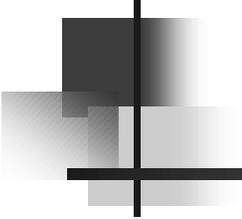
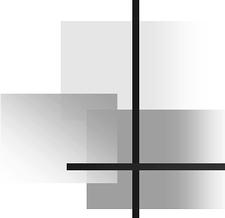


# Chapter 1



# CS 3204: Introduction

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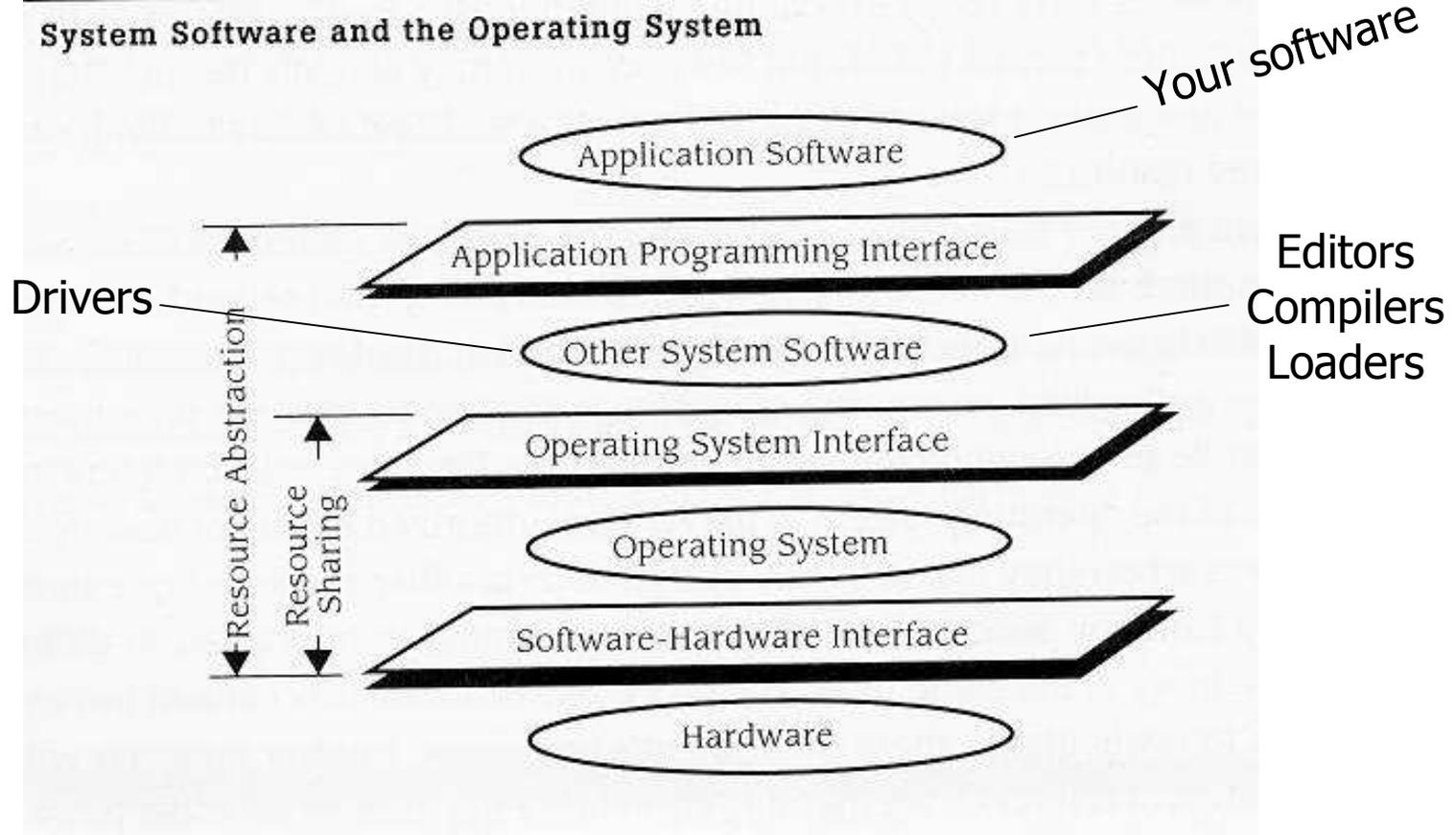


# What is an Operating System (OS) ?

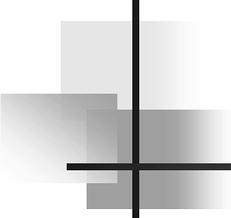
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- Definition 1:
  - An OS is the interface between the hardware and the software environment, equivalent to an *extended* or *virtual* machine
- Definition 2:
  - An OS is a resource manager – provides “resource abstraction”
- In fact, it achieves 1 through 2.
- Therefore, both definitions are applicable at some times.

# System Software and the OS interface



*from the textbook*



# Resource Abstraction

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- How does the OS “manage resources” ?
  - By providing *Resource Abstraction* to the other system software and applications
- What is Abstraction ?
  - Abstraction hides the details
  
- *Resource Abstraction*
  - hides the “nitty-gritty” details of the underlying resource

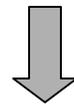
# Resource Abstraction ... an example

(Consider the C language statement `fprintf` )

```
fprintf ( fileId , "%d" , var1 )
```



```
write ( block , 100 , device , 266 , 9 )
```

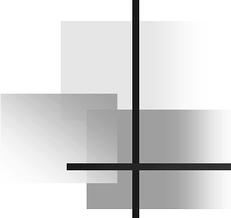


```
load ( block , 100 , device )
```

```
seek ( device , 266 )
```

```
out (device , 9 )
```

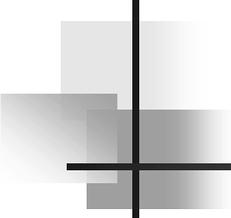
Multi-level  
abstraction



# Resource Abstraction

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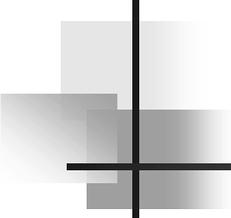
- Typical resource abstractions
  - Memory
  - Disk
  - Keyboard
  - Monitor



# Resource Sharing

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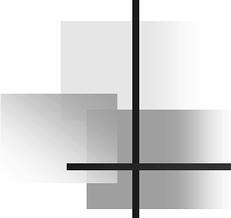
- Managing resources through abstractions implies the ability to '*share resources*'
- Types of Sharing:
  - Space Multiplexed
    - Divided into 2 or more distinct units of resource
    - Example: disk, memory
  - Time multiplexed
    - Exclusive control for a short period of time
    - Example: processor



# Resource Sharing

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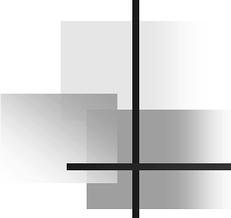
- Multiple processes accessing same resource concurrently
- Isolation: only one processor has access at any given time



# Terminology

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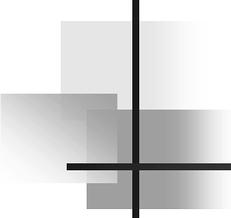
- **Concurrency**
  - The simultaneous execution of different programs
  - Types of Concurrency
    - **Physical** – multiple processors → Simultaneous access to memory
      - Example: CPU, I/O
    - **Logical** – interleaved execution → Lost updates
      - Example: processes
- **Multiprogramming**
  - The concurrent execution of multiple programs on a single processor
  - Could be space-multiplexed into memory and time-multiplexed in processors



# OS Strategies for Providing Services

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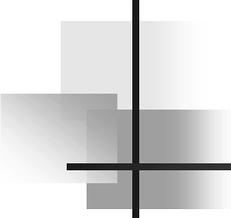
- Batch
- Time share
- PCs and Workstations
- Process Control & Real-time systems
- Networked



# Batch processing systems

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- Sequentially loaded set of jobs
- Supported multiprogramming
- Jobs compete for Resources
  - 1<sup>st</sup>: memory
  - 2<sup>nd</sup>: processor
  - 3<sup>rd</sup>: ???
- No “real time” interaction between user and computer
- Current examples include .bat files under DOS – Windows, shell files under Unix/Linux



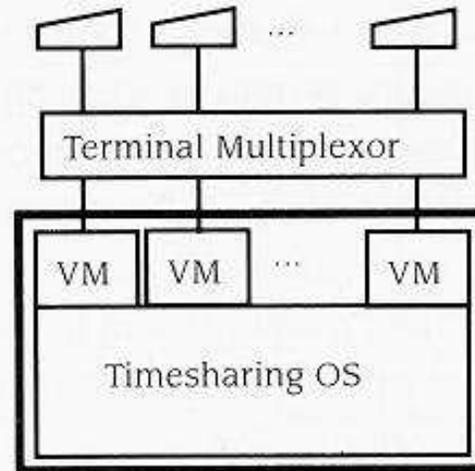
## Time share (1970s)

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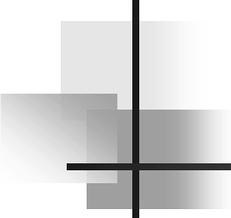
- Multiprogramming environment
- Multiple interactive users
  
- Why time-share (TS) ?
  - To spread the cost of large machine
  - To fully utilize computing power
  
- TS provides each user with his/her own Virtual Machine

# Time share system...

A Timesharing System



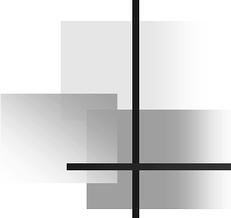
*from the textbook*



## Time share... ctd.

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- TS eventually supported multitasking
  - Multitasking:
    - A time share system that support multiple processes per user, where.
    - A process is a “program in execution
- TS elevated the importance of
  - Need for barriers and safeguards among users and there processes - User/User & Process/Process
    - Memory protection
    - File Protection



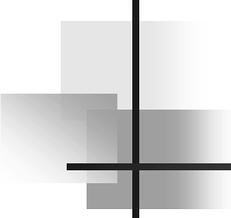
# Personal Computers (PCs) & Workstations

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- Originally
  - Single User
  - Single Processor
  
- Now
  - Single or Multiple Users
  - Multiprogrammed

# PCs Workstations... Evolution

- Earlier machines
  - Too large, too expensive, and too fast for one person
- Mini-computers
  - Smaller versions (like DEC PDP), yet they too grew in size
- Micro-computer
  - Single chip processor
- Workstation
  - Multiple user
  - Multiprogrammed
  - Multitasking



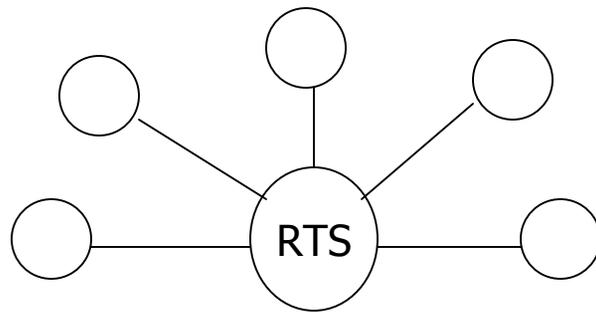
# PCs & Workstations... Contribution

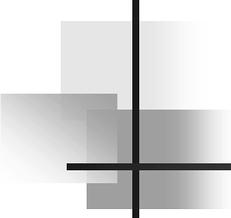
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- Contributed to the growth of
  - Networking
    - Email
    - File server
  - Point and click interface
    - Like that in Mac and Windows

# Process Control & Real time Systems

- Process Control Systems (PCS)
  - Single application monitoring one process
  - Example: System to monitor the heat of a liquid
- Real Time Systems (RTS)
  - Tied together Process Control Systems



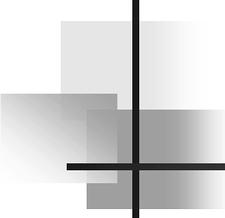


# Real Time Systems... type

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- Hard RTS
  - Had timing constraints that COULD NOT be missed
  - Example: Chemical processes, Nuclear power plants, Defense systems
- Soft RTS
  - Make best effort to accommodate time constraints
  - Example: Transaction processing (ATM)

RTS: Tradeoff of generality of operations/functionality to ensure that deadlines can be made

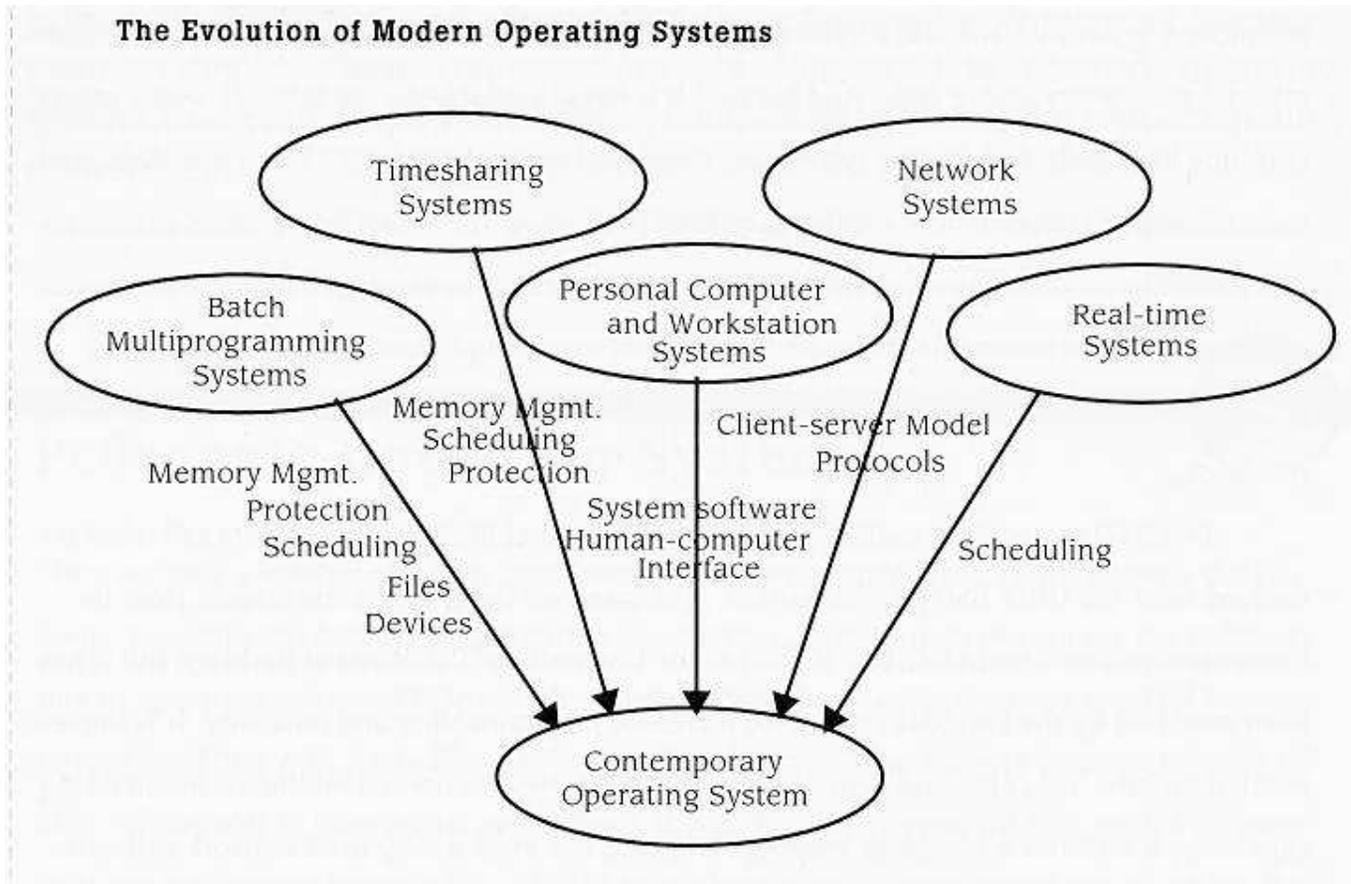


# Networks of Computers

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- Problem is too large
  - Partition it among machines
- Communication exchange
  - Email
  - File transfers
- Servers
  - File
  - Printer
  - Database
- Provide access to non-local resources
  - LAN, WAN
  - Client / Server

# Summary



*from the text book*