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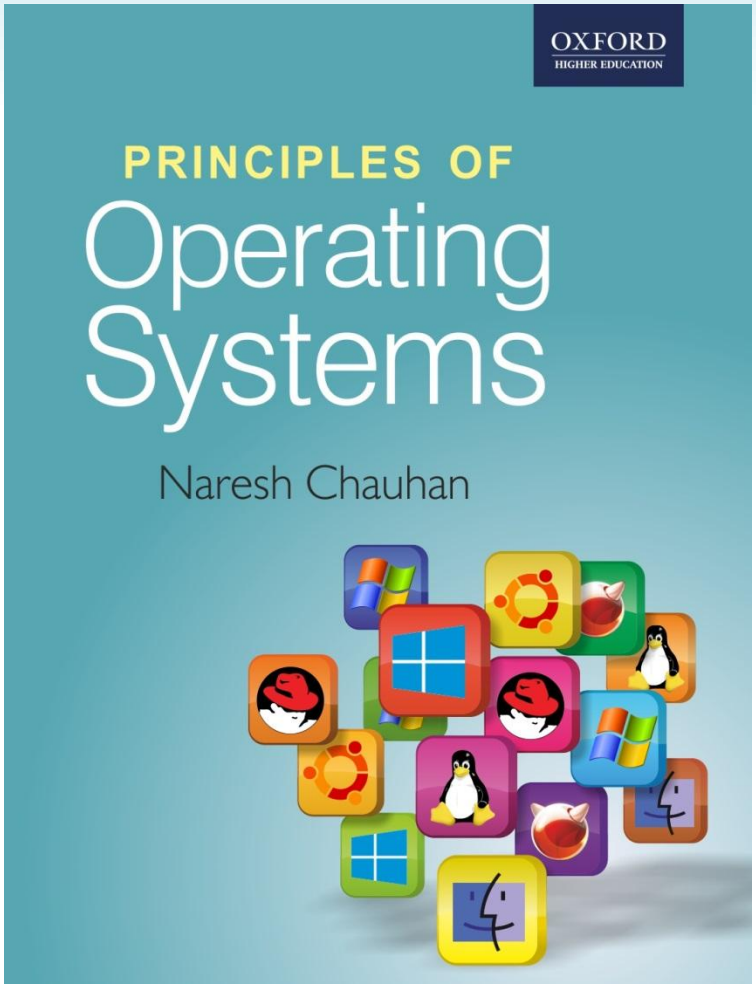

Principles of Operating Systems

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Chapter 1

Introduction to Operating Systems

Objectives

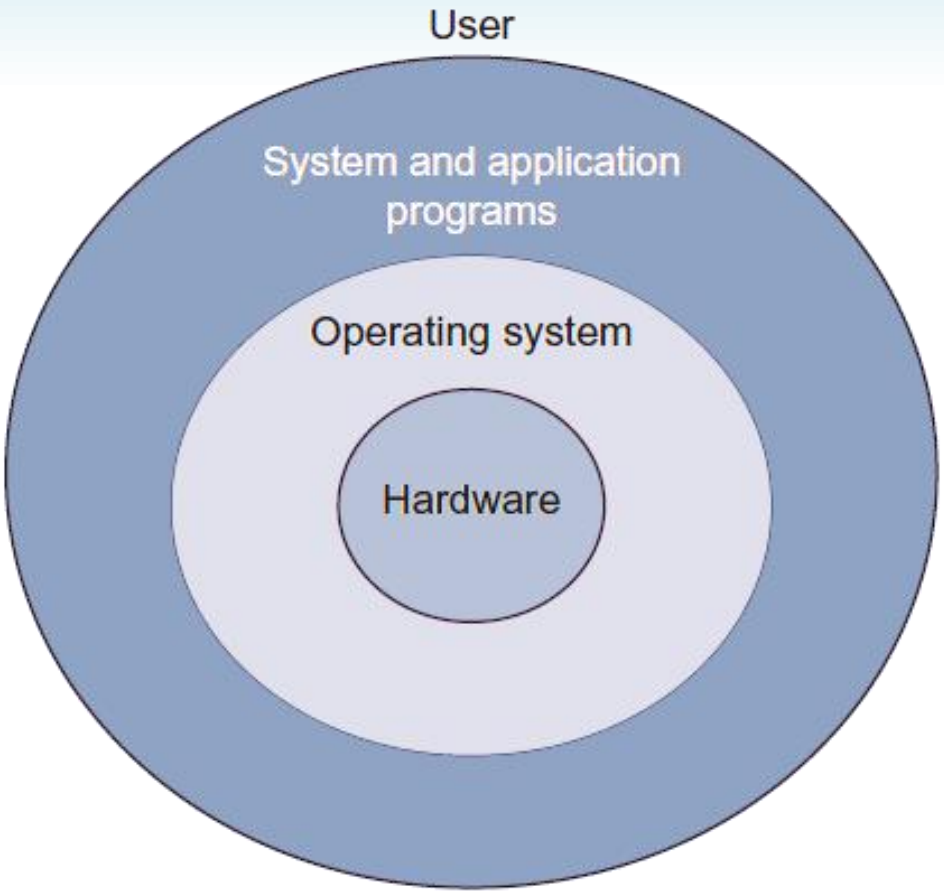
- The need for an Operating System (OS)
- The evolution of Operating Systems
- Batch processing systems
- Multiprogramming systems
- Multiuser systems
- Multitasking systems
- Multiprocessor systems
- Distributed systems
- Real time systems
- Embedded systems
- Goals of an operating system
- Functions of Operating systems
- Generic components of operating systems

Operating System Functions

Presents an environment for the user so that he or she can easily work without worrying about the hardware resources.

Manages all the resources in an efficient manner

Computer System with Operating System



Evolution of Operating Systems

Generation	Period	Computer architecture	Problems and development of Operating systems
First	1940s–1950s	Vacuum tubes based technology, plug boards and punched cards, magnetic core memories	No operating system

Evolution of Operating Systems

Generation	Period	Computer architecture	Problems and development of Operating systems
Second	1950s–1960s	Transistors based technology, Mainframe computers, line printers, magnetic tapes, assemblers, linkers, loaders, compilers, FORTRAN, COBOL	Set up delay problem due to loading and unloading of tapes in earlier computer systems. CPU was idle. Jobs of users prepared with same programming language were batched together. Automated job sequencing Resident monitor Batch systems Mismatch between the speed of CPU and I/O devices Offline operation with magnetic tapes Tapes were sequential access devices

Evolution of Operating Systems

Generation	Period	Computer architecture	Problems and development of Operating systems
Third	1960s–1980s	IC based technology, Minicomputer Magnetic disk	Hard disks came into existence Spooling Multiprogramming Multiprogrammed batch systems Lack of user/programmer interaction with their jobs in multiprogrammed batch systems Timesharing multiuser systems CTSS MULTICS UNICS UNIX Unix written in C

Evolution of Operating Systems

Generation	Period	Computer architecture	Problems and development of Operating systems
Fourth	1980s–Present	LSI and VLSI based technology, Microcomputer	CP/M for PCs MS-DOS Multiuser facilities were not there in DOS XENIX OS/2 No user friendliness and convenience due to command driven and complex file systems Apple Macintosh Windows Multitasking Multithreading X-windows Motif Network operating systems Distributed operating systems

Types of Operating System

Type of operating system	Features/benefits	Example	Applicable to which type of application
Batch systems	More than one job can be stored in main memory Batches of same type of jobs can be executed quickly	FMS (FORTRAN monitor system), IBM's operating system for 7094	Background jobs in which the user interaction is not necessary
Multiuser systems	Jobs of different users who are connected to a main computer are executed through the multiprogramming Interaction of jobs with the user is possible Debugging is easy	CTSS by MIT, TSS by IBM, MULTICS, UNIX	When multiple users need to share a single system

Types of Operating System

Type of operating system	Features/benefits	Example	Applicable to which type of application
Multitasking systems	Multiple tasks of a single user can be opened on the system through multiprogramming	Windows	When a user wants to open and work simultaneously on many windows on the system
Network systems	The user is able to connect to another machine and perform many operations The user is aware of the location of the network node where he/she wants to connect	Novell Netware, Windows NT, Windows 2000, Windows XP, Sun Solaris	When a user wants to remote login on a system, wants to transfer a file, etc. on a network system

Types of Operating System

Type of operating system	Features/benefits	Example	Applicable to which type of application
Distributed systems	When multiple nodes of a wide network realized as a powerful machine sharing the resources on the network. The users are not aware where their processes are being sent and executed.	Amoeba, V system, Chorus	When computational speed and resource sharing is required and implemented through various full computer systems in a network
Real-time systems	Used to handle time-bound responses to the applications	pSOS, VxWorks, RTLinux, etc.	Applicable to systems which require time-bound response, i.e., for the real-time processing systems

Types of Operating System

Type of operating system	Features/benefits	Example	Applicable to which type of application
Embedded systems	Specialized systems with size, memory and power restrictions	Palm Pilot, Toshiba Pocket PC, Palm OS, Symbian OS, iPhone OS, RIM's BlackBerry, Windows Phone, Linux, Palm WebOS, Android and Maemo.	Used in consumer electronics items, mobile phones, smart cards, etc.

Goals of an Operating System

Convenience

- Hardware abstraction/Virtual machine
- Convenient programming environment
- Response time
- Easy to use interface

Resource utilization/management

Protection

Functions of Operating system

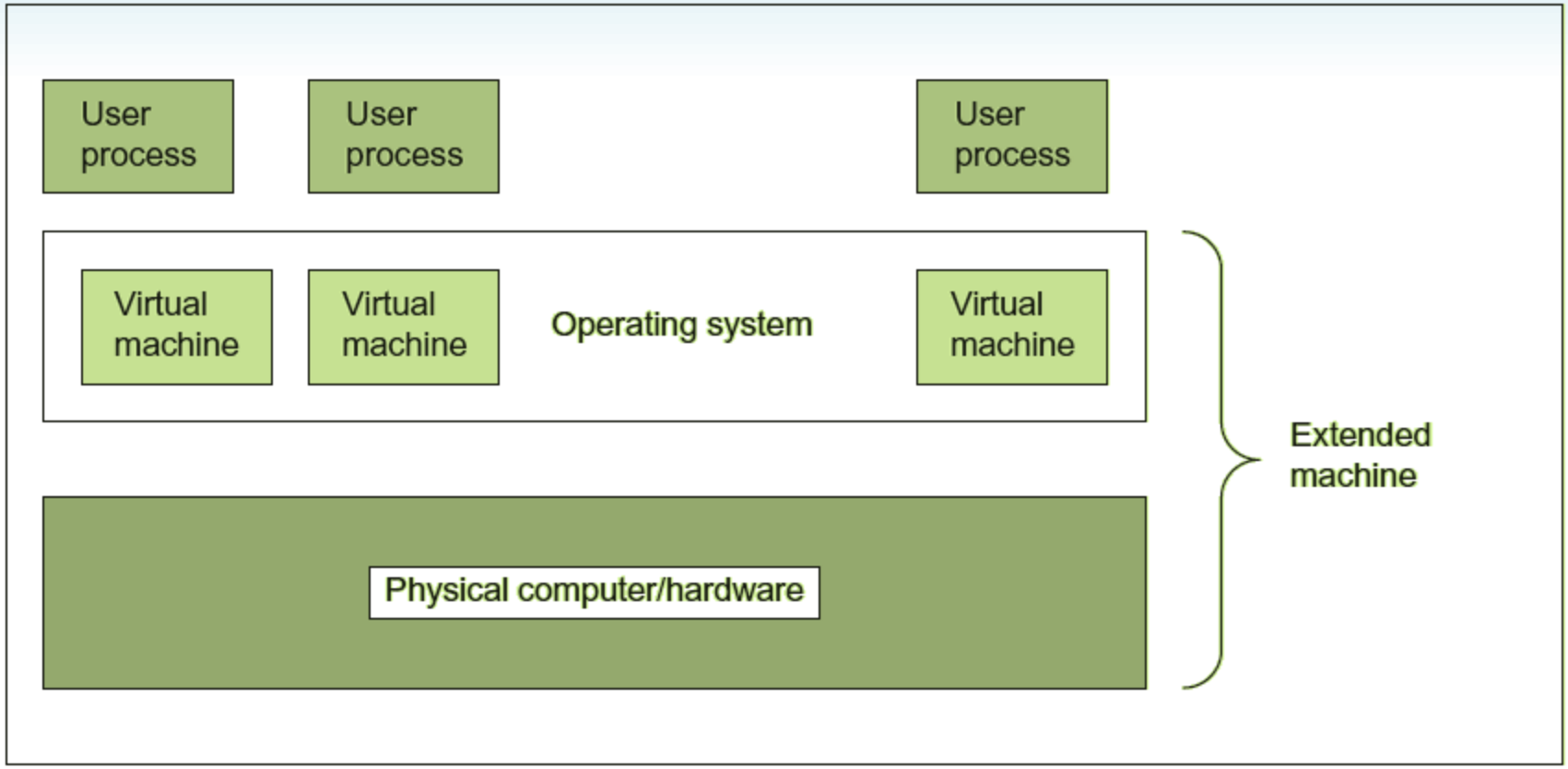
User view

- User Interface
- Program development and execution
- Accessing I/O operations
- Accessing File systems
- Error detection

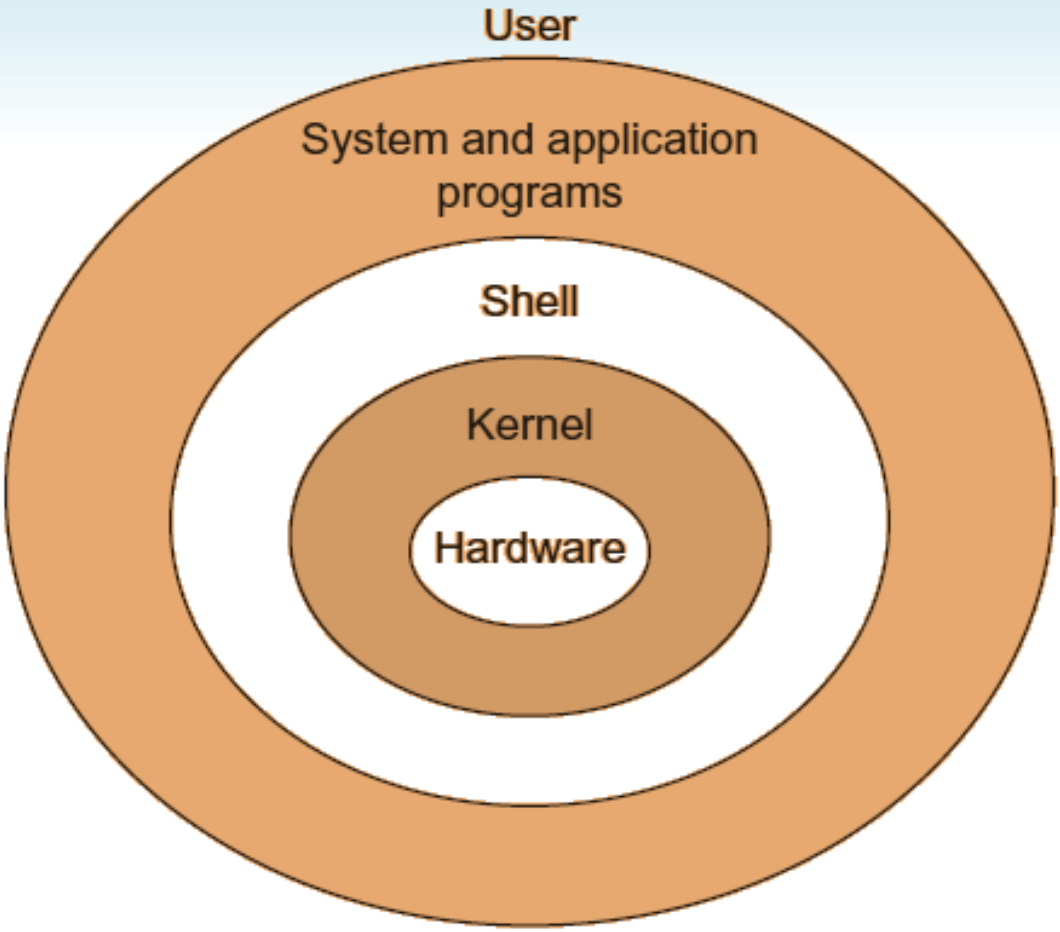
System view

- Resource manager
- Control Program
- Virtual machine manager

Operating system as a Virtual Machine Manager



Operating System Generic Components



Operating system structure with shell and kernel