CHAPTER - XI
COMPUTER NETWORKS I

Class XII

Unit I

Programming and Computational Thinking (PCT-2)

(80 Theory + 70 Practical)

Prepared by

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INTRODUCTION

Subject	Max Marks	Avg Marks	Grade
English	100	80	B
Hindi	100	91	A+
Maths	100	85	B+
PH.E	200	175	A
History	100	79	C+

INTRODUCTION

What is Computer Network?

A computer network is a set of computers connected together for the purpose of sharing resources. The most common resource shared today is connection to the Internet. Other shared resources can include a printer or a file server. The Internet itself can be considered a computer network

ADVANTAGES OF COMPUTER NETWORK

ADVANTAGES OF COMPUTER NETWORK

1. IT ENHANCES COMMUNICATION AND AVAILABILITY OF INFORMATION.

2. IT ALLOWS FOR MORE CONVENIENT RESOURCE SHARING.

3. IT MAKES FILE SHARING EASIER.

ADVANTAGES OF COMPUTER NETWORK

4. IT IS HIGHLY FLEXIBLE.

5. IT IS AN INEXPENSIVE SYSTEM.

6. IT BOOSTS STORAGE CAPACITY.

DISADVANTAGES OF COMPUTER NETWORK

DISADVANTAGES OF COMPUTER NETWORK

1. IT LACKS INDEPENDENCE.

2. IT POSES SECURITY DIFFICULTIES.

3. IT LACKS ROBUSTNESS.

DISADVANTAGES OF COMPUTER NETWORK

4. IT ALLOWS FOR MORE PRESENCE OF COMPUTER VIRUSES AND MALWARE.

5. IT REQUIRES AN EFFICIENT HANDLER.

6. IT REQUIRES AN EXPENSIVE SET-UP.

COMPONENTS OF COMPUTER NETWORK

COMPONENTS OF COMPUTER NETWORK

1. HUBS

2. SERVERS

3. CLIENT

4. COMMUNICATION CHANNEL

COMPONENTS OF COMPUTER NETWORK

1. HUBS

COMPONENTS OF COMPUTER NETWORK

1. HUBS

A network host is a computer or other device connected to a computer network. A network host may offer information resources, services, and applications to users or other nodes on the network.

There are two types of hub:

- (I) ACTIVE HUB
- (II) PASSIVE HUB

(I) ACTIVE HUB

i) it’s electrically amplify the signal as it moves from one connected device to another.

(ii)active concentrators are used like repeaters to extend the length of the network.

REPEATERS:

it’s an device that electrically amplifies the signal it receives and rebroadcasts it.

(ii) PASSIVE HUB

It allows the signal to pass from one computer to another without any change.

COMPONENTS OF COMPUTER NETWORK

2. SERVERS

COMPONENTS OF COMPUTER NETWORK

2. SERVERS

A server is a type of computer or device on a network that manages network resources. Servers are often dedicated.

COMPONENTS OF COMPUTER NETWORK

3. CLIENT(S)

COMPONENTS OF COMPUTER NETWORK

3. CLIENT

A client is a piece of computer hardware or software that accesses a service made available by a server.

COMPONENTS OF COMPUTER NETWORK

4. COMMUNICATION CHANNEL

COMPONENTS OF COMPUTER NETWORK

4. COMMUNICATION CHANNEL

A communication channel or simply channel refers either to a physical transmission medium such as a wire, or to a logical connection over a multiplexed medium such as a radio channel in telecommunications and computer networking

COMPONENTS OF COMPUTER NETWORK

4. COMMUNICATION CHANNEL

Types of communication channels are:

1. WIRED OR GUIDED COMMUNICATION CHANNEL

2. WIRELESS OR UNGUIDED COMMUNICATION CHANNEL

4. COMMUNICATION CHANNEL

1. WIRED OR GUIDED COMMUNICATION CHANNEL

1. WIRED OR GUIDED COMMUNICATION CHANNEL

When host and server with one another through guided media

Like ,network cables like it's called wired communication channels/medium

Example:

- ✓ **TWISTED-PAIR CABLES**
- ✓ **COAXIAL CABLES**
- ✓ **FIBRE OPTICAL CABLE .**

4. COMMUNICATION CHANNEL

2. WIRELESS OR UNGUIDED COMMUNICATION CHANNEL

2. WIRELESS OR UNGUIDED COMMUNICATION CHANNEL

When hosts and server are connected with one another through guided media. Like, radio waves ,satellite etc.,

Example of wireless communication:

- ✓ **RADIO WAVE ,**
- ✓ **MICRO WAVE,**
- ✓ **SATELLITE etc.,**

TYPES OF NETWORK

TYPES OF NETWORK

A computer network means a group of 'network' Computers

A network can mean a small of linked computers to a chain of a few hundred computer of different types (eg , PCs, minis, mainframes etc) Spread around the world.

TYPES OF NETWORK BASED ON GEOGRAPHICAL SPREAD

Based on network span or geographical spread , network can be divided into two types:

- **(I)LAN (LOCAL AREA NETWORK)**
- **(II)WAN(WIDE AREA NETWORK)**

TYPES OF NETWORK BASED ON GEOGRAPHICAL SPREAD

LAN(LOCAL AREA NETWORK)

LAN (LOCAL AREA NETWORK)

Small computer network that are confined to a localised are a (eg ; an office , a building or a factory) are known as LAN's.

The key purpose of LAN is to serve its users in resource sharing .

The hardware as well as software resources are shared through LAN's.

LAN users can share data , information , programs , printers , modems ,etc.,

TYPES OF NETWORK BASED ON GEOGRAPHICAL SPREAD

WAN (WIDE AREA NETWORK)

WAN (WIDE AREA NETWORK)

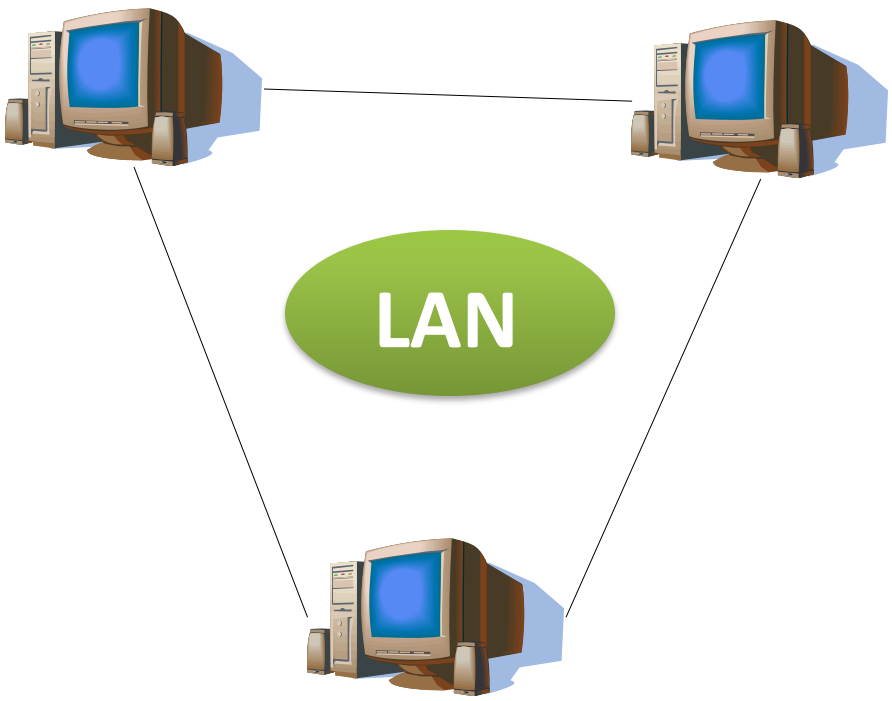
The network spread across countries (or) on a very big geographical area are known as WAN‘s.

It is a group of computers that are separated by a large distance and tied together .

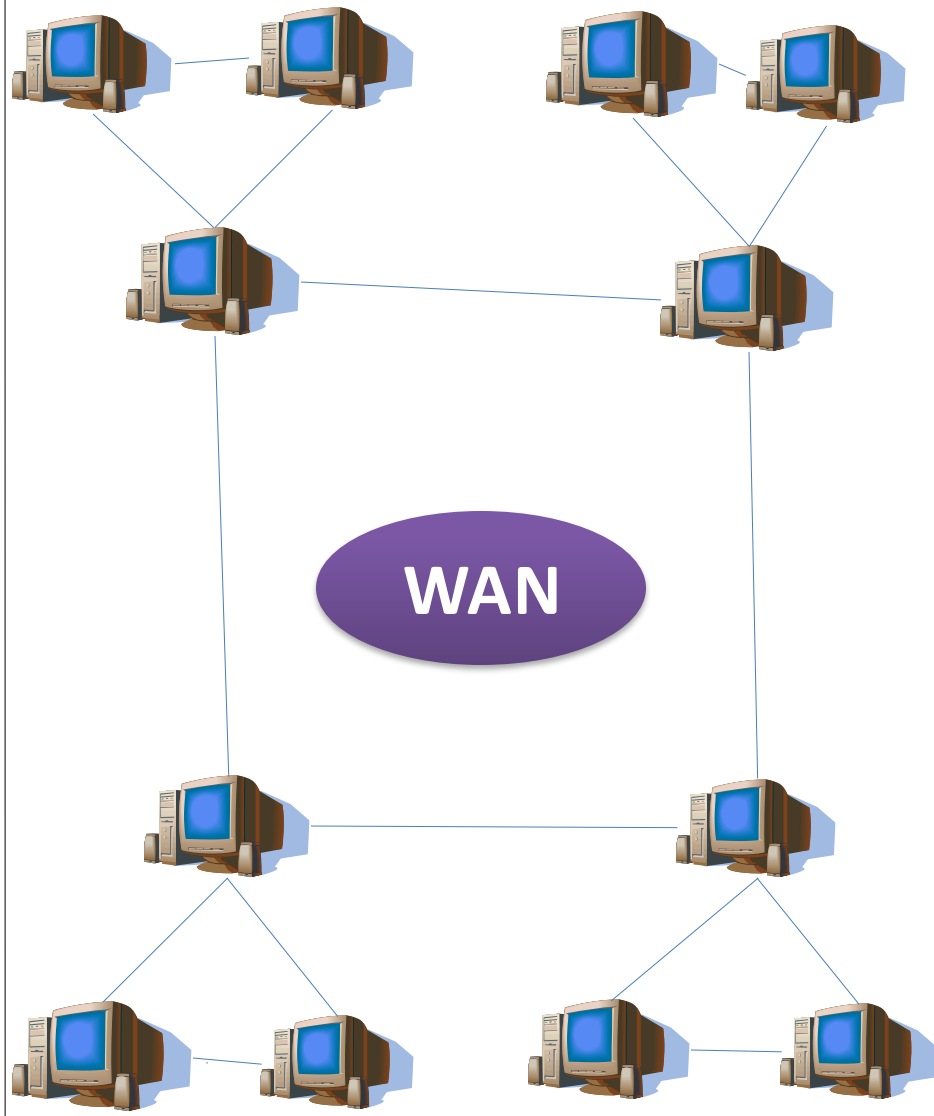
It can be a group of LAN’s that are separated across several locations and connected together to look like one big LAN.

Computers are connected to a wide area network are often connected through public networks such as telephone systems .

LAN



WAN



DIFFERENCE BETWEEN LAN & WAN

DIFFERENCE BETWEEN LAN & WAN

S.NO	LAN	WAN
1)	IT IS SPRED OVER A SMALL AREA	IT IS SPREAD OVER A VERY LARGE AREA
2)	IT IS USUALLY COSTS LESS TO SET IT UP	IT COSTS HIGHER TO SET IT UP
3)	IT IS USUALLY A SINGLE NETWORK	IT IS USUALLY A NETWORK OF MANY NETWORK

TYPES OF NETWORK BY COMPONENTS

TYPES OF NETWORK BY COMPONENTS

Another parameter based on which you can classify networks is the role played by network computers in the network operations on basis , there are 2 types of networks:

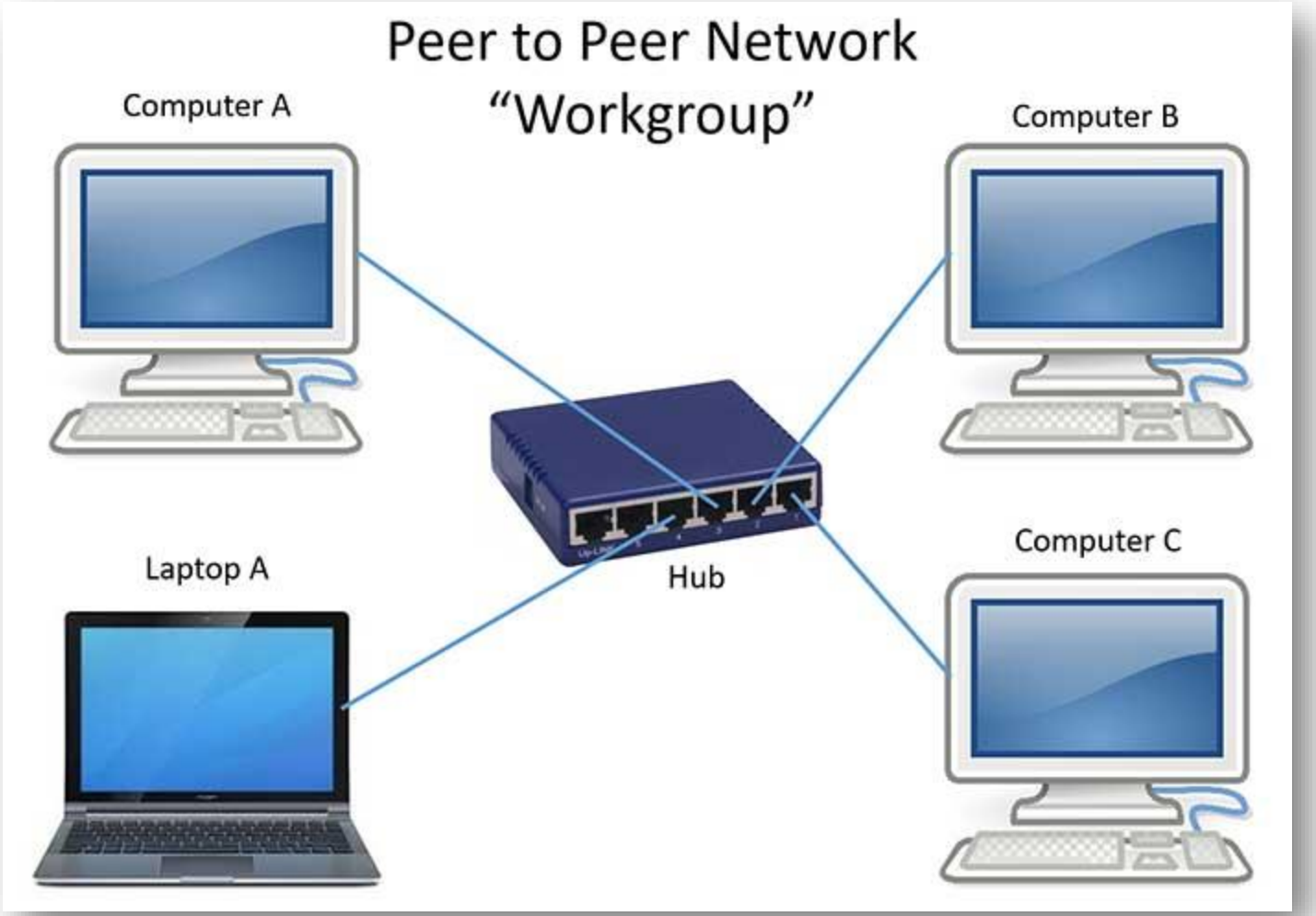
(I) PEER TO PEER NETWORKS

II) CLIENT / SERVER NETWORKS

TYPES OF NETWORK BY COMPONENTS

PEER TO PEER (P2P) NETWORKS

PEER TO PEER (P2P) NETWORKS



PEER TO PEER (P2P) NETWORKS

P2P network literally implements the meaning word Peer (ex : Each computer on P2P network is equal) , that is each computer can play a role of a client or a server.

The computer that serve on P2P computers are often termed as non-dedicated servers

Contd….

PEER TO PEER (P2P) NETWORKS

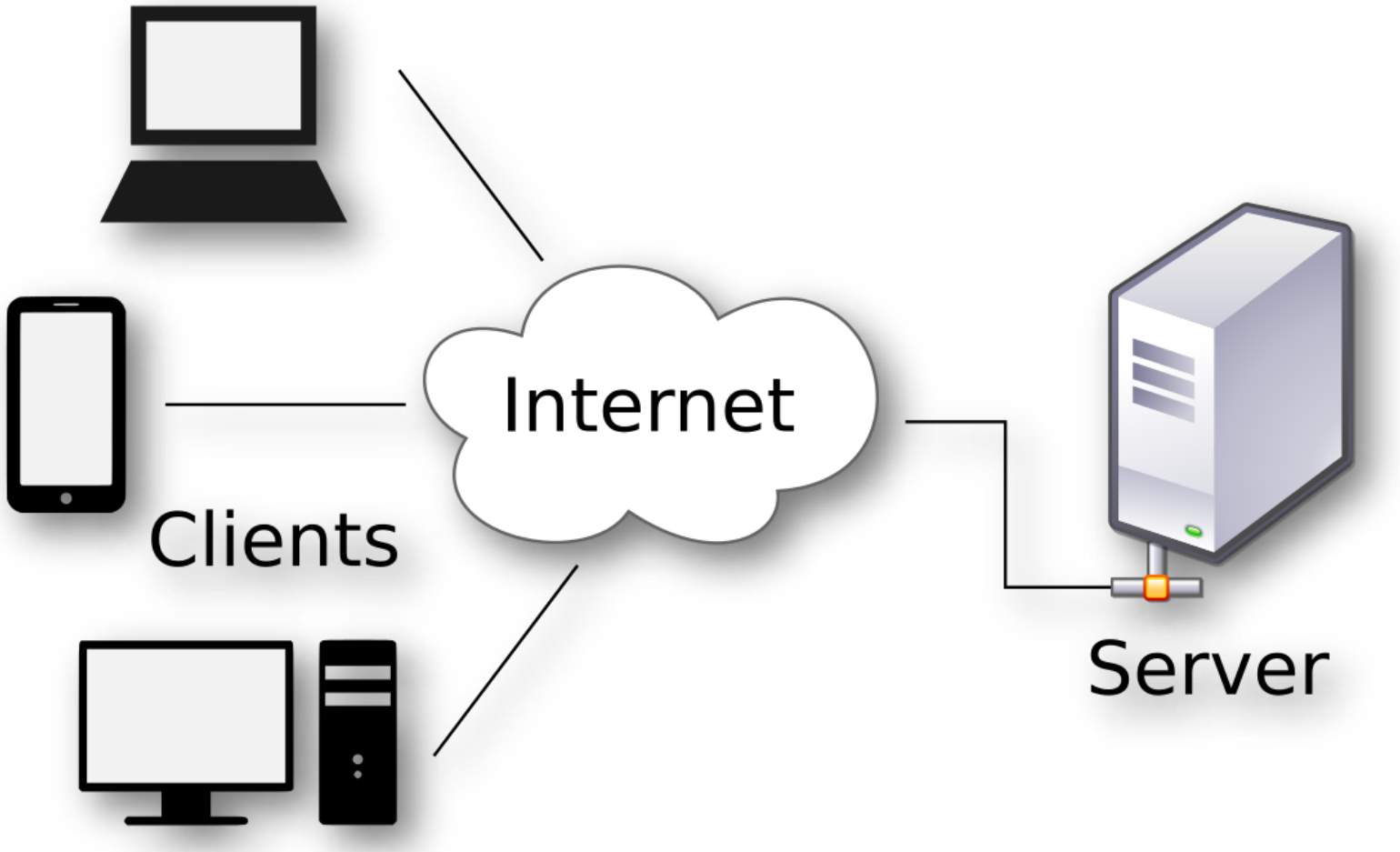
- **(P2P) networks are popular as home networks and for use in small companies as they are inexpensive and easy to install ,but they are limited scope and are difficult to secure.**
- **On small networks , workstation that can double up as a server is known as**

  NON-DEDICATDED SERVER .
- **Non–Dedicated Server can shuttle b\w client as well as server role.**
- **Small networks that are using such a servers are known as P2P networks.**

TYPES OF NETWORK BY COMPONENTS

CLIENT / SERVER NETWORKS

CLIENT / SERVER NETWORKS



CLIENT / SERVER NETWORKS

- Unlike P2P networks , bigger networks prefer to have centralised control .
- They do this by clearing designations servers and clients such networks are called

  CLIENT-SERVER NETWORKS (or)

  MASTER-SLAVE NETWORKS.
- On bigger network installation , there is a computer reserved for the server's job and its only job is to help workstations access the data, software , hardware resources .

CONTD…

CLIENT / SERVER NETWORKS

- **It does not double up as workstation and such servers is known as dedicated servers.**
- **Dedicated servers operates solely as a server on a network.**
- **For ex : There may be a server exclusively for serving files – related requests like storing files deciding about their access privileges & regulating the amount of space allowed for each server.**

DIFFERENCE BETWEEN CLIENT SERVER AND P2P

DIFFERENCE BETWEEN CLIENT SERVER AND P2P

SERVICE	CLIENT SERVER	P2P
SECURITY	The server controls security of network	No central control over security
MANAGEMENT	The server manages the network . Needs a dedicated team of people to manage the server .	No central control over the network . Any one can set up.

DIFFERENCE BETWEEN CLIENT SERVER AND P2P

SERVICE	CLIENT SERVER	P2P
DEPENDENCY	Clients are depend on the servers.	Clients are not depend on central servers.

DIFFERENCE BETWEEN CLIENT SERVER AND P2P

SERVICE	CLIENT SERVER	P2P
PERFORMANCE	The server can be upgraded to be made more powerful to cope with high demand.	If machines on the network are slow they will slow down other machines.
BACKUPS	Data is all backed up on the main server .	Each computer has to be backed up Data can easily be deleted by users .

TYPES OF NETWORK BASED ON COMMUNICATION CHANNEL

Computer networks are formed when computers are connected with one and other . The connections among the hosts are established using specific communication media.

The computer networks can be categorized as these:

1. **WIRED COMPUTER NETWORKS**

2. **WIRELESS COMPUTER NETWORKS**

TYPES OF NETWORK BASED ON COMMUNICATION CHANNEL

1. WIRED COMPUTER NETWORK

WIRED COMPUTER NETWORK

As clear by name in wired computer networks , the host and other devices are interconnected through wiring or cables. Most wired computer networks are of LAN type .

Although , there are wireless LAN's too and there are bigger networks that used wireless medias too.

Contd..

WIRED COMPUTER NETWORK

Commonly used cables in wired networks are one of the following three types:

- **A) TWISTED PAIR CABLE**
- **B) COAXIAL CABLE (COAX)**
- **C)FIBRE OPTIC CABLE (OPTIC FIBRE CABLE).**

TYPES OF NETWORK BASED ON COMMUNICATION CHANNEL

TYPES OF WIRED CABLES

A) TWISTED PAIR CABLE:

TYPES OF WIRED CABLES

A) TWISTED PAIR CABLE:

A twisted pair cable is a pair of insulated wires that are twisted together to improve electromagnetic capability and to reduce from outside source these available in various forms such as CAT1 , CAT2 , CAT3 , CAT4 , CAT5 , CAT6

TYPES OF NETWORK BASED ON COMMUNICATION CHANNEL

TYPES OF WIRED CABLES

B) COAXIAL CABLE (COAX)

TYPES OF WIRED CABLES

B) COAXIAL CABLE (COAX)

This type cables consist of a solid wire core surrounded by one or more foil or wire shield each separated by some kind of plastic insulator

Ex : Thicknet and Thinnet .

TYPES OF NETWORK BASED ON COMMUNICATION CHANNEL

TYPES OF WIRED CABLES

C) FIBRE OPTIC CABLE :

TYPES OF WIRED CABLES

C) FIBRE OPTIC CABLE :

Consist of a bundle of glass threads each of which capable of transmitting messages modulated on to light waves .

Example:

- **Single node**
- **Multi-node**

TYPES OF NETWORK BASED ON COMMUNICATION CHANNEL

WIRELESS COMPUTER NETWORKS

WIRELESS COMPUTER NETWORKS

The computer networks that use environment or air as the media , through which information is transmitted without any cable or wires or the electronic conductor , rather by using electromagnetic waves like: IR(infrared) , RF(radio frequencies) , satellite , etc are wireless computer networks

EXAMPLE: i) When you connect all smartphones to a common WIFI (a wireless LAN)

ii) WAN can also be formed using wireless media such as satellite.

TYPES OF WIRELESS NETWORK

TYPES OF WIRELESS NETWORK

1. MICRO WAVE
2. RADIO WAVE
3. SATELLITE

Some other wireless communication media are :

- **Infrared waves**
- **Laser waves**

TYPES OF WIRELESS NETWORK

MICRO WAVE

MICRO WAVE

Micro waves are high frequency waves that used to transmit data wirelessly over a long distances. The microwave transmission consists of a transmitter , receiver and the atmosphere .

- ✓**Shorter wavelength than radio waves.**
- ✓**Higher frequency than radio waves.**
- ✓**Higher energy than radio waves.**

Examples: Cell Phones and Radar.

TYPES OF WIRELESS NETWORK

RADIO WAVE

RADIO WAVE

- ✓ **Longest wave Length.**
- ✓ **Lowest Frequency.**
- ✓ **Lowest Energy.**
- ✓ **WI-FI that has become common word today also use radio waves to transmit data among connected devices.**

Some More Examples: TV,AM,FM Radio Signals.

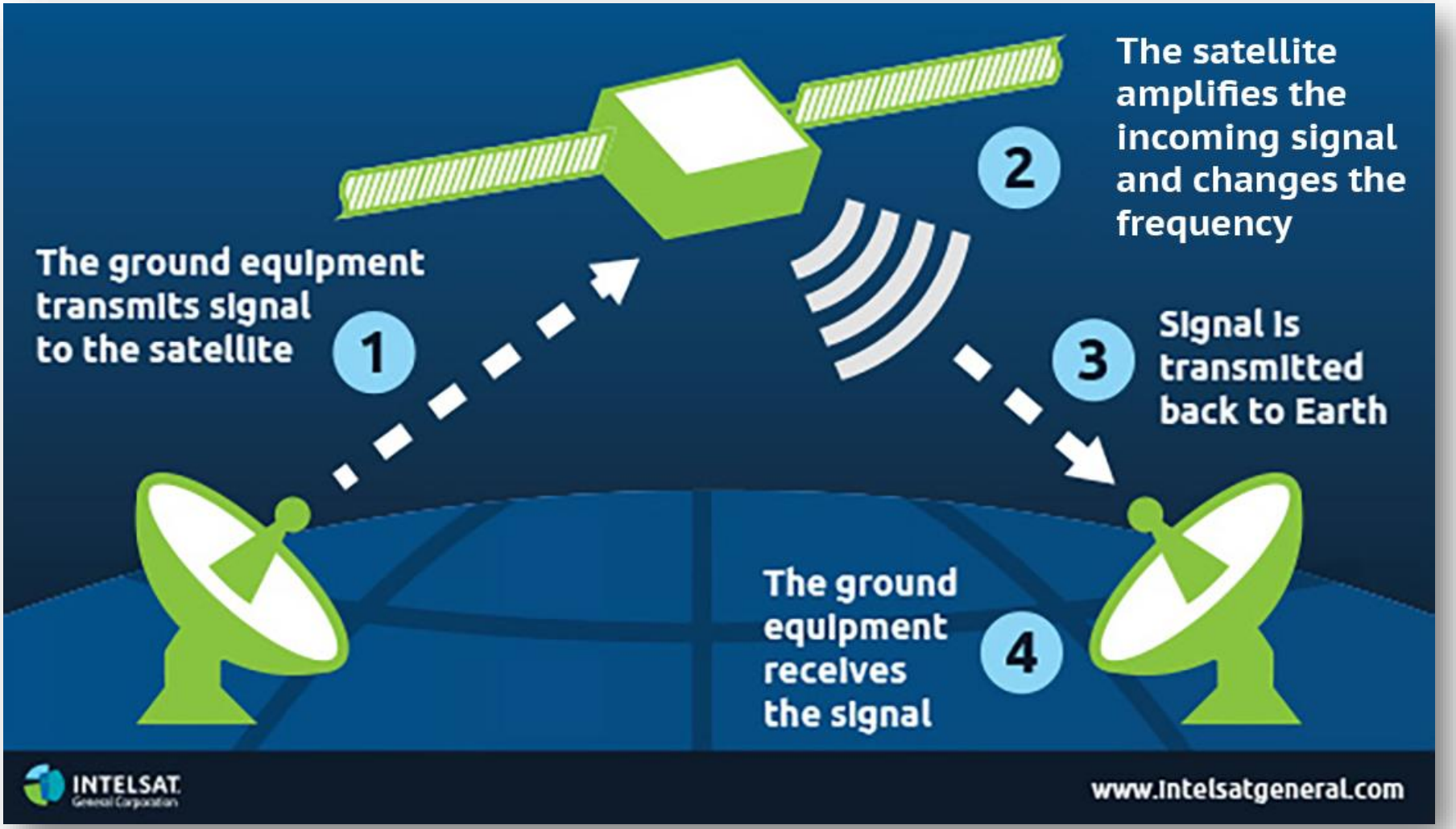
Radio waves easily travel through the atmosphere and many materials.

SATELLITE

SATELLITE

- ✓ Satellite communication is a special case of a microwave relay system.
- ✓ Satellite communication use the synchronous satellite to relay the alien radio signal transmitted from ground station.
- ✓ The satellite accept data / signals transmitted from an earth station , amplify them , and retransmit them to another station.
- ✓ Using such as a setup data can be transmitted to other side of the earth in only one step. Contd…

SATELLITE

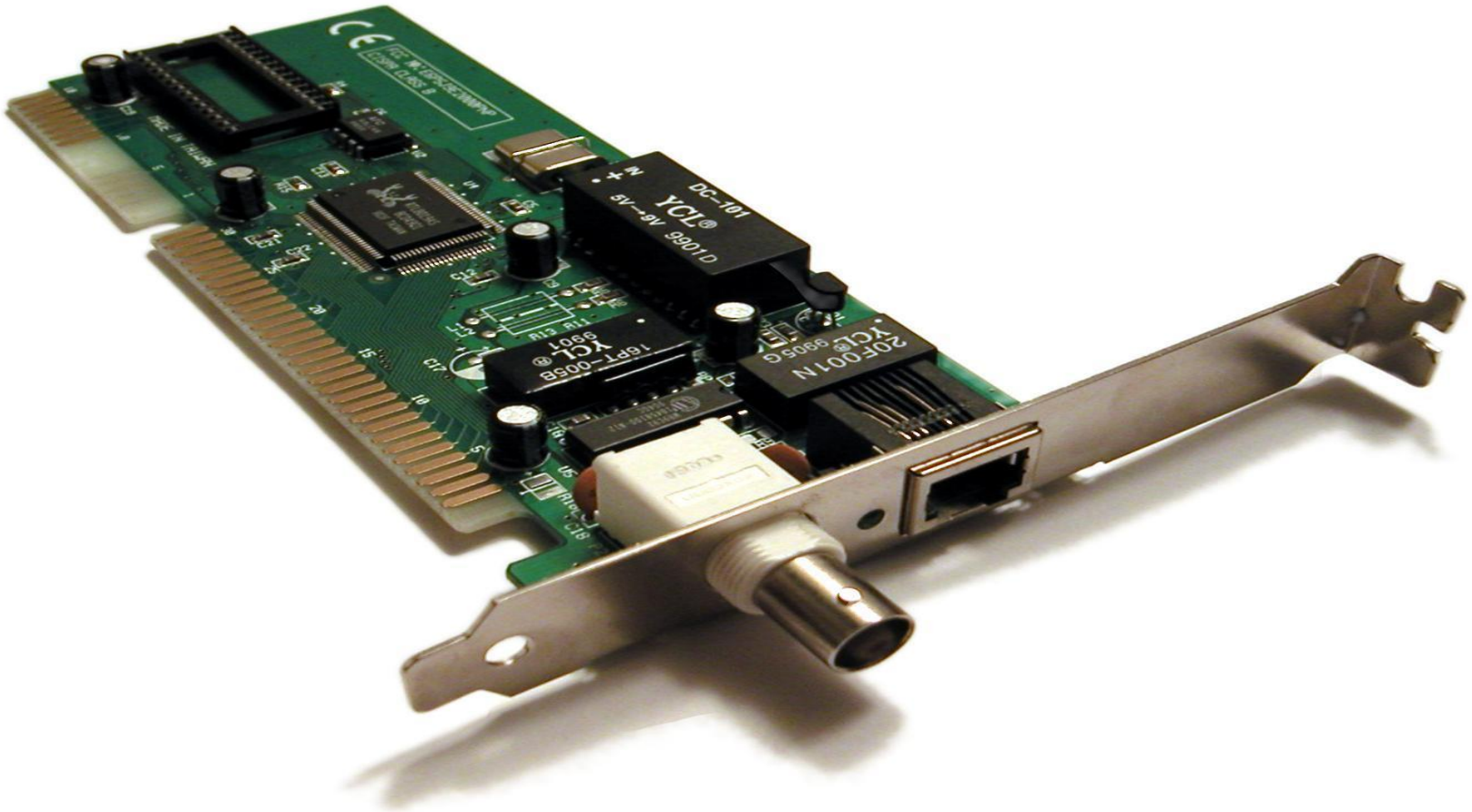

The satellite amplifies the incoming signal and changes the frequency
2
The ground equipment transmits signal to the satellite
1
3
Signal is transmitted back to Earth
The ground equipment receives the signal
4
INTELSAT
www.intelsatgeneral.com

NETWORK DEVICES AND HARDWARE

NETWORK DEVICES AND HARDWARE

In the smooth functioning of a computer , other than computers and wiring , many devices (or) specialized hardware play important roles .

NETWORK INTERFACE CARD (NIC)



NETWORK INTERFACE CARD (NIC)

- ✓ A standalone computer (a computer that does not attached to a network) lives in its own world and carries out its tasks with its own inbuilt resources.
- ✓ The (NIC) is a device that is attached to each of the workstations and the server & helps the workstation to establish all the important connections with network.
- ✓ Each NIC that is attached to a workstation has a unique number identification which is known as note address

Contd…

NETWORK INTERFACE CARD (NIC)

- ✓ **The NIC is also called as Terminal Access Point (TAP) different manufacturers have different name for the interface .**
- ✓ **The NIC is also called as *NIU* – (Network Interface Unit)**
- ✓ **The (NIC) manufacturers assigns a unique physical address to each NIC-card , this physical address is know as MAC-address ------ (Media Access Control)**

MAC ADDRESS

MAC ADDRESS

- ✓ **The (NIC) manufacture assigns a unique physical address to each NIC-card , the physical address is know as (MAC-Address) .**
- ✓ **A MAC-Address is a 6-bytes with each byte separated by an colon**

Eg;

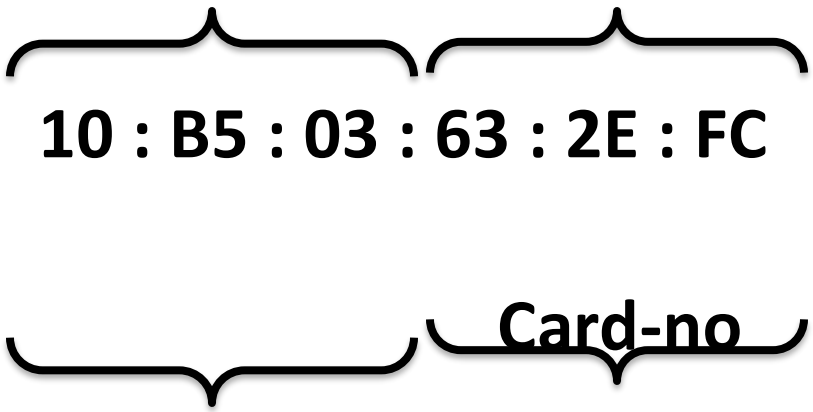
10 : B5 : 03 : 63 : 2E : FC

Contd..

MAC ADDRESS

- **MAC-address is actually an number assigned to the network card of your computer .**
- **The first three bytes are *"manufacturer—ID"* and the last three byte are the *card—no* .**

Eg;

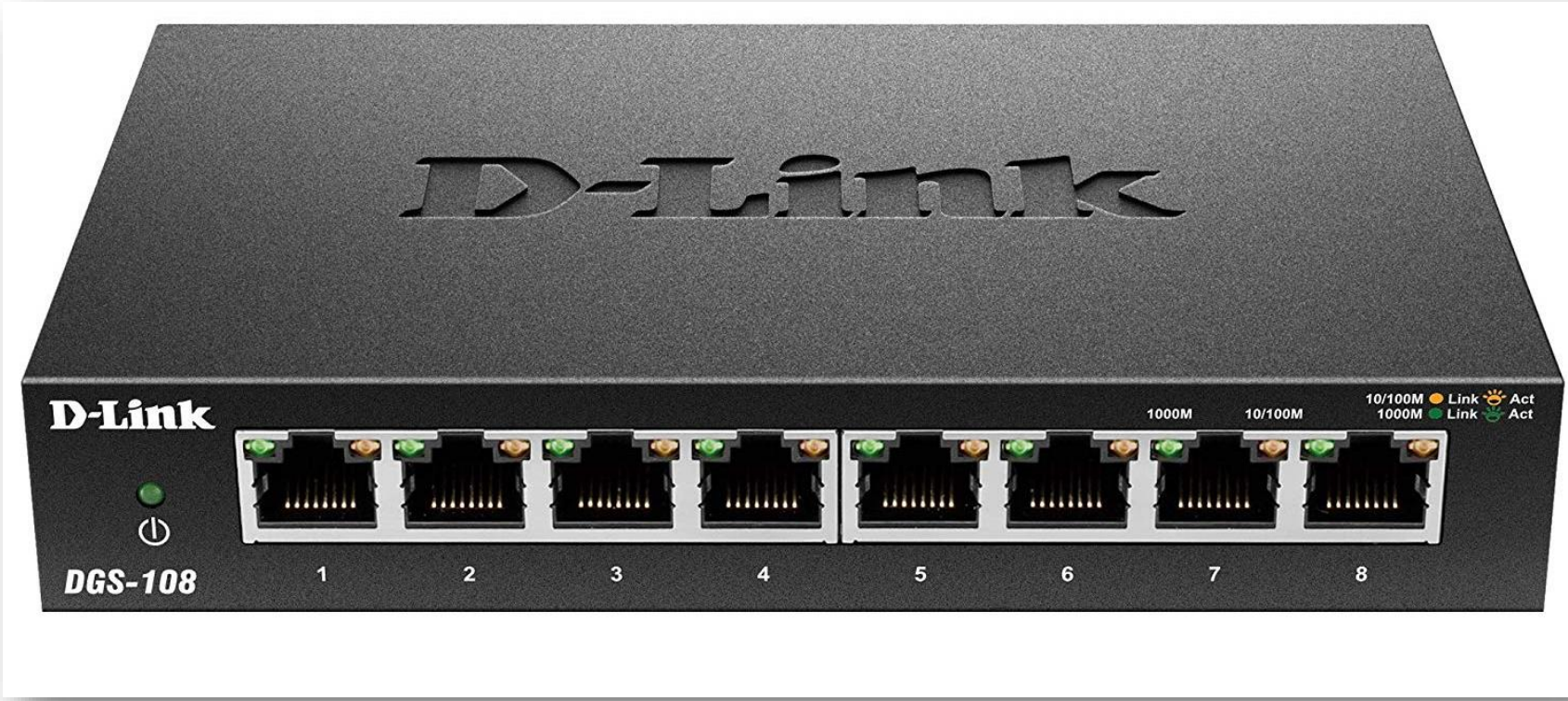


WI-FI CARD

WI-FI CARD

- ✓ **It's either an internal (or) external *local area network adapter* with a built-in wireless radio and antenna.**
- ✓ **Most common WI-FI cards used in desktop computers are PCI express WI-FI cards made to fit the PCI express cards slots on the mother board .**
- ✓ **The primary benefit of using a WI-FI card in desktop computer is that it allows you to set-up your workstation (or) home office without considering the proximity (or) availability of hard line network access**

SWITCH


D-Link
D-Link
DGS-108
1000M
10/100M
10/100M Link Act
1000M Link Act
1
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8

SWITCH

- ✓ A switch is a device that is used to segment networks into different subnetworks called *subnet* or LAN Segment.
- ✓ Segmenting the network into smaller subnet, prevents traffic overload in a network.
- ✓ A switch is responsible for filtering (or) transforming data in a specific way and forwarding packets between LAN segment.

Contd…

SWITCH

- **A switch can support any packet of protocol.**
- **LAN's that are segmented through switches are called as switched LANs.**

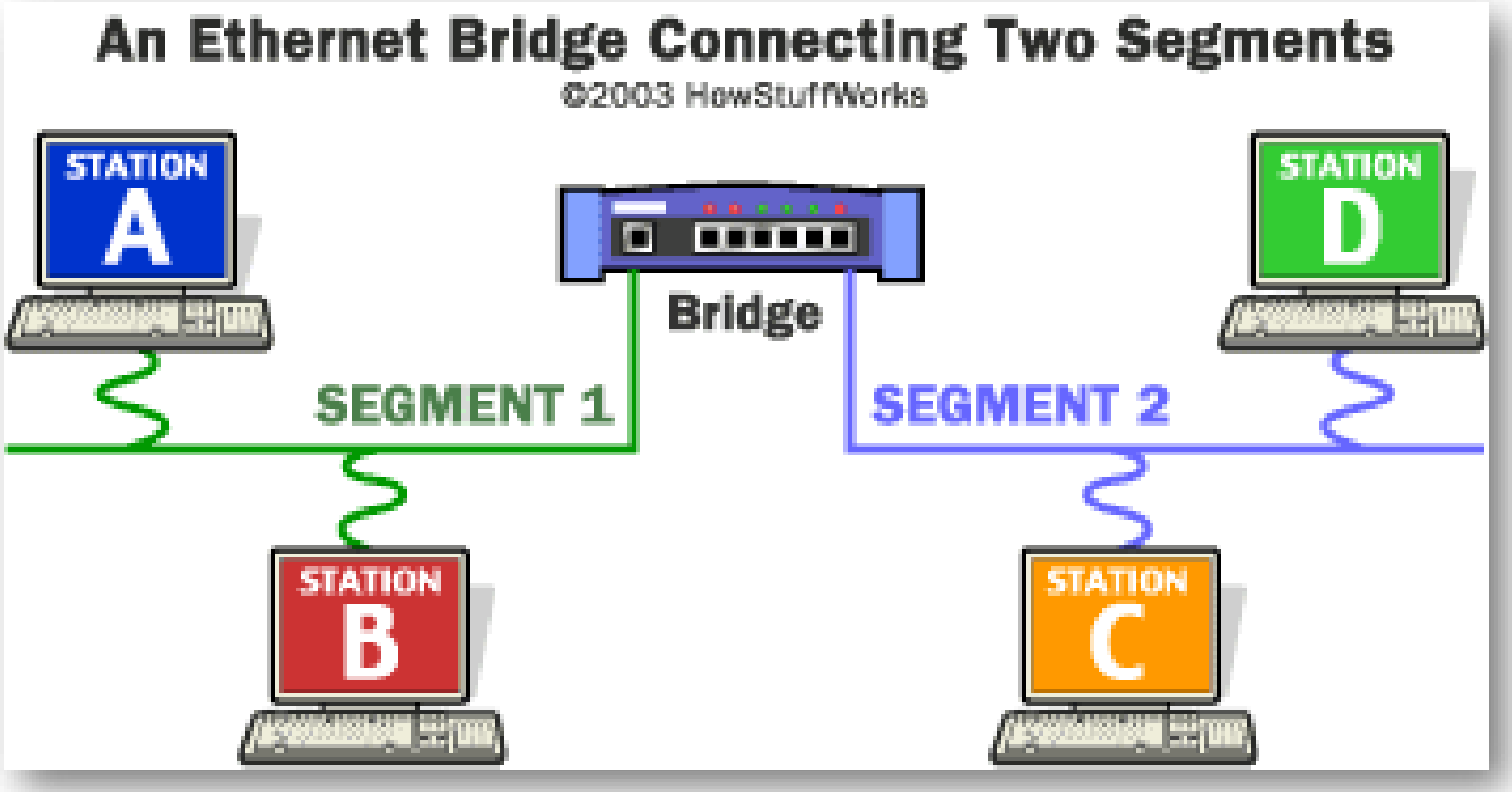
BRIDGE

BRIDGE

- ✓ A bridge is a device that let's you link networks together.
- ✓ Bridges are smart enough to know which computers are on which side of the bridge, so they only allow those messages that need to get other side to cross the bridge.
- ✓ Bridges can handle networks that follow same protocol.

Contd..

BRIDGE


An Ethernet Bridge Connecting Two Segments
©2003 HowStuffWorks
STATION A
STATION D
Bridge
SEGMENT 1
SEGMENT 2
STATION B
STATION C

ROUTER

ROUTER

- ✓ A device that works like a bridge but can handle different protocol is know as Router.
- ✓ A Router is a network device that forwards data from one network to another network.
- ✓ A router works like a bridge but can handle different protocols.

ROUTER

- **If the destination is unknow to a router it sends the traffic to another router (using logical address) which knows the destination, Based on a network road map called as (*Routing Table).***

- **Routers can help to ensure that packets are travelling the most efficient paths to their destination.**

GATEWAY

GATEWAY

- ✓ A gateway is a network device that connects dissimilar networks.
- ✓ It establishes an intelligent connection between a local network and external network with completely different structures
- ✓ Gateway is actually a node on a network that server as an entrance to another network.
- ✓ In enterprises the gateway is the computer that routes the traffic from workstation to a out side network that serving the web pages.

ACCESS POINT(AP) / WIRELESS ACCESS POINTS

ACCESS POINT(AP)

- An ACCESS POINT-(AP) , also called as (Wireless access point) WAP
- WAP is a hardware device that establishes connections of computer devices on wireless LAN with a fixed wire network.
- AP is a station that transmits and receives data
- AP has a range of (up to 150 feet for home based APs).
- Wireless routers can function as(AP) , but not all (AP)can work as routers.

THE CLOUDS

THE CLOUDS

- **A cloud is a generic term used for “INTERNET”.**
- **Cloud computing is internet-based computing whereby shared resources, software , and information are provided to computer and other devices are in demand, like electricity grid.**
- **Cloud computing is a new name for an old concept :*the delivery of computing services from a remote location .***

CLOUD COMPUTING

SERVER

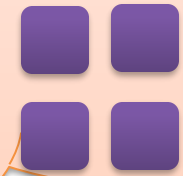
VISUAL DESKTOP

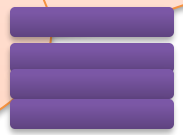
SOFT WARE PLATFORM

APPLACATION

STORAGE /DATA

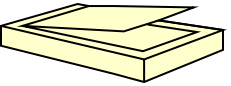
OS

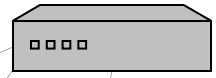


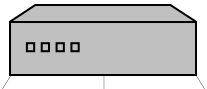


NETWORK DIVECES

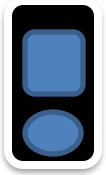
NETWORK DIVECESC

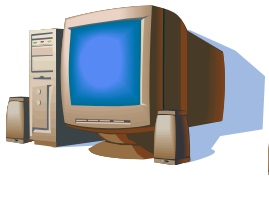


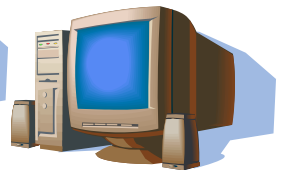


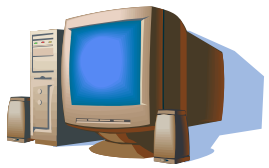


END USERS









TYPES OF CLOUDS

1. PRIVATE CLOUDS
2. PUBLIC CLOUDS
3. COMMUNITY CLOUDS
4. HYBIRED CLOUDS

1.PRIVATE CLOUDS

1.PRIVATE CLOUDS

- ✓ These are the clouds for exclusive use by single organization and typically controlled, managed and hosted in private data centers.
- ✓ The hosting and operation of private clouds may also be outsourced to third party services provider, but a private clouds remains for the exclusive use of one organization.

Contd…

1.PRIVATE CLOUDS

Best Private Cloud Providers

- ✓ **HPE. By most estimates, Hewlett Packard Enterprise (HPE) is a key leader in the private cloud market.**

Vmware	**Dell**	**Oracle**
IBM	**Microsoft.**	**Cisco.**
NetApp.		

2.PUBLIC CLOUDS

2.PUBLIC CLOUDS

These are the clouds for use by multiple organization on shared basis and hosted and by the third party services provider.

- ✓ **Examples of public clouds include Amazon Elastic ComputeCloud (EC2), IBM's Blue Cloud, Sun Cloud,Google AppEngine and Windows Azure Services Platform**

3.COMMUNITY CLOUDS

3.COMMUNITY CLOUDS

- **These are the clouds for use by a group of related organization who wish to make use of a common cloud computing environment .**
- **FOR EXP:**
  - **All suppliers to a larger manufacture.**
  - **All universities in a given region.**

4.HYBRID CLOUDS

4.HYBRID CLOUDS

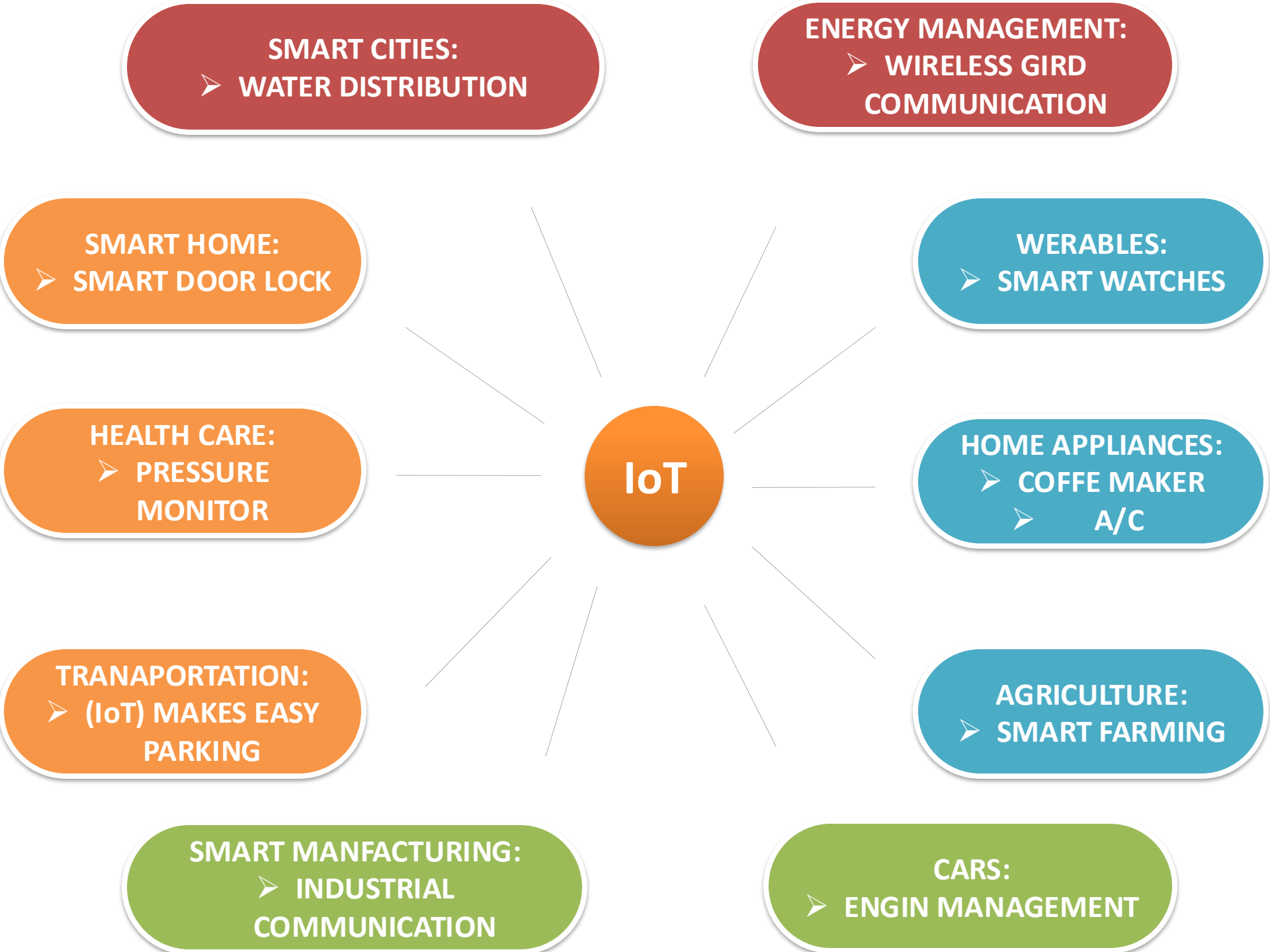
When a single organization adopts both private and public clouds for a single application in order to take advantage of the benefits of both.

INTERNET OF THING (IoT)

INTERNET OF THING (IoT)

- **(IoT) is a phenomenon that connects the things to the internet over wired or wireless connections.**
- **(IoT) allows the people and things to be connected ANYTIME, ANYPLACE WITH ANYTHING AND ANYONE .**

Contd…


SMART CITIES:
WATER DISTRIBUTION
ENERGY MANAGEMENT:
WIRELESS GIRD COMMUNICATION
SMART HOME:
SMART DOOR LOCK
WERABLES:
SMART WATCHES
HEALTH CARE:
PRESSURE MONITOR
IoT
HOME APPLIANCES:
COFFE MAKER
A/C
TRANAPORTATION:
(IoT) MAKES EASY PARKING
AGRICULTURE:
SMART FARMING
SMART MANFACTURING:
INDUSTRIAL COMMUNICATION
CARS:
ENGIN MANAGEMENT

DIFFERENCE BETWEEN PRIVATE AND PUBLIC CLOUDS

PUBLIC VS PRIVATE

PUBLIC		PRIVATE
Publicly Shared Virtualized Resources		Privately Shared Virtualized Resources
Supports Multiple Customers		Cluster of Dedicated Customers
Supports Internet Connectivity		Connectivity Over Internet, Fiber, and Private Network
Suited for Less Confidential Information		Suited for Secured Confidential Information and Core Systems

ThankYou