Overview of Operating System

Operating System

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(NBA and NAAC accredited, ISO 9001:2015 certified)

Objective/s of this session

1. To introduce basic concepts and functions of operating systems.

Learning Outcome/Course Outcome

1. Understand of the role of Operating Systems in Computer System..

Content

Part –I

- Operating System Objectives and Functions
- The Evolution of Operating Systems

Part-II

- Developments Leading to Modern Operating Systems
- Virtual Machines

Part-III

- BASH Shell scripting: Basic shell commands
- Shell as a scripting language

Different Architectural Approaches

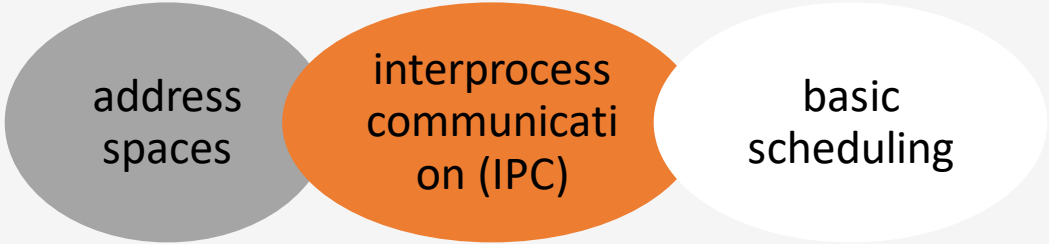
- Demands on operating systems require new ways of organizing the OS

Different approaches and design elements have been tried:

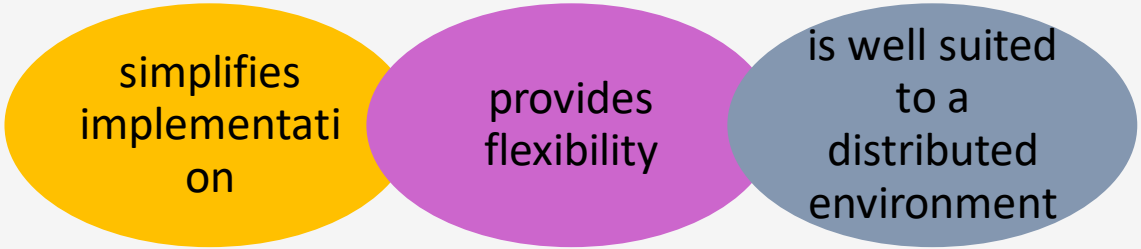
- Microkernel architecture
- Multithreading
- Symmetric multiprocessing
- Distributed operating systems
- Object-oriented design

Microkernel Architecture

- Assigns only a few essential functions to the kernel:



- The approach:



Multithreading

- Technique in which a process, executing an application, is divided into threads that can run concurrently

Thread

- dispatchable unit of work
- includes a processor context and its own data area to enable subroutine branching
- executes sequentially and is interruptible

Process

- a collection of one or more threads and associated system resources
- programmer has greater control over the modularity of the application and the timing of application related events

Symmetric Multiprocessing (SMP)

- Term that refers to a computer hardware architecture and also to the OS behavior that exploits that architecture
- Several processes can run in parallel
- Multiple processors are transparent to the user
    - these processors share same main memory and I/O facilities
    - all processors can perform the same functions
- The OS takes care of scheduling of threads or processes on individual processors and of synchronization among processors

SMP Advantages

Performance	more than one process can be running simultaneously, each on a different processor
Availability	failure of a single process does not halt the system
Incremental Growth	performance of a system can be enhanced by adding an additional processor
Scaling	vendors can offer a range of products based on the number of processors configured in the system

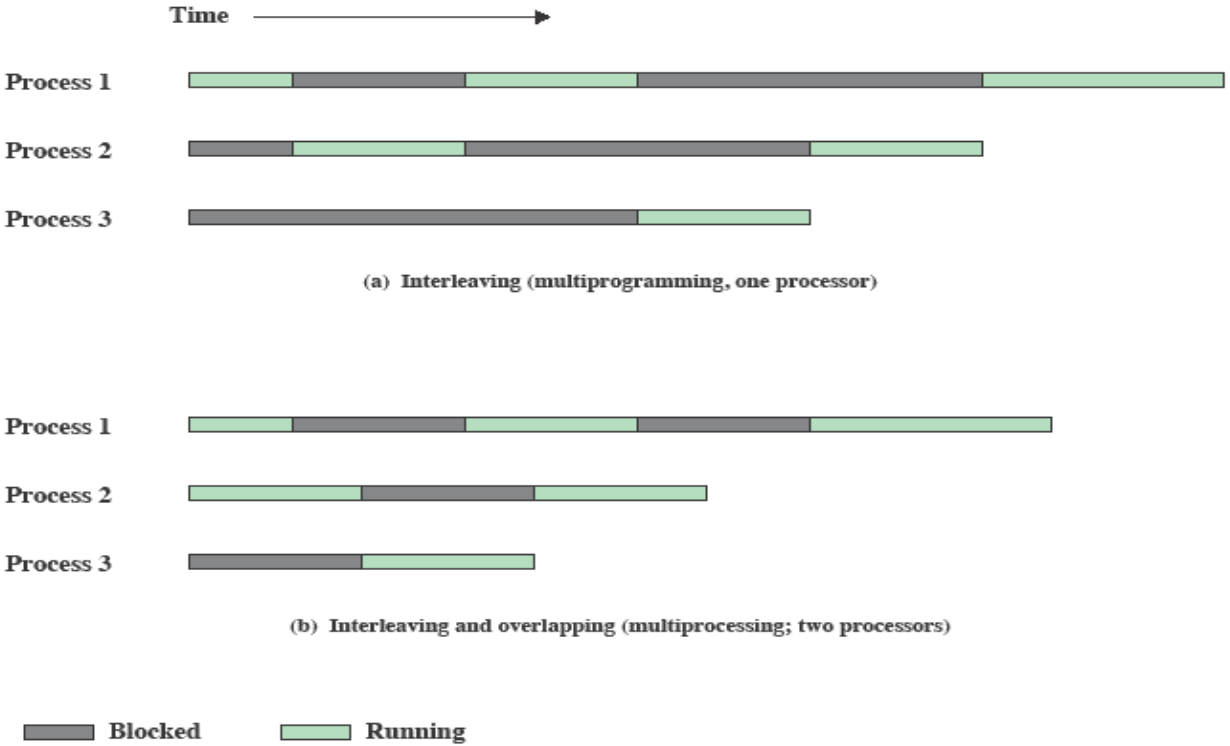


Figure 2.12 Multiprogramming and Multiprocessing

Courtesy : Operating System Internals and Design Principles by William Stallings

OS Design

Distributed Operating System

- Provides the illusion of
  - a single main memory space
  - single secondary memory space
  - unified access facilities
- State of the art for distributed operating systems lags that of uniprocessor and SMP operating systems

Object-Oriented Design

- Used for adding modular extensions to a small kernel
- Enables programmers to customize an operating system without disrupting system integrity
- Eases the development of distributed tools and full-blown distributed operating systems

Virtual Machines and Virtualization

- Virtualization
  - enables a single PC or server to simultaneously run multiple operating systems or multiple sessions of a single OS
  - a machine can host numerous applications, including those that run on different operating systems, on a single platform
  - host operating system can support a number of virtual machines (VM)
    - each has the characteristics of a particular OS and, in some versions of virtualization, the characteristics of a particular hardware platform.

Virtual Memory Concept

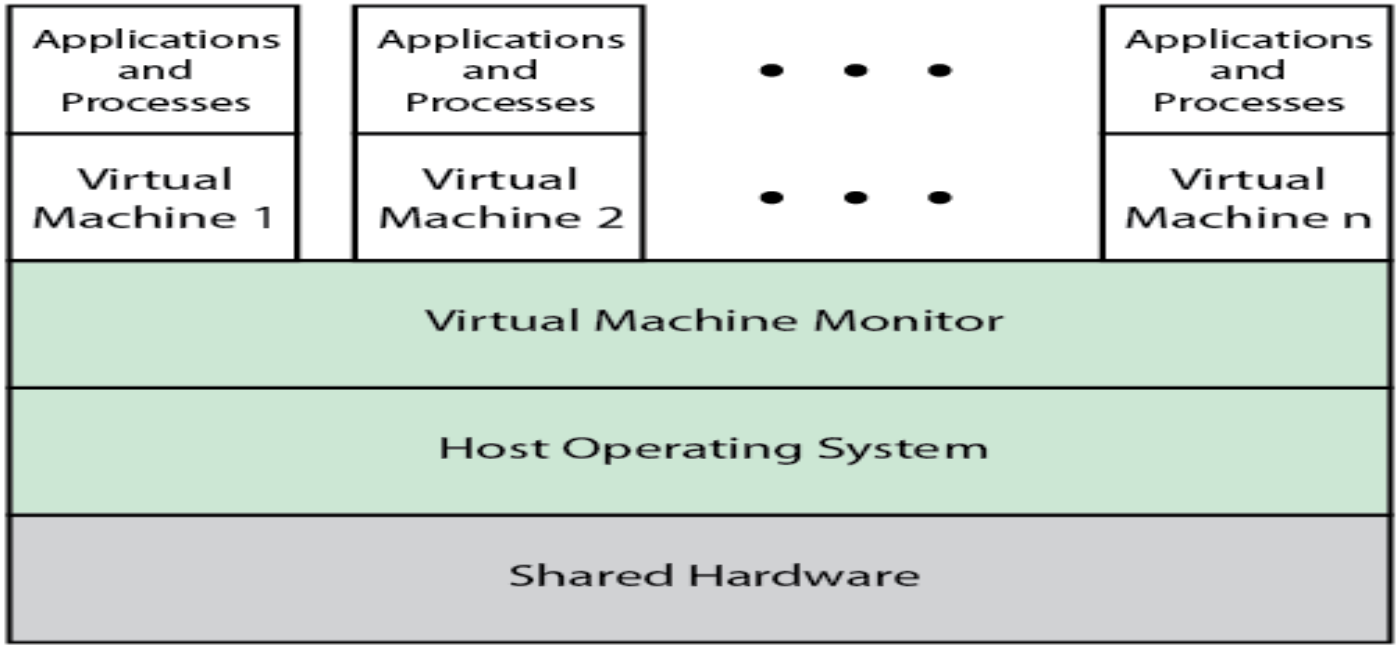


Figure 2.13 Virtual Memory Concept

Courtesy : Operating System Internals and Design Principles by William Stallings

Virtual Machine Architecture

Process perspective:

- the machine on which it executes consists of the virtual memory space assigned to the process
- the processor registers it may use
- the user-level machine instructions it may execute
- OS system calls it may invoke for I/O
- ABI defines the machine as seen by a process

Application perspective:

- machine characteristics are specified by high-level language capabilities and OS system library calls
- API defines the machine for an application

OS perspective:

- processes share a file system and other I/O resources
- system allocates real memory and I/O resources to the processes
- ISA provides the interface between the system and machine

Process and System Virtual Machines

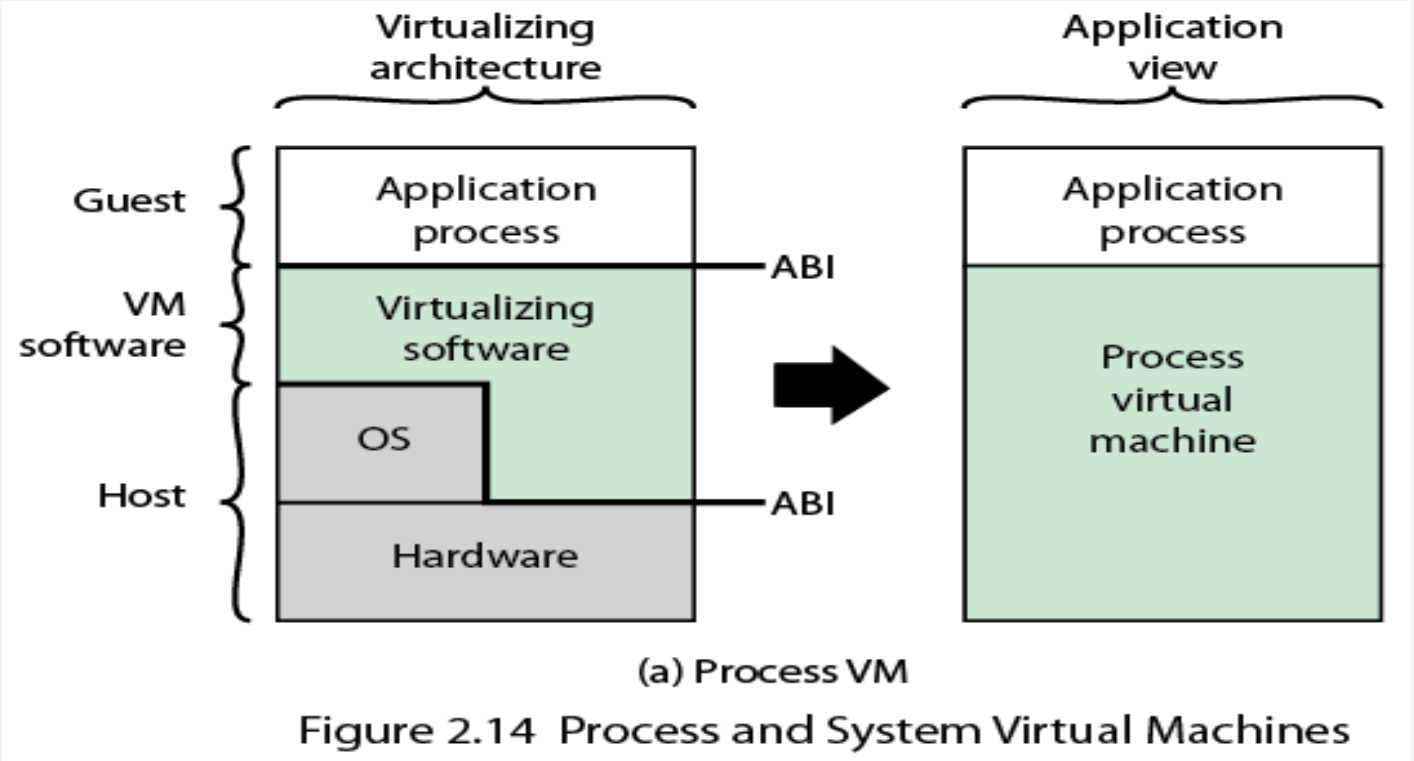
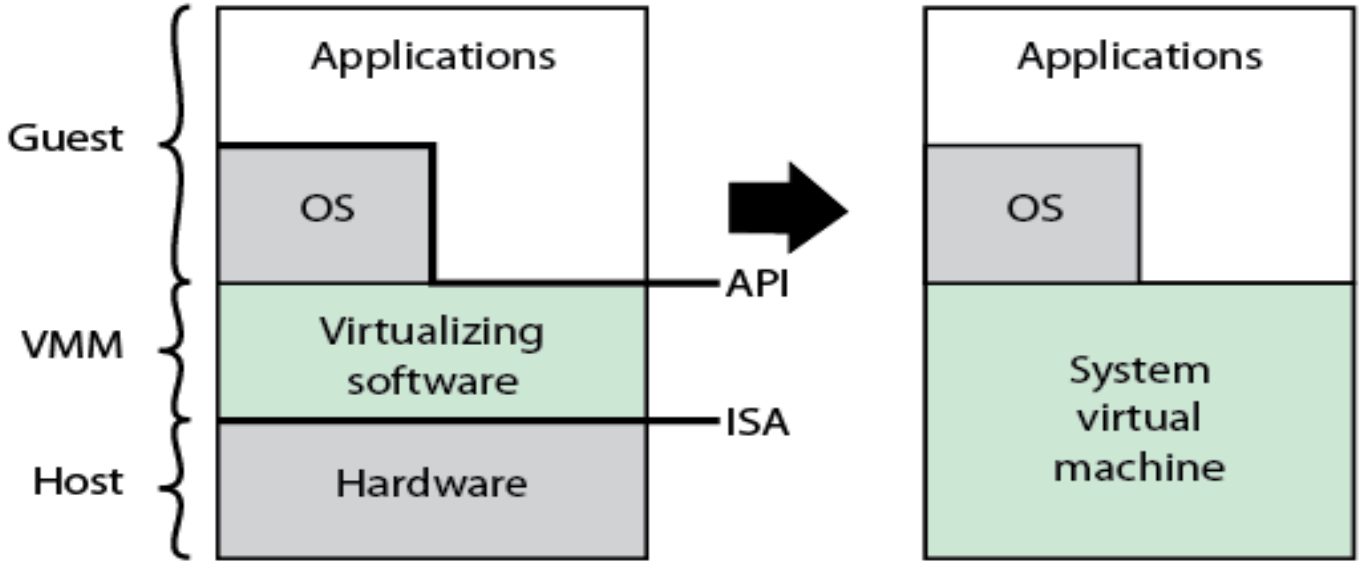


Figure 2.14 Process and System Virtual Machines

Courtesy : Operating System Internals and Design Principles by William Stallings

Process and System Virtual Machines



(b) System VM

Figure 2.14 Process and System Virtual Machines

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To be discussed next time

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Thank You