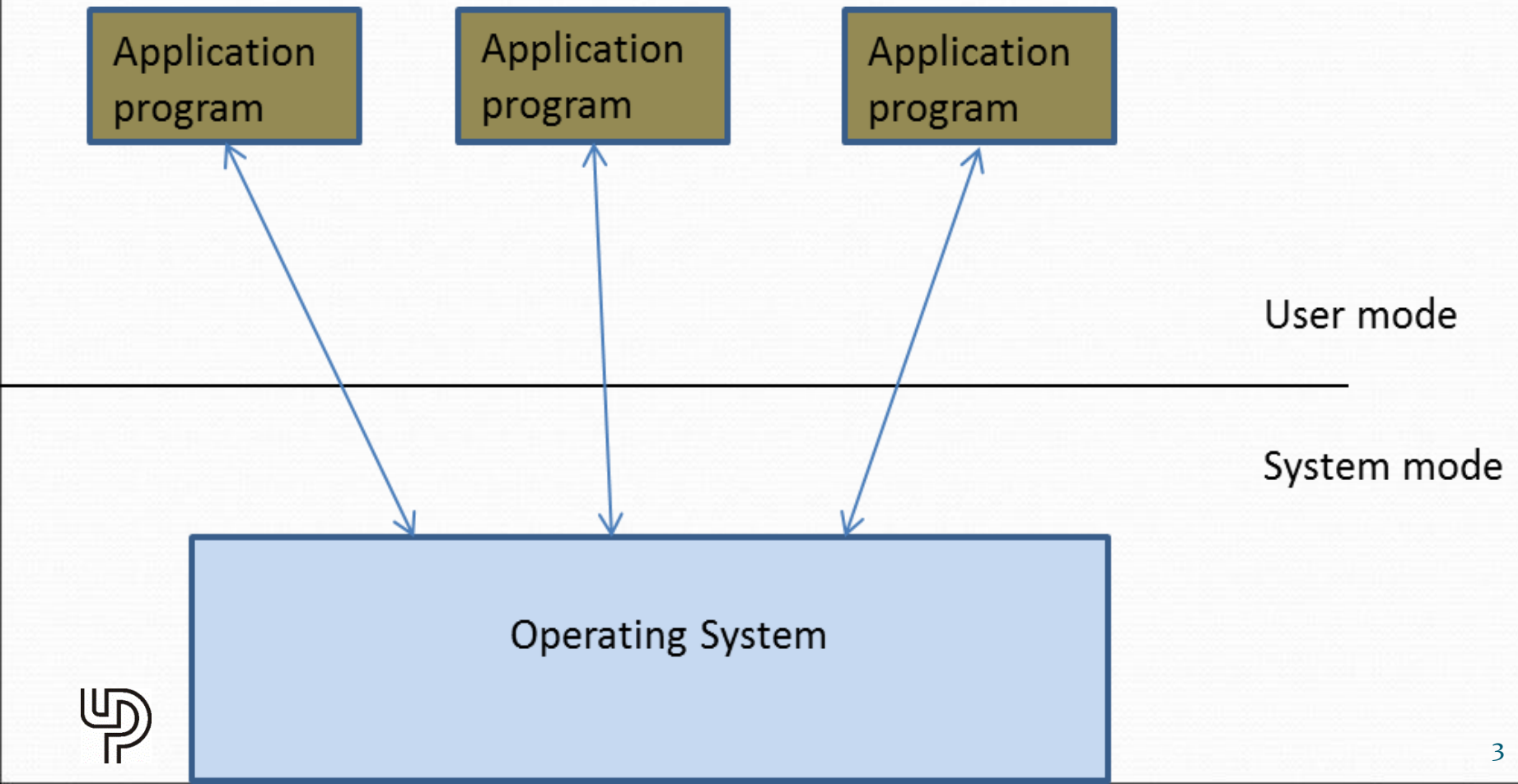
# CS-3103 : Operating Systems : Sec-A (NB) : OS Architecture

# Introduction

- Operating system architecture models are of three main types:
  - Monolithic operating system
  - Layered operating system
  - Client–Server or microkernel operating system

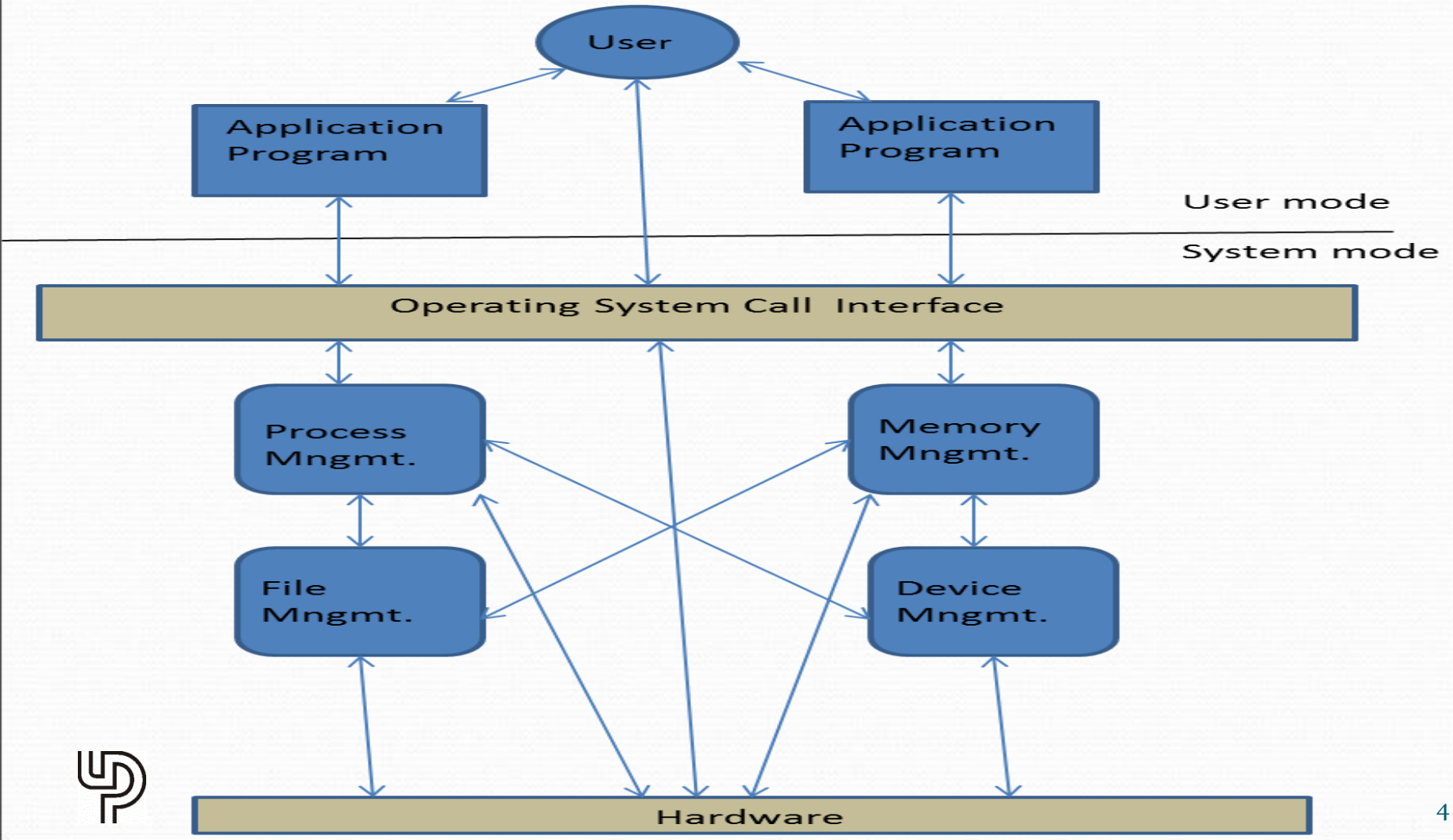
# Processor Execution Modes

- There are two modes of processor execution:
  - User mode
  - System mode



# Monolithic Operating System

- The OS is divided into procedures.
- Example - MS DOS

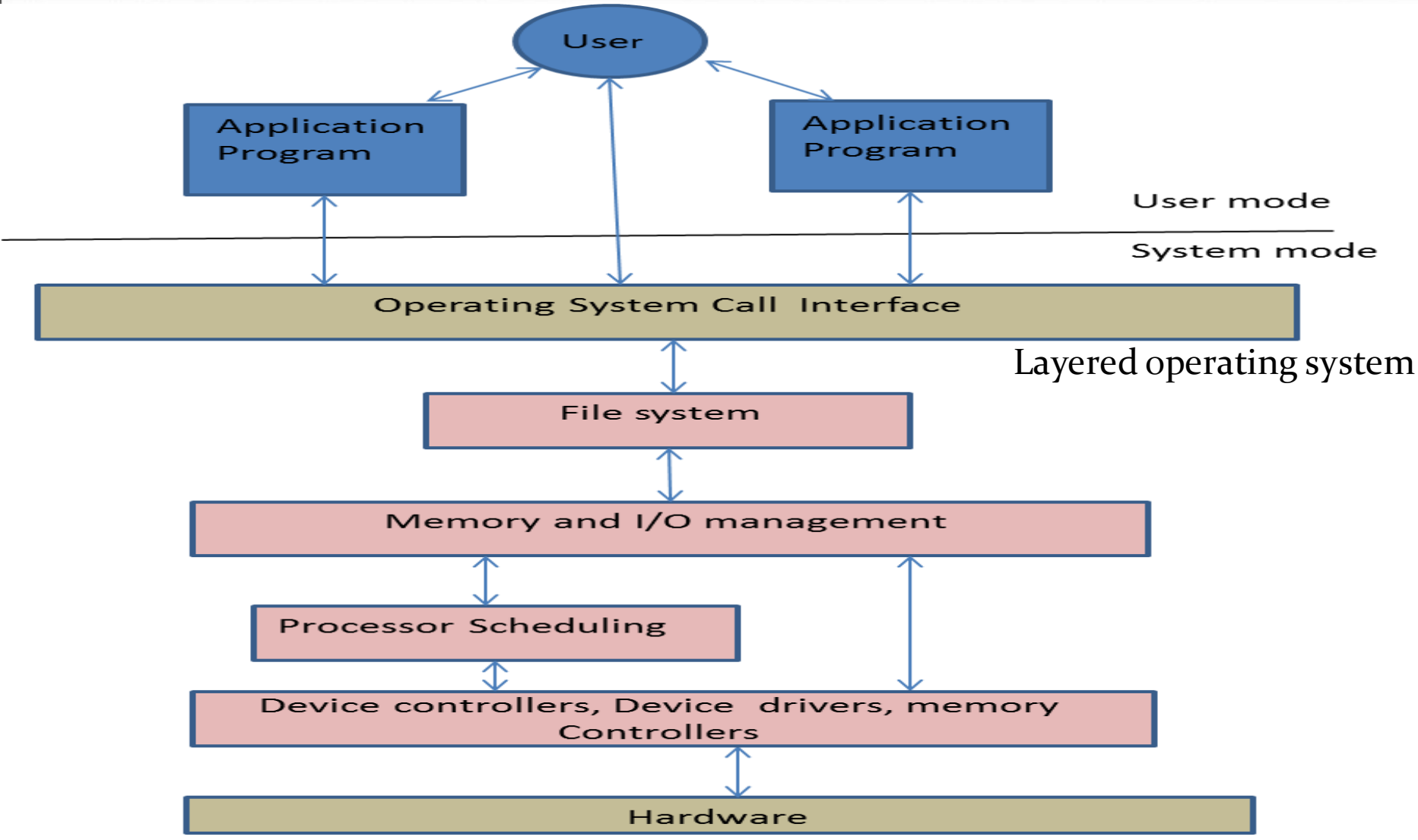


# Advantages and Disadvantages of Monolithic Operating Systems

- **Advantages**
  - Efficiently manage the resources
  - The code becomes efficient because of the smaller size of the OS.
- **Disadvantage**
  - The OS cannot handle procedures or components that contain errors.

# Layered Operating System

- The various components are implemented as a collection of logical layers. Example: VAX/VAS and UNIX.



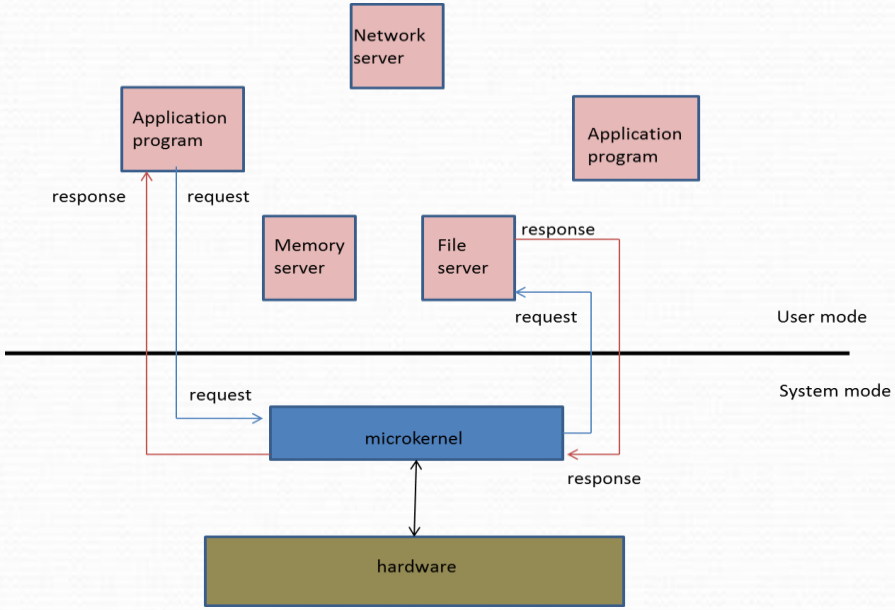

Layered operating system

# Advantages and Disadvantages of Layered Operating Systems

- **Advantages**
  - Each layer can be developed independently.
  - The degree of portability is high.
- **Disadvantages**
  - System becomes slow.
  - OS cannot handle a layer with errors.

# Microkernel Operating Systems

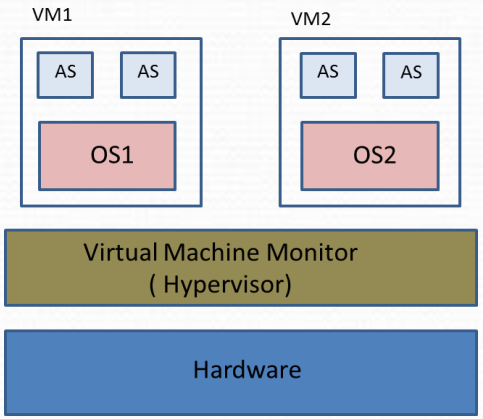
- Designers separated the most essential components of an operating system in the form of a microkernel.




Microkernel operating system

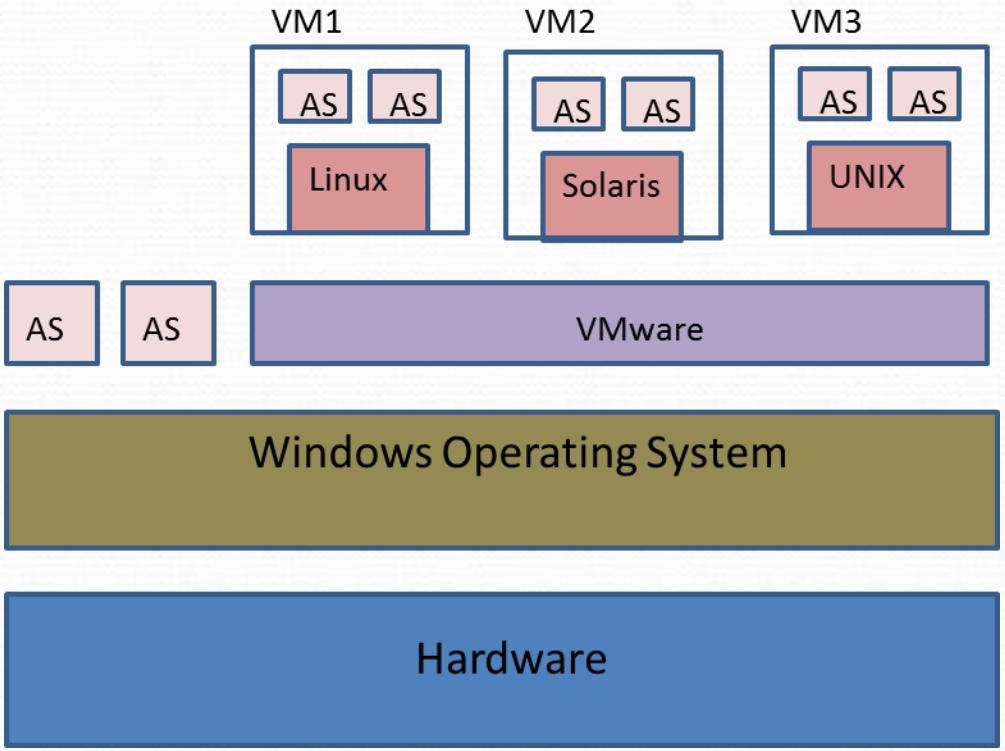
# Virtual Machine Architecture

- Virtualization can be defined as, “The process of creating multiple copies of an object”.
- The software that creates multiple copies of a machine is called a Virtual Machine monitor or a hypervisor.
- Example: IBM MVS/360, VMware, Xen, etc.




Virtual machines

# VMware Loaded on Windows OS

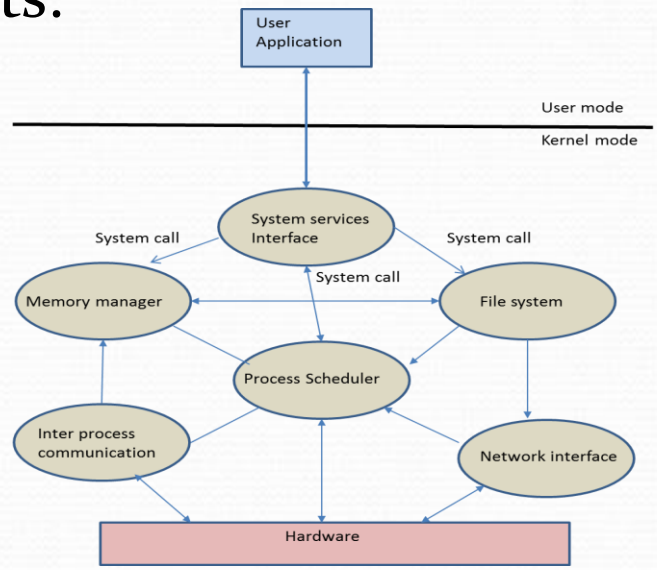


# Advantages and Disadvantages of Virtual Machines

- **Advantages**
  - Binary compatibility is achieved without making any changes to the application programs.
  - No need to change the underlying operating system.
  - A new version of an operating system can be tested for bugs.
- **Disadvantage**
  - Performance of the guest operating system becomes low.

# Linux Kernel Architecture

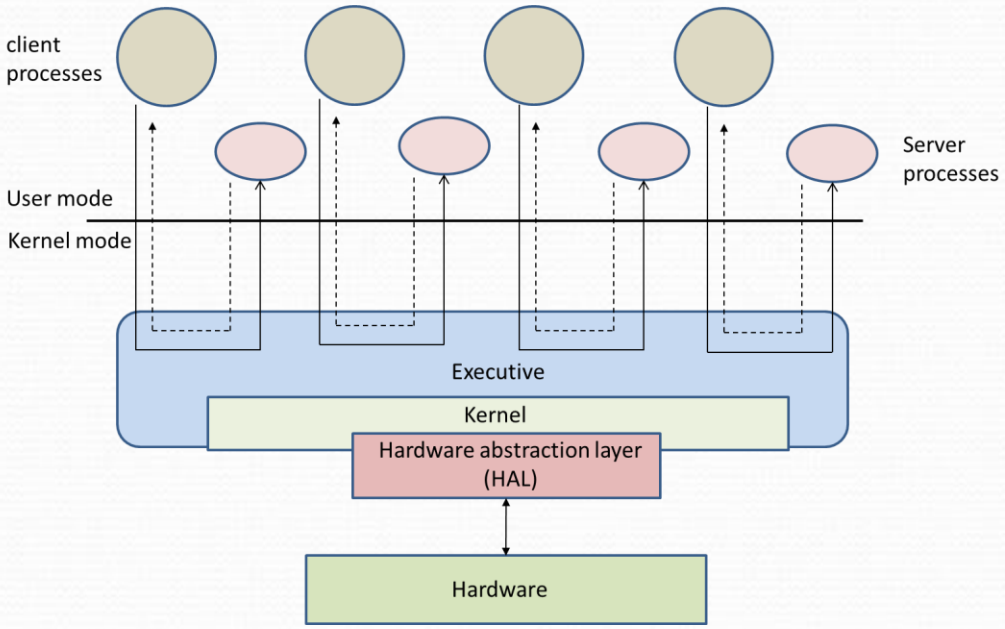
- Linux is a monolithic architecture.
- It consists of the following components:
  - Process scheduler
  - Memory manager
  - File system
  - Interprocess communication
  - Network interface




Linux architecture

# Windows Architecture

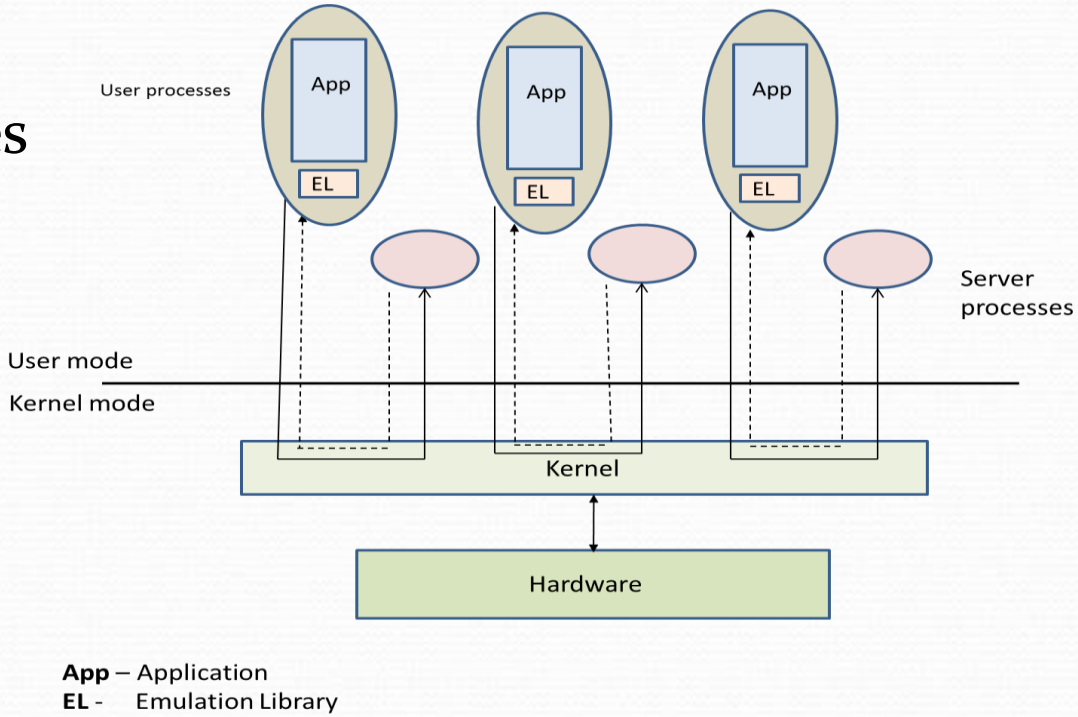
- Windows OS is primarily a ‘client–server’ OS architecture
- It is a hybrid of layered and microkernel architecture.




Windows operating system architecture

# Mach System Architecture

- It is a microkernel architecture consisting of three layers:
  - Processes
  - Server processes
  - Kernel




Mach system architecture

# Mach System Architecture

- The kernel performs the following functions:
  - Task and thread management
  - Inter-process communication
  - Memory object management
  - System call redirection
  - Device support
  - Multiprocessing
  - Multi-computer support