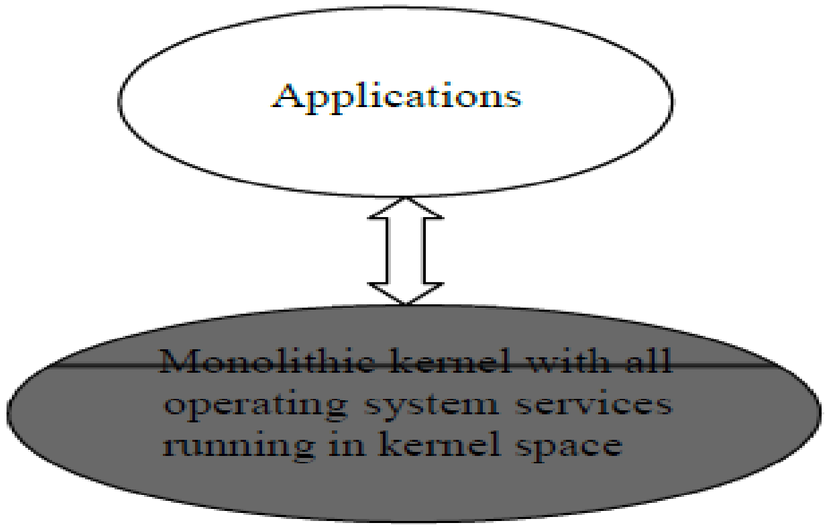


Figure 2: The Monolithic Kernel Model

Microkernel

- The microkernel design incorporates only the essential set of Operating System services into the kernel
- Rest of the Operating System services are implemented in programs known as '*Servers*' which runs in user space
- The kernel design is highly modular provides OS-neutral abstraction.
- Memory management, process management, timer systems and interrupt handlers are examples of essential services, which forms the part of the microkernel

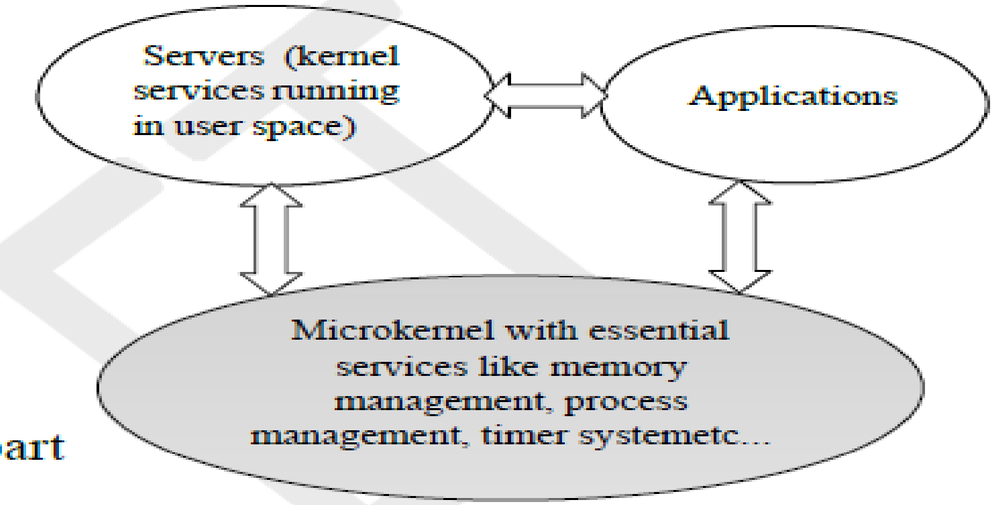


Figure 3: The Microkernel Model

- QNX, Minix 3 kernels are examples for microkernel.

Benefits of Microkernel:

1. Robustness: If a problem is encountered in any services in server can reconfigured and re-started without the need for re-starting the entire OS.
2. Configurability: Any services , which run as 'server' application can be changed without need to restart the whole system.

THANK YOU