**MODULE 1:**
Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine, Case study on UNIX and WINDOWS Operating System.

**MODULE 2:**
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF, Process management in UNIX

**MODULE 3:**
Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer-Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc., System V IPC

**MODULE 4:**
Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

**MODULE 5:**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation –Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures –Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, first in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU), Memory Management in UNIX

**MODULE 6:**

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

# Books

Operating System by P.B. Galvin

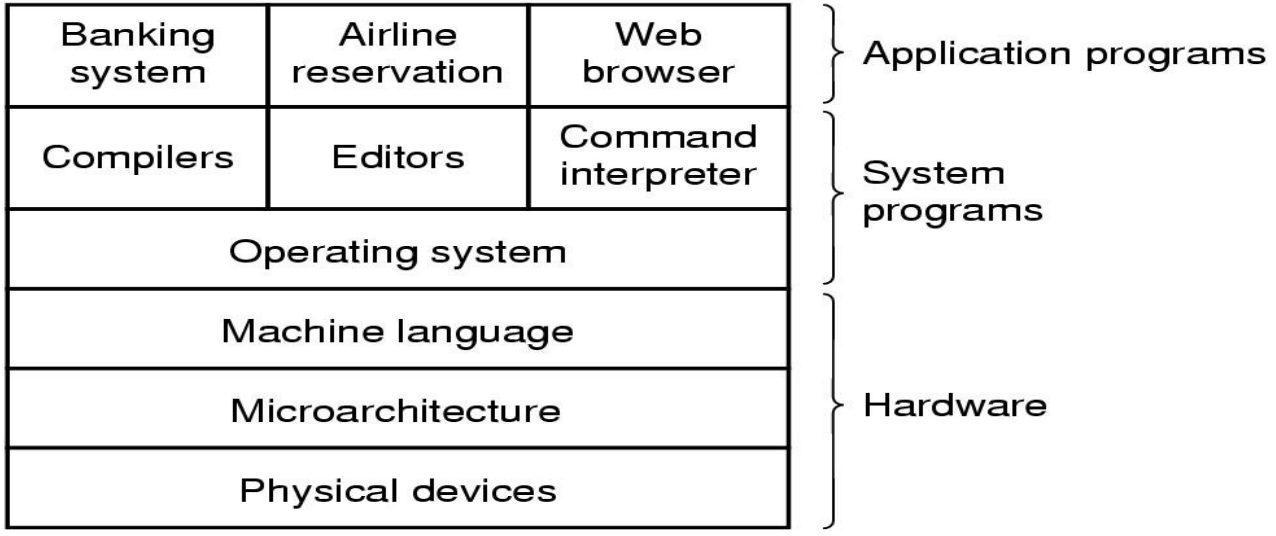
G.Gagne
A. Silberschatz

Operating System by Prof. D. M. Dhamdhere

# 1.1 General Definition

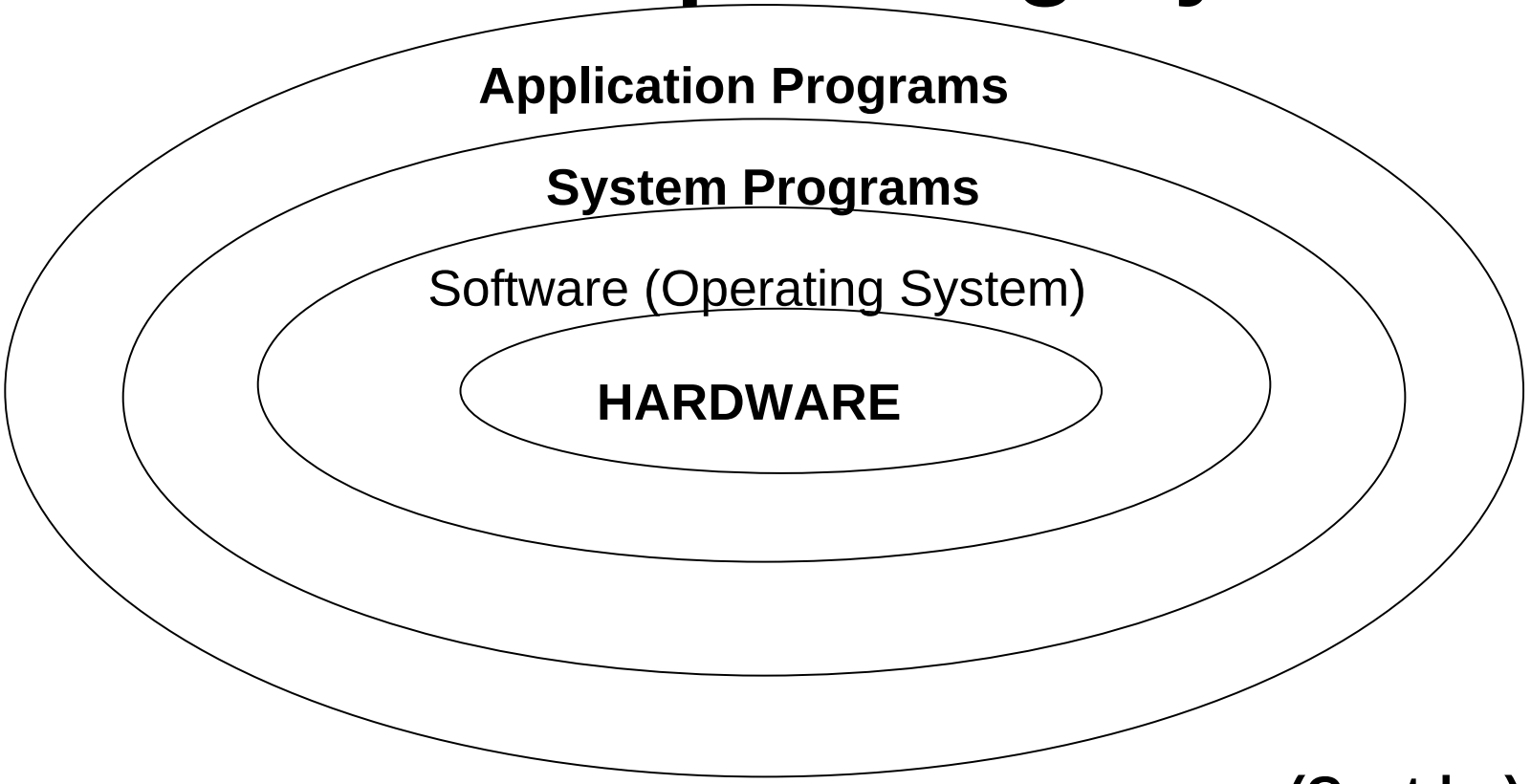
- An OS is a program which acts as an *interface* between computer system users and the computer hardware.
- It provides a user-friendly environment in which a user may easily develop and execute programs.
- Otherwise, hardware knowledge would be mandatory for computer programming.
- So, it can be said that an OS hides the complexity of hardware from uninterested users.

# Introduction




- A computer system consists of
  - hardware
  - system programs
  - application programs

# Structure of Operating System:




**(Contd…)**

# Structure of Operating System (Contd…):

- The structure of OS consists of 4 layers:
  1. **Hardware**

     Hardware consists of CPU, Main memory, I/O Devices, etc,

  2. **Software (Operating System)**

     Software includes process management routines, memory management routines, I/O control routines, file management routines.

     (Contd…)

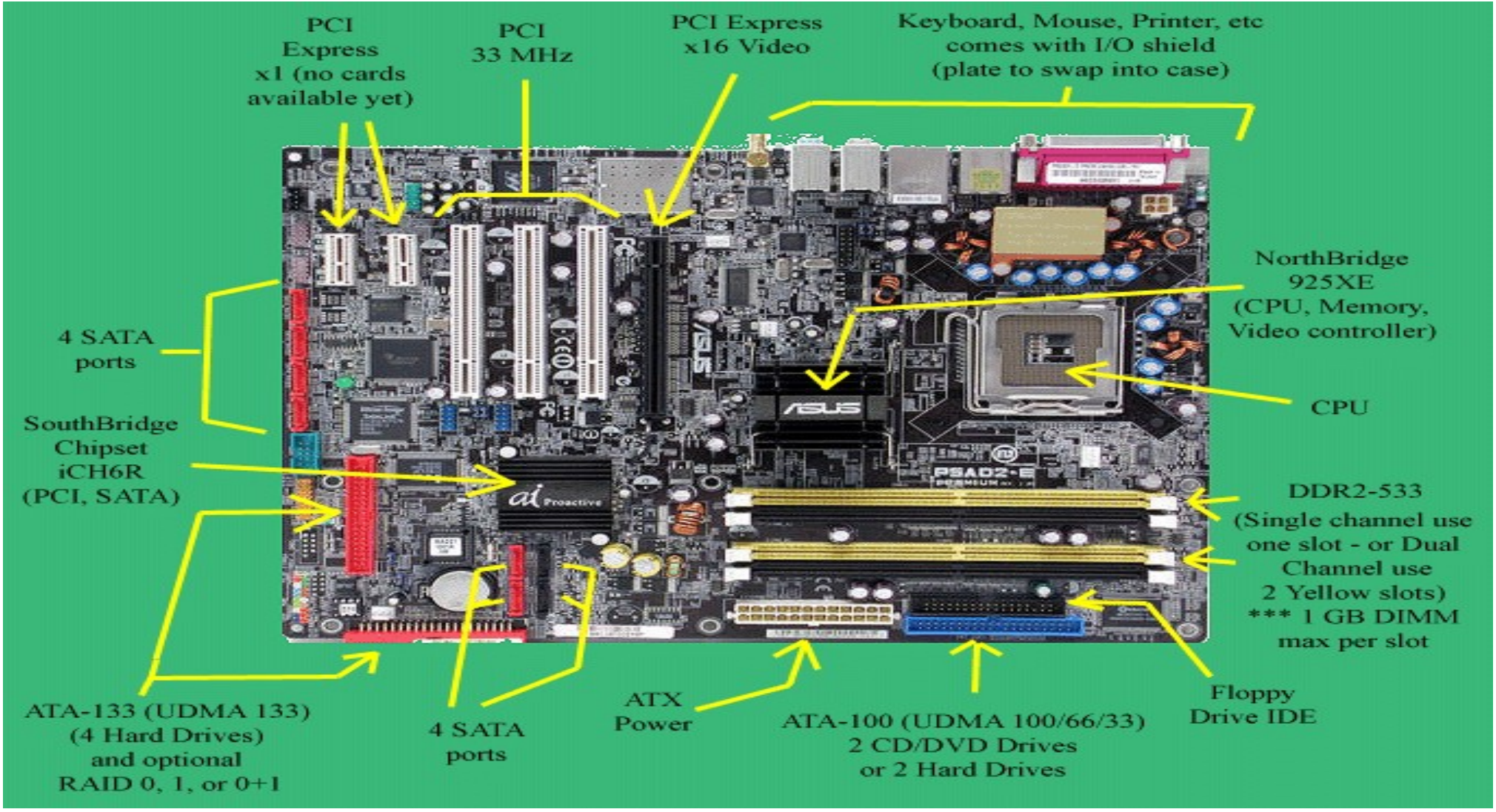
# Structure of Operating System (Contd…):

3. **System programs**

   This layer consists of compilers, Assemblers, linker etc.

4. **Application programs**

   This is dependent on users need. Ex. Railway reservation system, Bank database management etc.,


PCI Express x1 (no cards available yet)
PCI 33 MHz
PCI Express x16 Video
Keyboard, Mouse, Printer, etc comes with I/O shield (plate to swap into case)
NorthBridge 925XE (CPU, Memory, Video controller)
CPU
4 SATA ports
SouthBridge Chipset iCH6R (PCI, SATA)
DDR2-533 (Single channel use one slot - or Dual Channel use 2 Yellow slots) *** 1 GB DIMM max per slot
ATA-133 (UDMA 133) (4 Hard Drives) and optional RAID 0, 1, or 0+1
4 SATA ports
ATX Power
ATA-100 (UDMA 100/66/33) 2 CD/DVD Drives or 2 Hard Drives
Floppy Drive IDE

- We buy the computer hardware.
- Then we ask the vendor to install the operating system ( Windows , Linux , MAC....etc).
- Then we install the device drivers and anti virus.
- Then we can install the application software(MS word, VlC player ….etc)
- Then we start working on it.

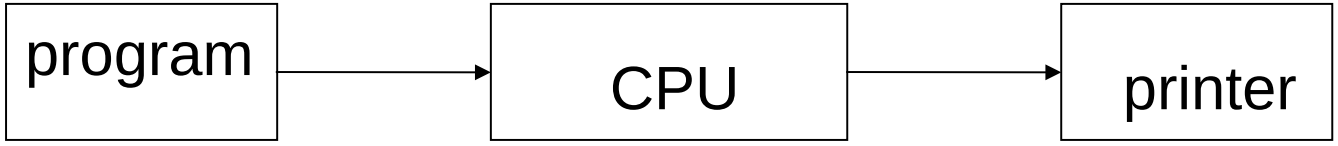
# History of Operating Systems

- First generation 1945 - 1955
  - vacuum tubes, plug boards
- Second generation 1955 - 1965
  - transistors, batch systems
- Third generation  1965 – 1980
  - ICs and multiprogramming
- Fourth generation 1980 – present
  - personal computers

# History

- Pre 1950 : the very first electronic computers
  - –valves and relays
  - –no OS
  - –single program ( written with 0 and 1)  with dedicated function

- Pre 1960 : stored program valve machines
  - –single job at a time
  - –Still program written with 0 and 1.
  - –OS just consists of a program loader



# Early Systems

- Structure
  - Single user system.
  - Programmer/User as operator (Open Shop).
  - Large machines run from console.