OPERATING SYSTEMS

Chapter 1: Introduction

Syllabus and Lesson Plan

- The Lesson Plan of OS
- The syllabus of OS
- Access the lesson plan and syllabus at http://mycse/cse

- The Slide does not contain all the information and cannot be treated as a study material for Operating System. Please refer the text book for exams.

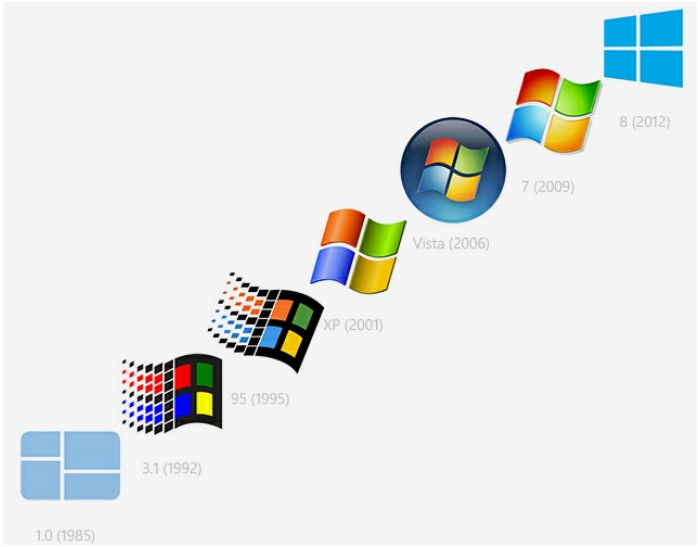
Chapter 1: Introduction

- What Operating Systems Do
- Operating-System Structure
- Operating-System Operations
- Process Management
- Memory Management
- Storage Management
- Protection and Security
- Special-Purpose System

What are the different Operating systems you aware of ?

Mac OS X

Google Chrome OS



android

openSUSE

fedora

solaris

ubuntu

How it all started??

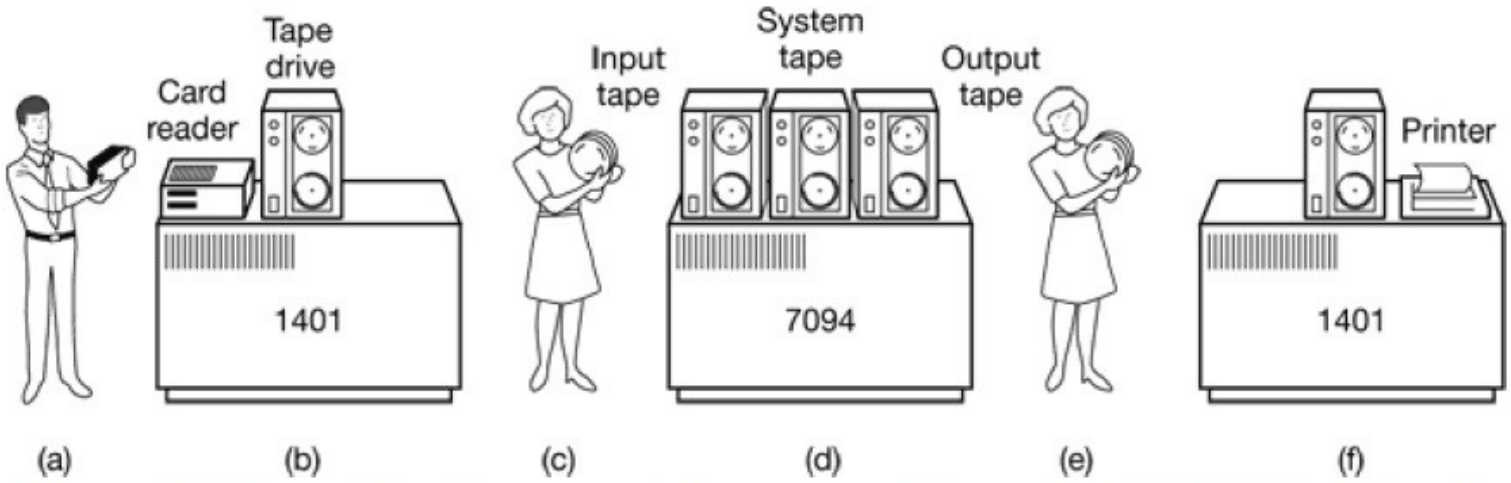
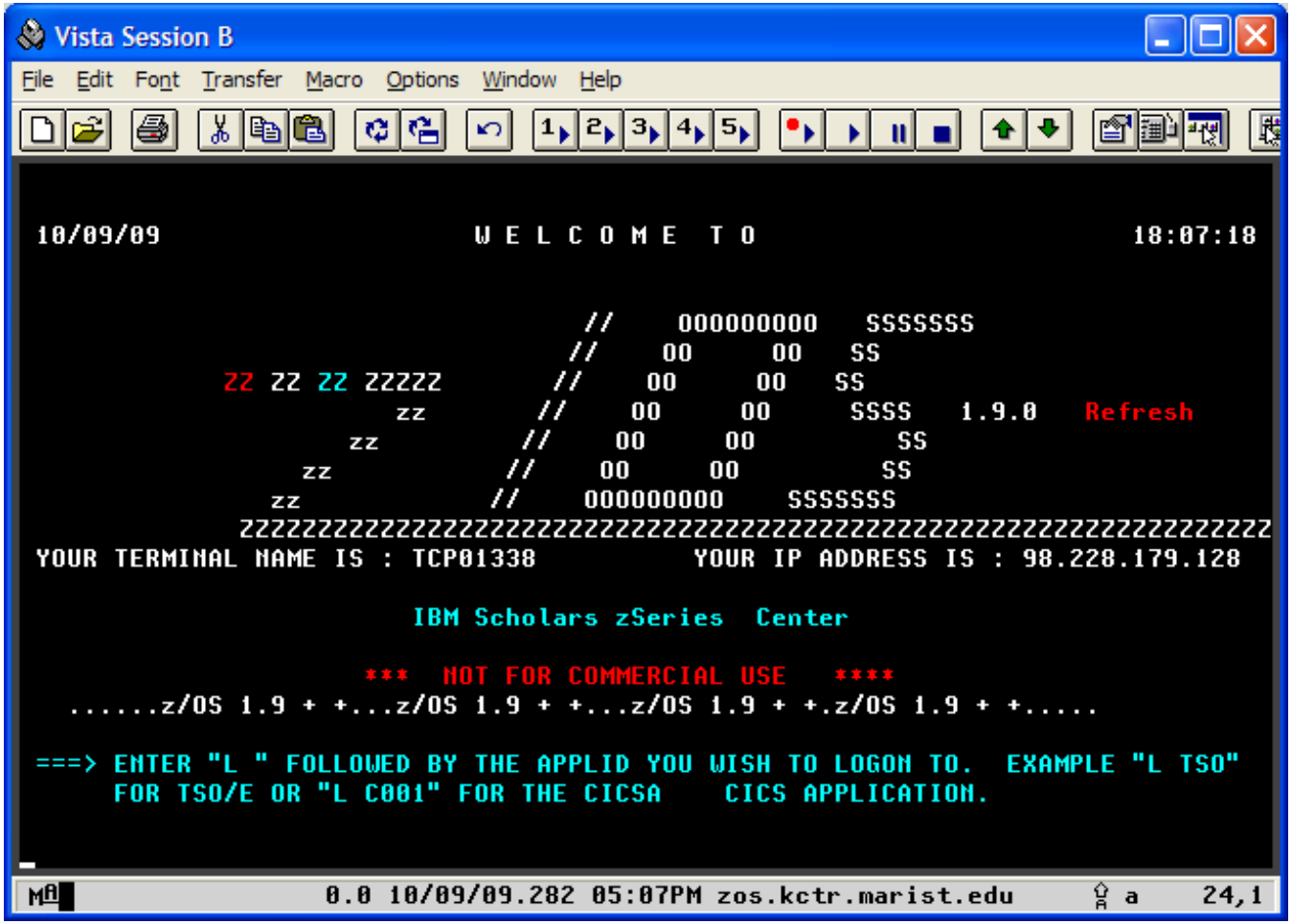
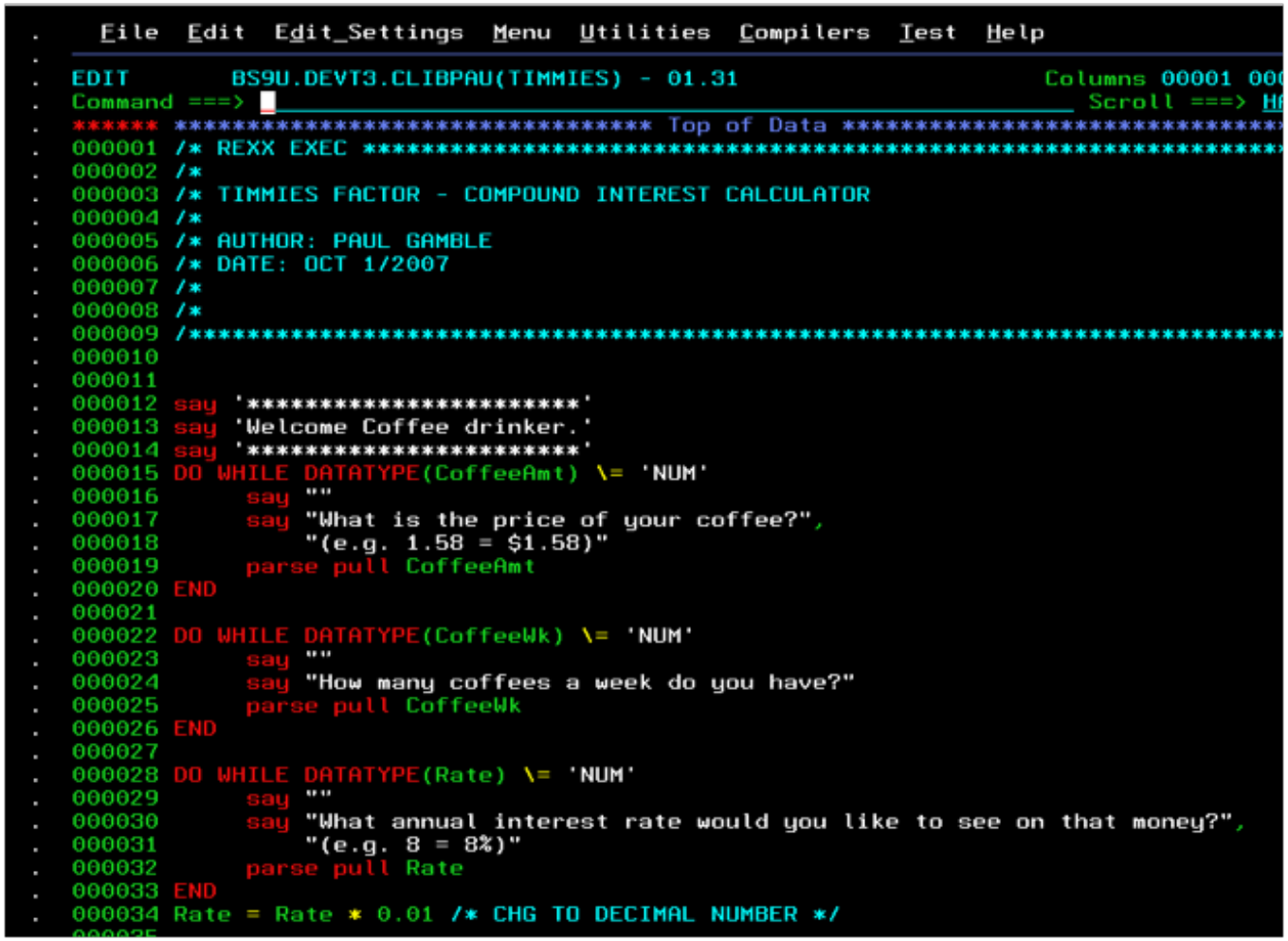


Figure 1-2. An early batch system. (a) Programmers bring cards to 1401. (b) 1401 reads batch of jobs onto tape. (c) Operator carries input tape to 7094. (d) 7094 does computing. (e) Operator carries output tape to 1401. (f) 1401 prints output.

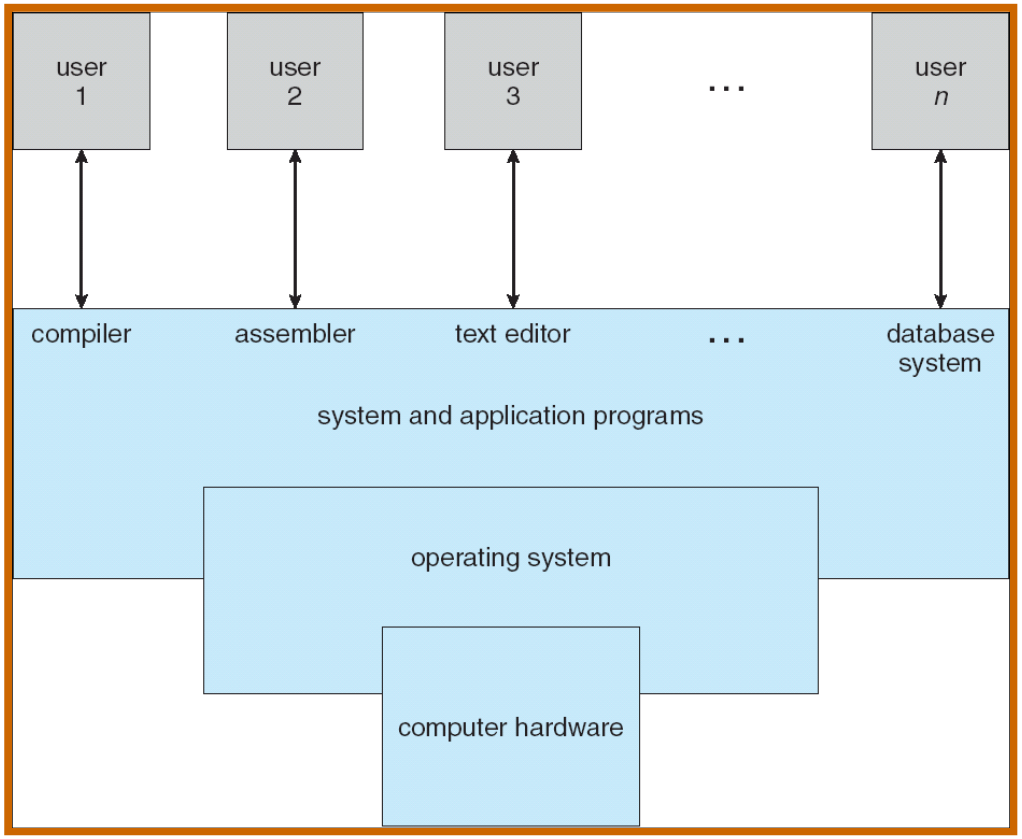
The main frame screen



The main frame screen

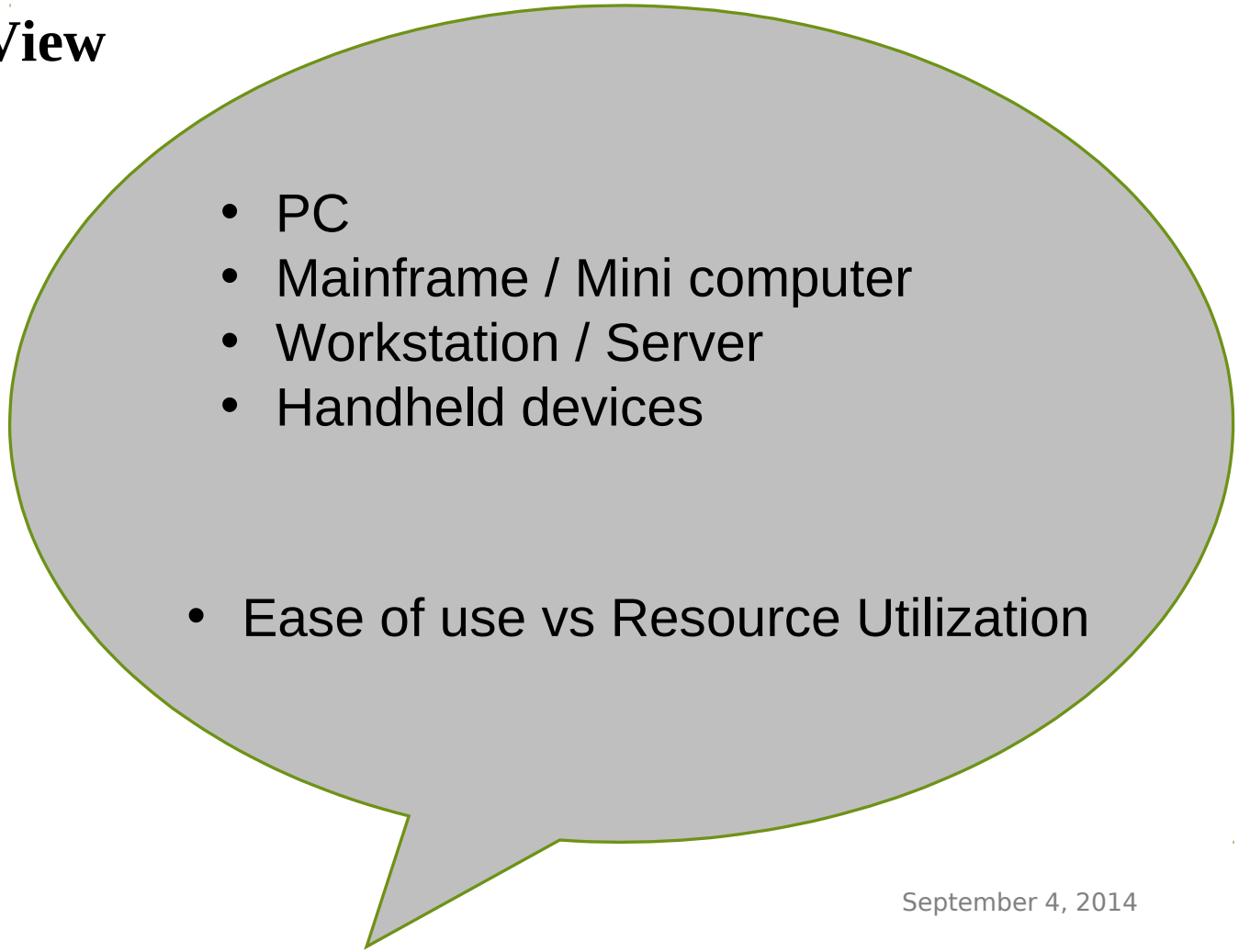


Four Components of a Computer System



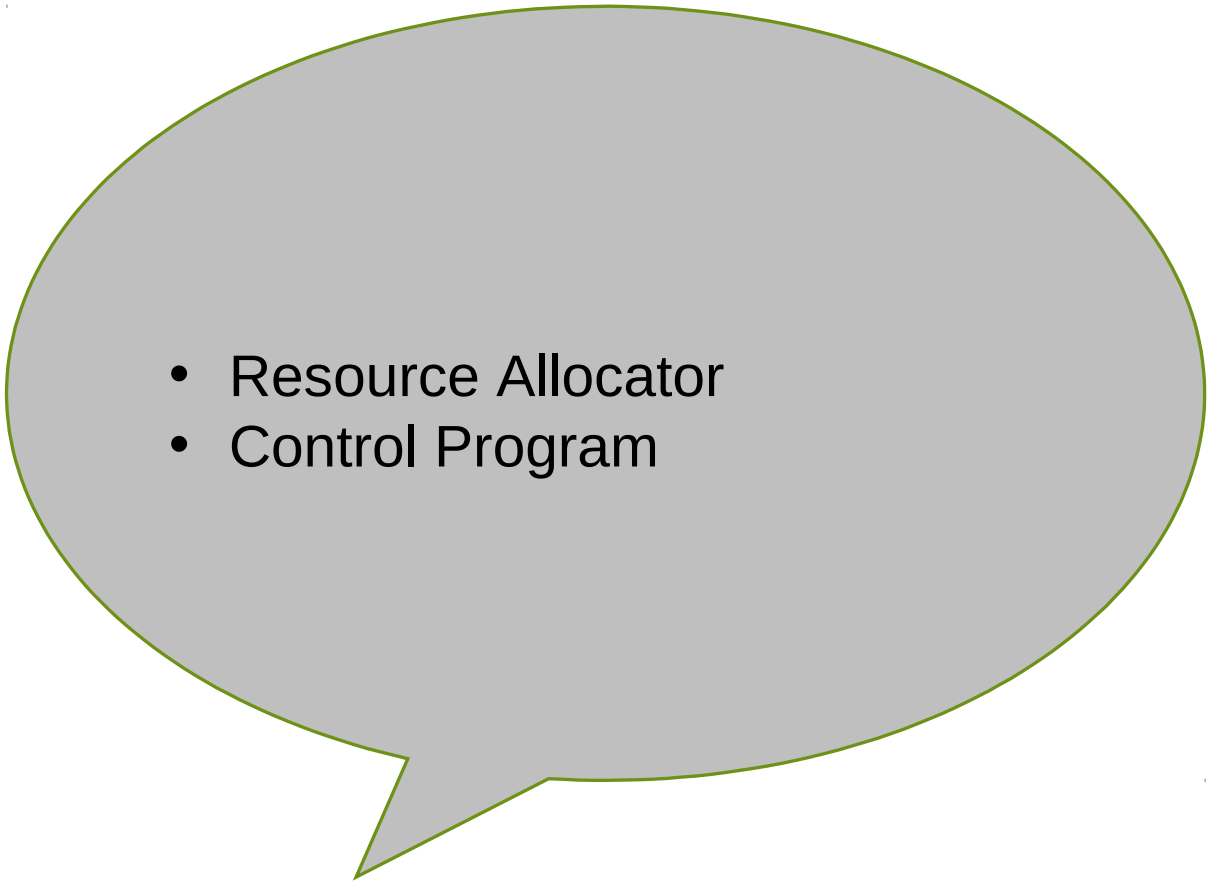
What OS Do??

- **User's View**



What OS Do??

- **System's View**



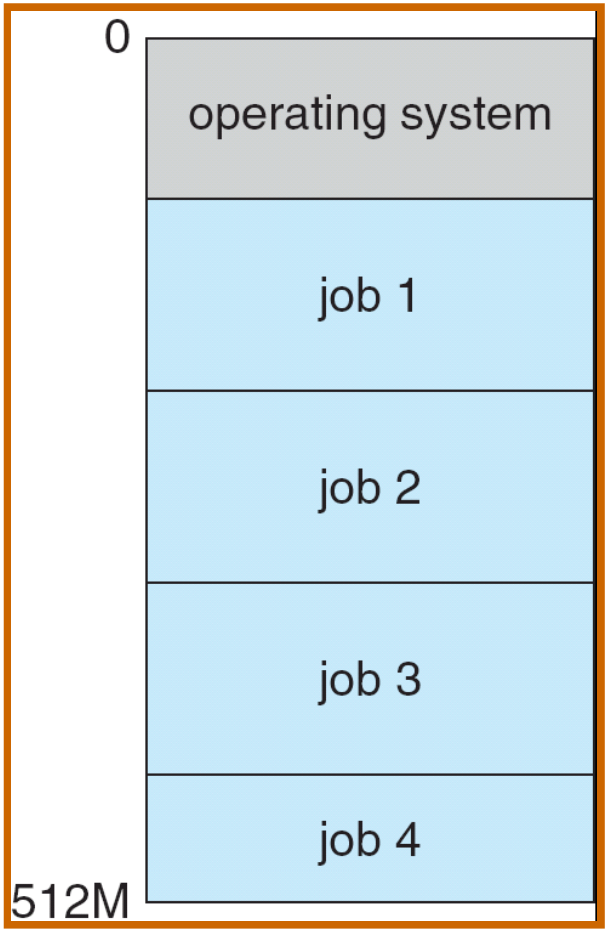
Defining operating System

- No Universally accepted definition - A program that runs all times on a computer (Kernel)
- What is the space taken by OS?

- Types of programs
  - System Programs
  - Application Programs

Operating System Structure

- **Multiprogramming**
  - Efficiency
  - Job Pool
- **Time sharing (Multi tasking)**
  - Creative Interactive Computing
  - CPU Scheduling
  - Virtual Memory and Swapping

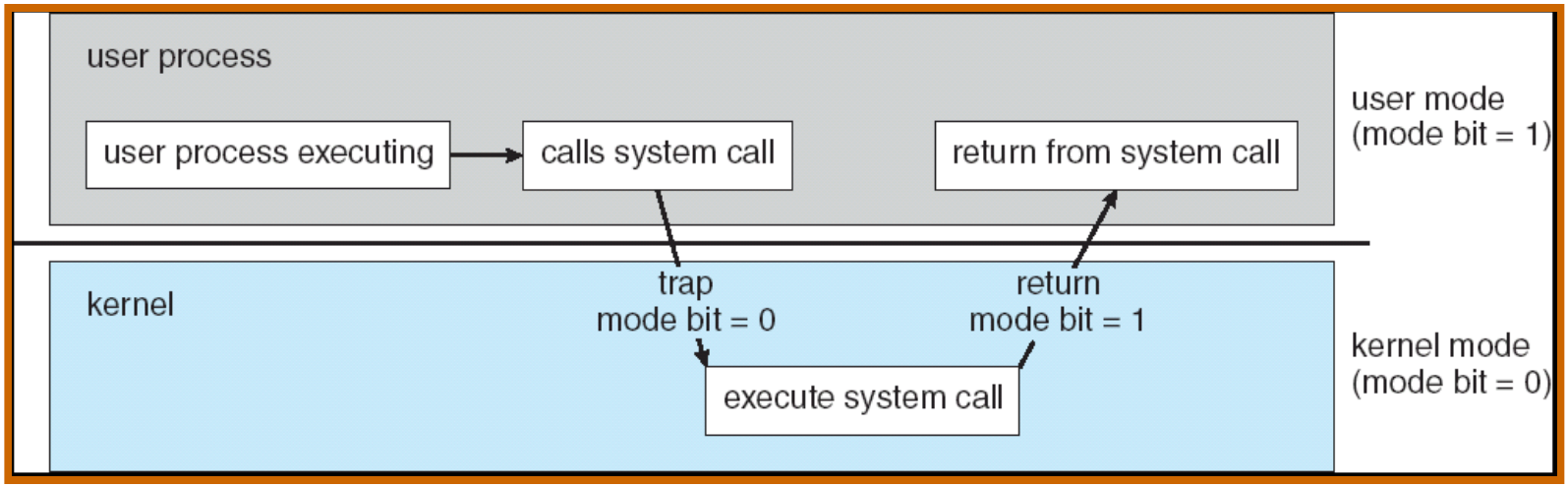


What is an OS ??

- **A magician —** provides each user with the illusion of a dedicated machine with infinite memory and CPU time
- **A government —** allocates resources efficiently and fairly, protects users from each other, provides safe and secure communication
- **A parent —** always there when you need it, never breaks, always succeeds
- **A fast food restaurant —** provides a service everyone needs, always works the same everywhere (standardization)
- **A complex system —** but keep it as simple as possible so that it will work

Operating System Operations

- **Dual-mode** operation allows OS to protect itself and other system components
  - **User mode** and **kernel mode**
  - **Mode bit** provided by hardware



Operating System Operations

- **System Calls -**System call is the method used by a process to request action by the OS
- **Privileged instructions -** The protection is accomplished by designating some machine instructions that cause harm as privileged instructions
- **Interrupt service Routine**
- What happens when an illegal instruction is executed?

Operating System Operations

- **Timer**

- Timer to prevent infinite loop / process hogging resources
- Variable timer is implemented by a fixed rate clock and a counter set by the OS

Process Management

- **What is a program?**
- Program is a *passive entity*, (contents of a file stored on a disk)

- What is a process?
- process is an *active entity*, (A process is a program in execution)

- Single thread vs Multi thread process (program counter)

Process Management Activities

- Creating and deleting both user and system processes
- Suspending and resuming processes
- Providing mechanisms for process synchronization
- Providing mechanisms for process communication
- Providing mechanisms for deadlock handling

Memory Management

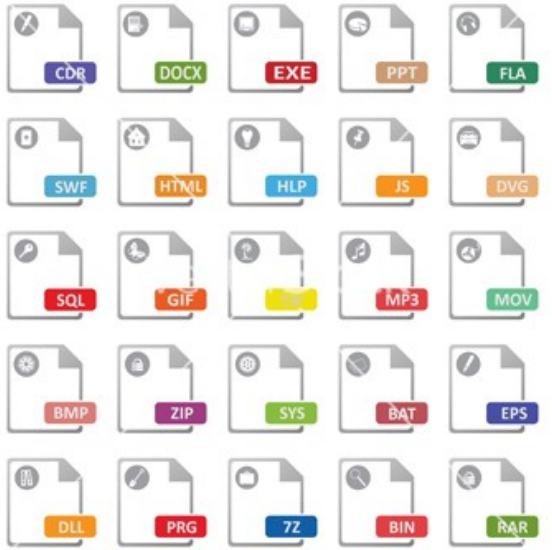
- CPU reads instructions from main memory – instruction-fetch-cycle
- Reads and writes data during data-fetch-cycle
- **Memory management activities**
- Book keeping parts of memory used and by whom
- Deciding which process and data to move in and out of memory
- Allocating and deallocating memory space needed

Storage Management

- File management system
- Mass Storage management
- Caching
- I/O Systems

File Management

- What is a file??
- Logical storage unit – abstracts from the physical properties of its storage devices



File Management

- What are the different kinds of storage media?
- Magnetic Disk
- Optical Disk
- Magnetic tape

File Management

- What are the characteristics of storage media?
- Access speed
- Capacity
- Data transfer rate
- Access method(sequential/random)

Mass Storage Management

- **Activities of OS**
- Free space management
- Storage allocation
- Disk Scheduling

- Tertiary storage CD, DVD
- WORM vs RW
- May push the task to Application Programs

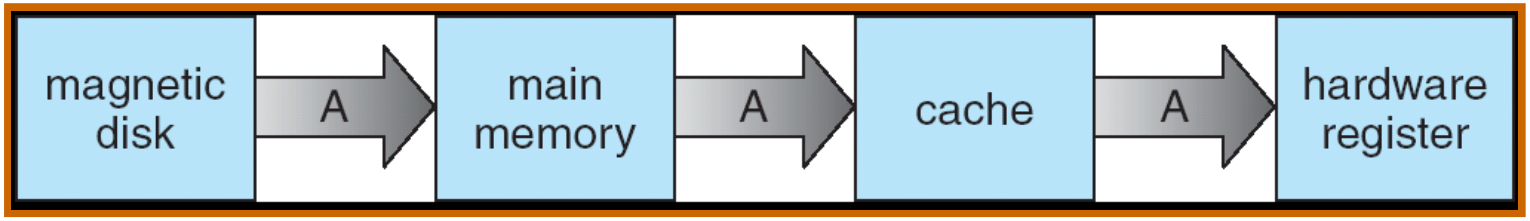
Caching

- Index registers vs Hardware (Instructions)
- Limited size – cache management
- Data at different levels of hierarchy

Level	1	2	3	4
Name	registers	cache	main memory	disk storage
Typical size	< 1 KB	> 16 MB	> 16 GB	> 100 GB
Implementation technology	custom memory with multiple ports, CMOS	on-chip or off-chip CMOS SRAM	CMOS DRAM	magnetic disk
Access time (ns)	0.25 – 0.5	0.5 – 25	80 – 250	5,000.000
Bandwidth (MB/sec)	20,000 – 100,000	5000 – 10,000	1000 – 5000	20 – 150
Managed by	compiler	hardware	operating system	operating system
Backed by	cache	main memory	disk	CD or tape

Caching

- Movement of information – explicit vs implicit
- How data is moved between different levels? (a++)
- When there are many processors?
- Cache Coherency



I/O Systems

- Hide peculiarities of hardware – known to device driver
- **Components of I/O subsystem**
- Memory management component – buffering, caching, spooling
- A general device driver interface
- Drivers for specific hardware device

Protection and Security

- **Protection –** Any mechanism for controlling the access of processes or user to the resources defined by the computer system

- **Security –** defense of the system against internal and external attacks
  - Huge range, including denial-of-service, worms, viruses, identity theft, theft of service

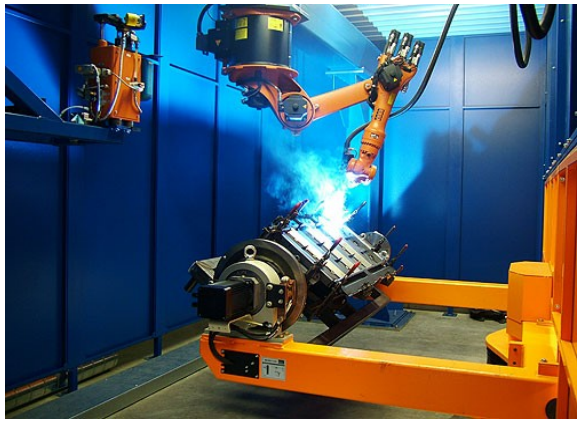
- User ids, group ids are used to distinguish.

Special Purpose Systems

- Real time embedded Systems
- Multimedia Systems
- Handheld systems

Real time embedded systems

- Rigid time constraints - control device
- Sensors bring data – cannot miss the dead line
- Medical Imaging, Industrial Control systems, Automobiles, home appliances, avionics



Multimedia Systems

- Process audio video files
- Live webcasts
- Soft real time system - a little delay wont cause any damage

Hand held Systems

- PDA’s palm and pocket PC’s , Cellular telephones
- **Issues**
- Limited size – small memory,
- slow processor and
- small display screen

REFERENCES

- http://stst.elia.pub.ro/news/SO/Modern%20Operating%20System%20-%20Tanenbaum.pdf
- http://www.dailymorningcoffee.com/wp-content/uploads/2013/02/windows-evolution.jpg
- https://design.ubuntu.com/wp-content/uploads/ubuntu-logo112.png
- http://www.retep.sk/fedora/logo.png
- http://www.unixstickers.com/image/cache/data/stickers/opensuse/Opensuse-logo+type-wog.sh-600x600.png
- http://3.bp.blogspot.com/-p5OCxowfsZc/UE7uIhYG7xI/AAAAAAAAAqM/LC4b4ncH5IY/s1600/Mac-OS-X-logo.gif
- http://www.millennialmainframer.com/wp-content/uploads/blogger/-OuuMa_5nqb8/USrxr7K99HI/AAAAAAAAAYro/664ntcRe_jg/s1600/image016.gif
- http://faculty.cs.niu.edu/~leon/benson_tso_guide/images/tn3270%20welcome%20to%20zos.png

REFERENCES

- http://www.prosofteng.com/recovery_101/images/10149_TDRC_ICON_trashFILES_V2.png
- http://cdn.vectorstock.com/i/composite/23,25/computer-files-icons-vector-1082325.jpg
- http://museum.ipsj.or.jp/computer/device/magnetic_disk/images/0071_01_l.jpg
- http://www.digitalmatrix.us/images/intelli/Optical%20Disc%203.jpg
- http://www.blogcdn.com/kr.engadget.com/media/2010/01/magnetic_tape-by-ibm-and-fujifilm.jpg
- http://www.duceyavionics.ca/images/kingairC90.jpg
- http://blog.robotiq.com/Portals/13401/images/5-kuka-welding-robot.jpg