Lecture 5
Topics: Modern Structure of Operating Systems
Layered Approach
- **Microkernel**
- **Modules**

UNIX
Windows NT, 2000, XP (check case study)

Modern Structure

Layered Structure:
If we have the hardware support, the OS can be broken into smaller pieces, creating a modular operating
system.
The OS is broken into a number of layers (levels), each built on top of lower layers.
The lowest (0 layer) is the hardware. The highest (N_{th} layer) is the user interface.
Each layer uses functions and services of lower-level layers only.

The new-layered structure replaces the traditional vertical architecture with a horizontal one.

WINDOWS
New terms:

Microkernel
The microkernel concept is introduced in **Windows NT** architecture.
Microkernel represents the most used and fundamental component of the OS. The microkernel functions
as a message exchange: validates messages, passes them between components, grants access to the
hardware, and performs a protection function.

HAL (Hardware Abstraction Layer)
HAL isolates the OS from platform specific hardware differences. Provides the support for Symmetric
Multiprocessing (SMP). Most of the upper level modules can access the hardware only through the HAL.

KERNEL MODE
Microkernel - most used code of the OS.
Executive

USER MODE
Environmental subsystems

User-mode processes that enable Windows to run programs developed for other operating systems:
Win32, POSIX, OS/2.
The most important subsystem is **Win32**. Win32API represents the native environment for Windows NT, Windows 2000, and Windows XP.

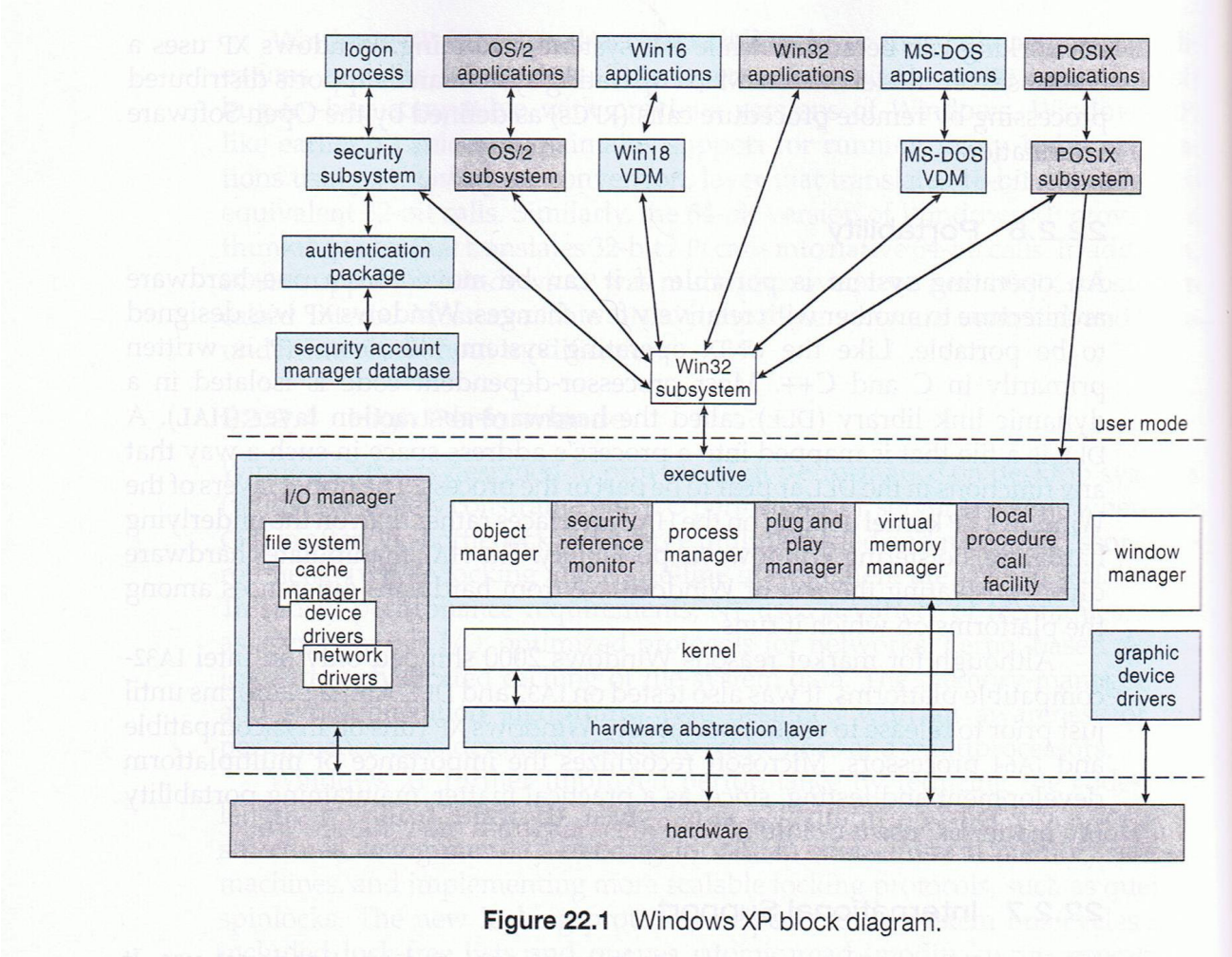

Figure 22.1 Windows XP block diagram.

UNIX
System V Release 4 (SVR4)
Features:

- Real-time processing support
- Process scheduling classes
- Virtual memory management
- Virtual file system
- Preemptive kernel

Unix runs on machines ranging from 32-bit microprocessors up to supercomputers.
A small core of facilities provides functions and services needed by a number of system processes. Each of the outer circles represents functions that can be implemented in many different ways.