

# Computer and Information Technology

LECTURE 3

CLASSIFICATION OF COMPUTERS

# Types of Computers

## According to Processor and Storage Capacity

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Depending upon its purposes and sectors of use, a digital computer can have one to thousands of processors, can have couple of secondary storage to massive hundreds of thousands of storage units. We are about to classify digital computers based on its capacity to learn about them. We mainly categorized them as:

- Supercomputers
- Mainframe Computers
- Mini Computers
- Micro Computers

# Types of Computers

## According to Processor and Storage Capacity

**Supercomputers** have thousands of interconnected high performance processors. Usually they are divided into segments called blades and each blade has multiple nodes housing high performance multicore CPUs and GPUs. They are equipped with high performance custom made cache and main memory units. At a glance, supercomputers have:

- ❖ Hundreds of thousands CPU and GPU
- ❖ Housed in big spacious floors in a building
- ❖ Massive primary and secondary storage
- ❖ Can execute Quadrillions\* of instructions in a second
- ❖ Requires intensive heat management and electric power

(\*1 Quadrillion = 1000 Billion)

# Types of Computers

According to Processor and Storage Capacity

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Let's check this  
video

Summit the  
Supercomputer  
by CNBC

# Types of Computers

## According to Processor and Storage Capacity

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### **Uses of Supercomputers**

- ❖ Control and management of cores in nuclear plants.
- ❖ Checking and designing aircraft, spacecraft and massive plants in simulation.
- ❖ Launch, control and station keeping of spacecraft and satellites.
- ❖ Complex scientific calculations and simulations in the field of Genetic Engineering and Bioinformatics.
- ❖ Observation of space and facilitate early warnings for catastrophic or significant astronomical events.
- ❖ Nuclear test, weapon design, weather forecasting and many more.

# Types of Computers

## According to Processor and Storage Capacity

**Mainframe computers** (or just mainframe) are purpose built for handling massive data transmission requests from remote devices or terminals via high speed computer networks. For this they contain massive secondary storage devices connected via internal high performance networks. Mainframe may not have that many processors like a supercomputer but it has to have enough to handle millions of data transmission requests in a second. Mainframe have:

- ❖ Massive storage capacity
- ❖ Can handle millions of data transmission and transaction requests
- ❖ Uses thousands of purpose built co-processors to handle data transfer. These co-processors are actually called I/O card.
- ❖ Requires intensive heat management and electric power

# Types of Computers

According to Processor and Storage Capacity

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Let's check this  
video

Mainframe Z14  
made by IBM



# Types of Computers

## According to Processor and Storage Capacity

### **Uses of Mainframe**

- ❖ Hosting websites that requires massive storage & data transmission requests.
- ❖ Used to handle millions of transaction requests for E-commerce activities
- ❖ Used by banks to handle transactions and customer account information.
- ❖ Used by airlines and other transportation companies for bookings and reservations.
- ❖ Used by military to handle communications and tracking.
- ❖ Used in academic research where massive knowledge sharing are required in a group of researchers are required.



# Types of Computers

## According to Processor and Storage Capacity

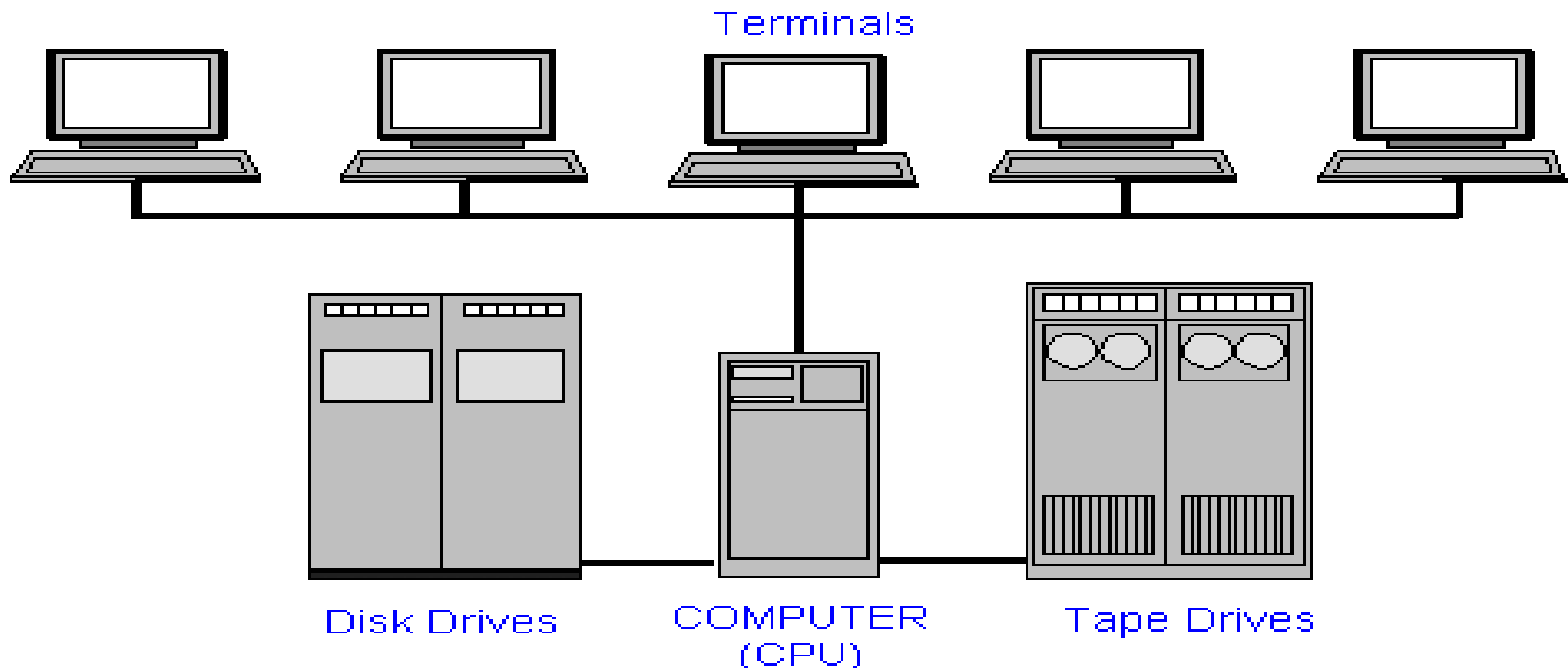
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**Minicomputer** is a class of computer that gained popularity during 1960s as low cost alternative to super and mainframe computers. Cheaper and smaller sized computers with less processing and storage handling capability compared to supers and mainframes were marketed as minicomputers. With time the necessity of such computing system declined but computers serving mini computers' purposes are now known as servers and workstations. Minis had:

- ❖ Capabilities to work for a number of clients in a client server network.
- ❖ Used for scientific and research purpose.
- ❖ Used as a server in a time sharing system with terminals.

# Types of Computers

According to Processor and Storage Capacity



*A typical mini computer serving terminals in a time sharing system*

# Types of Computers

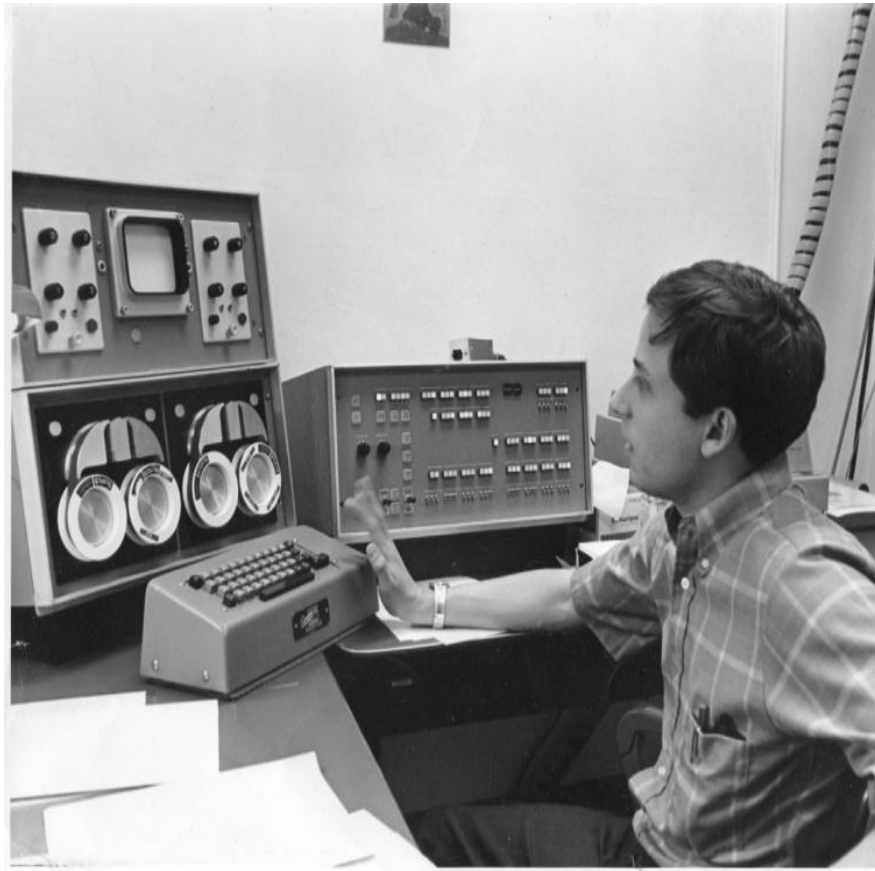
## According to Processor and Storage Capacity



# Types of Computers

## According to Processor and Storage Capacity

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# Types of Computers

## According to Processor and Storage Capacity

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# Types of Computers

## According to Processor and Storage Capacity

**Microcomputer** became popular after the invention of microprocessor that reduced the size of computers and made them too small that a whole could sit on a desktop (hence came the name desktop computer) and the cost reduction allowed manufacturer to aim at individual users instead of organizations (hence came the name personal computer or PC). At a glance:

- ❖ Microcomputers are built using one microprocessor.
- ❖ Small enough to sit on one's table.
- ❖ Storage and processing capacity good enough to target individual user for general purpose use,
- ❖ Price is low enough to target general customers for variety of uses.

# Types of Computers

More to know.....

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## **Server**

Servers are high performance computers to establish and maintain a network. They are usually more powerful than any micro computer utilizing multiple desktop processors or purpose built special processors. Interconnected high performance servers are used in data centers and these data centers hosts websites like facebook.

Even a small office may have their own server to run their LAN, intranet, extranet and can host their own mail server.



# Types of Computers

More to know.....

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## **Workstation**

Workstation is the new name for minicomputers. A typical workstation may have 2 or more high performance microprocessors connected in a purpose built main board.

Now a days, research labs uses this type of high performance computer system to perform simulations, complex scientific calculations and researchs

# Types of Computers

More to know.....

## **Terminal**

Terminals are low cost computers connected to high performance computers like super, mainframe, mini and servers. Dozens of user can access a high performance computer from their terminals simultaneously in a cost effective manner. Usually a time sharing OS runs this kind of system. There are three types of terminals:

1. Dumb Terminal – has no data processing capability.
2. Smart Terminal – has limited processing capability.
3. Intelligent Terminal – has full power processing and storage units of its own and can do its own data processing, yet it is connected to another high performing computer to use that computers resources.

# Types of Computers

## Based on Working Principle

According to working principle we have:

- 1) Analog Computers
- 2) Digital Computers
- 3) Hybrid Computers

They are distinguishable according to the type of input they get and how they are processed.



**Analog Computer**

**Vs.**



**Digital Computer**

# Types of Computers

## Based on Working Principle

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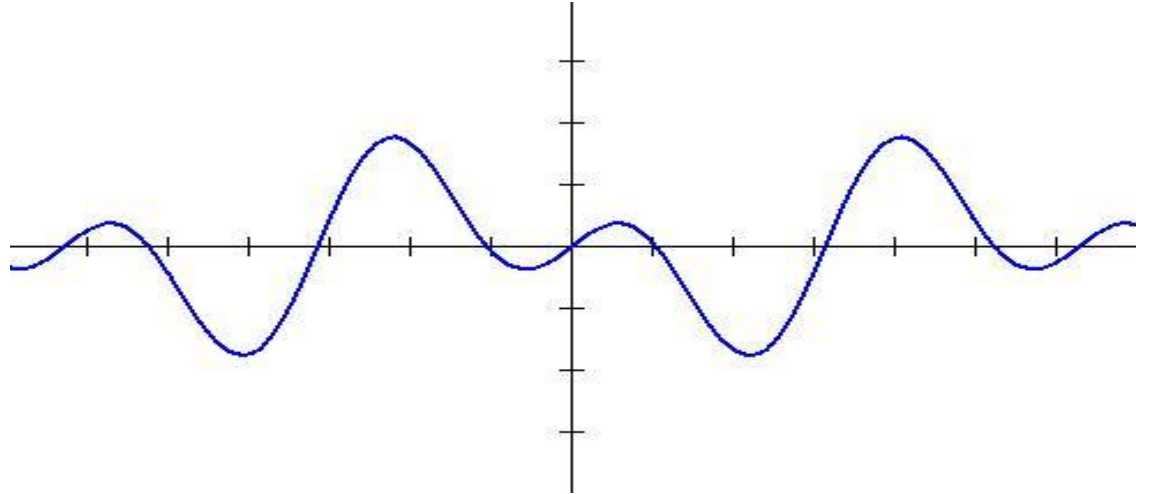
### **Analog Computer**

Analog computers process analog or continuously varying data. They operate on mathematical variables in the form of physical quantities that are continuously varying. For example temperature, pressure, voltages, length, velocity, etc.

The basis of the working of the analog computers is *modeling*. Any real physical process can always be replaced by a mathematical model having the similar properties. Usually we convert a system having analog quantities into its electrical analogy to make a mathematical model for computation.

# Types of Computers

## Based on Working Principle



*An analog computer (to the left) and a typical time varying continuous analog signal converted to its electrical form during modeling.*

# Types of Computers

## Based on Working Principle

### **Points to Remember for Analog Computers**

- Used to perform computation of continuously varying physical phenomenon.
- It works on the principle of measurement.
- Continuously varying physical quantities like pressure, temperature, distance gap, velocity, etc. are all converted into their equivalent electrical quantities.
- These converted signals are then fed to analog computers which uses its inverters, summers, multipliers, integrators and comparators to perform computation.
- Results are shown in meters, scopes or directly fed to a any machine that was under the control of that computer.

# Types of Computers

## Based on Working Principle

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### **Digital Computer**

Digital computer process data which is binary and in the form of 0s and 1s. Almost all the computers around us are digital computers. It accepts discrete values as input and internally it represents all these values as series of 0s and 1s. As it is easier for a circuit to understand the presence and complete absence of electricity in a circuit and it can be done using high speed electronic switches, digital computers employs this number system called binary consisting of only 1s and 0s.



# Types of Computers

## Based on Working Principle

### **Points to Remember for Digital Computers**

- Works on the principle of counting.
- Inputs are discretely varying data represented by 0s and 1s after encoding.
- Even after processing, the results that are generated are also discrete in nature. These results are view in monitors or can be collected from a printer.
- They are cheap and reliable (no ambiguity like analog computers)
- Can have way more data storage capacity.
- Digital computers have broad scope of programming for various purposes.

# Types of Computers

## Based on Working Principle

### **Hybrid Computers**

Hybrid computers are combination of analog and digital systems. Usually a hybrid computer has input devices to take analog inputs. These analog inputs are then converted into their digital equivalent by means of ADC devices and fed into the digital processing unit of the computer. After computation, results may stay in digital form or converted back to its analog form using DAC devices.

Example of hybrid system can be flight control computer, naval navigation computer systems, CT scan device, life support system, even a typical gas statiol pump.

# Key Differences Between Analog and Digital Computers

## Analog Computers

## Digital Computers

Works on the principle of measurement	Works on the principle of counting
Uses continuous ranges of values to represent information.	Uses discrete or discontinuous values to represent information.
Continuously varying voltage is fed as input to the system for manipulation using inverters, summers, multiplier, integrator, comparator or divisor to obtain the result.	Digital computers accept only discrete values as inputs, encode them in binary and after processing results are shown in comprehensible manner and kept in memory as binary.

# Key Differences Between Analog and Digital Computers

## Analog Computers

## Digital Computers

Results are represented by meters and oscilloscopes.	Results are viewed in monitors or collected from printers.
Analog systems are costly and suffers from accuracy issues.	Cheap and reliable.
Analog systems are not versatile and can't be multipurpose.	Digital systems are versatile and can be programmed to meet various needs.
Analog computers do not have the massive storage capacity like a digital computer.	Digital computers can store massive user data, instructions and can store programs.

Thank You for Your Patience  
Stay Home, Stay Safe  
Always put a mask on when  
you are in public!