Introduction

Lecture 1 | Part 2 | CSE421 – Computer Networks

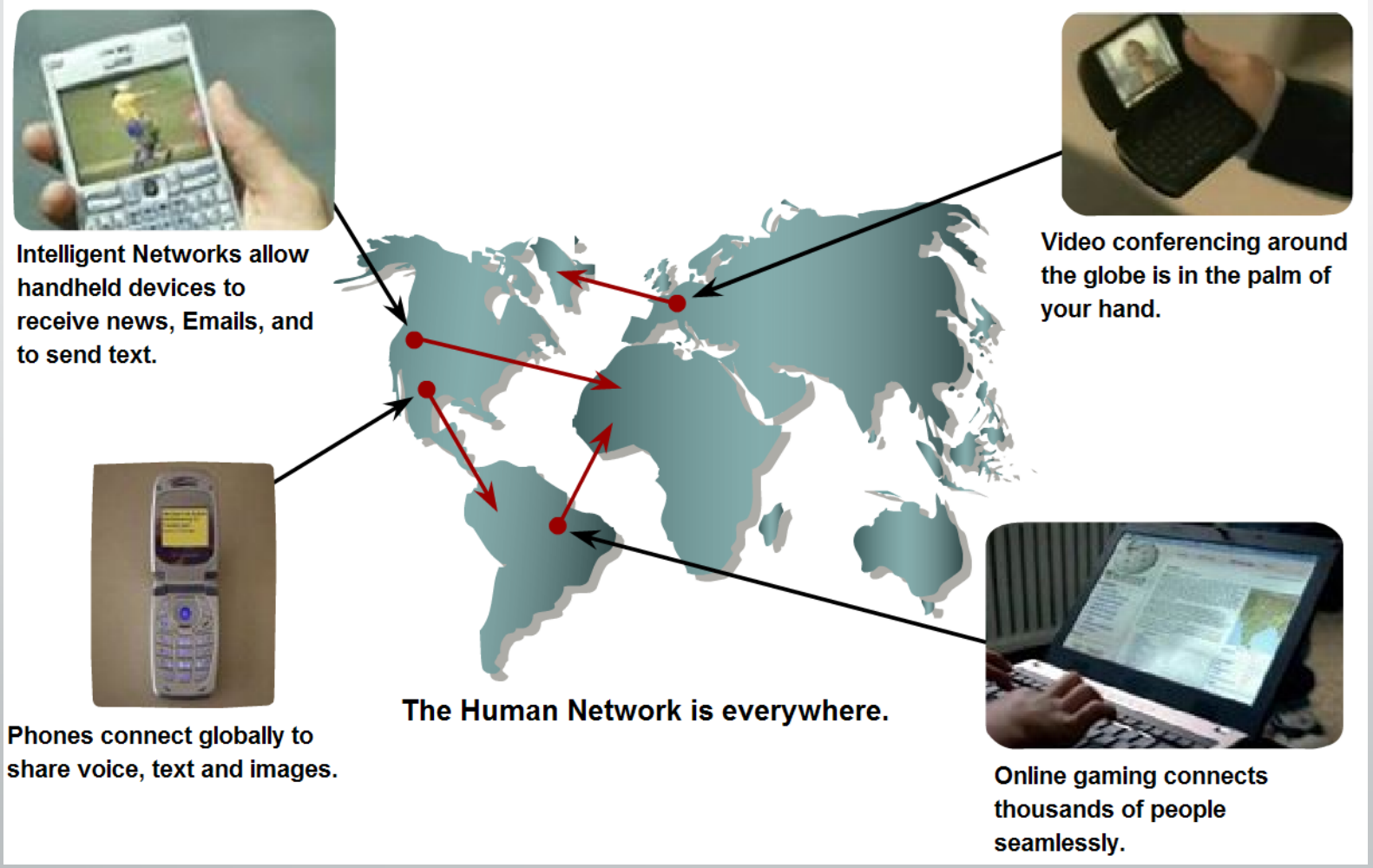
Department of Computer Science and Engineering
School of Data & Science

Objectives

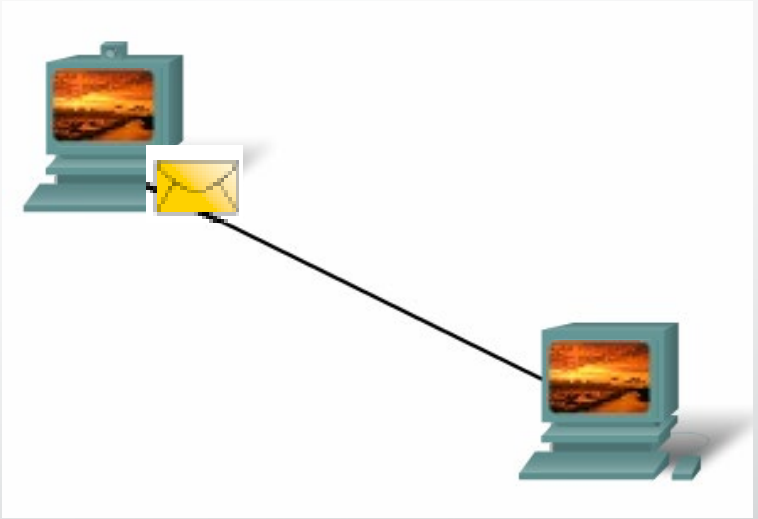
- Components of network
- Data representation
- Types of network

So, what's the purpose of **networks?**

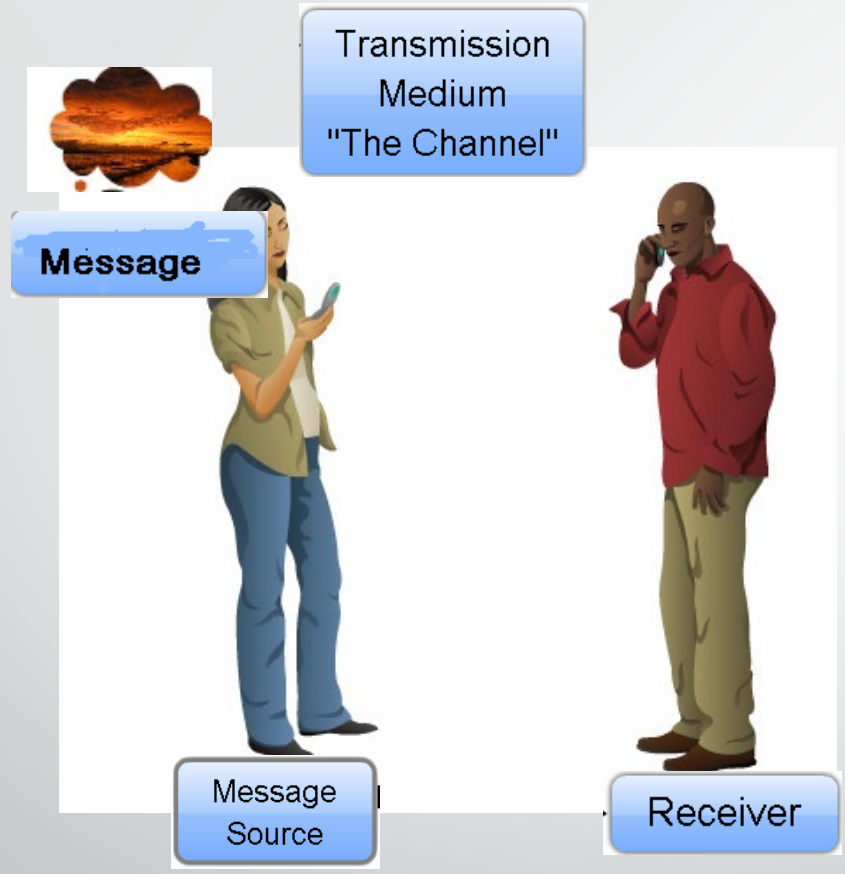
- **Communications!**

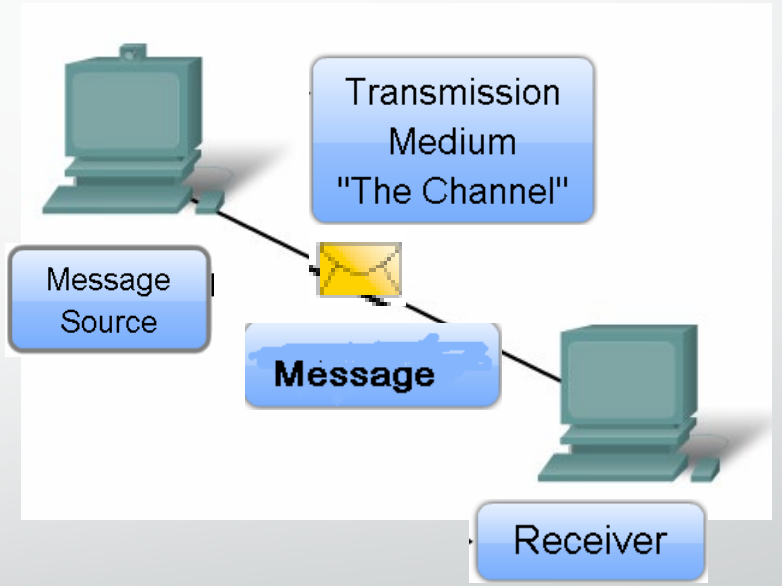


Elements of Communication



Elements of Communication - Example

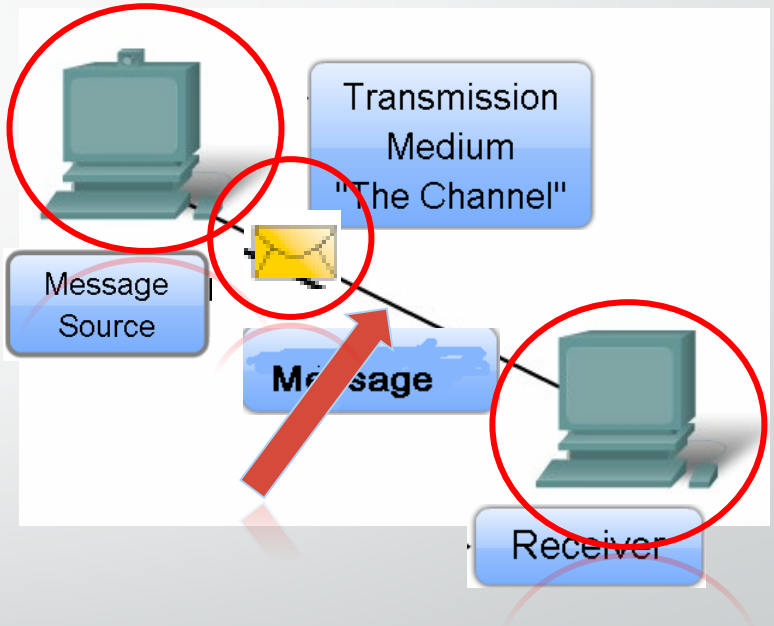




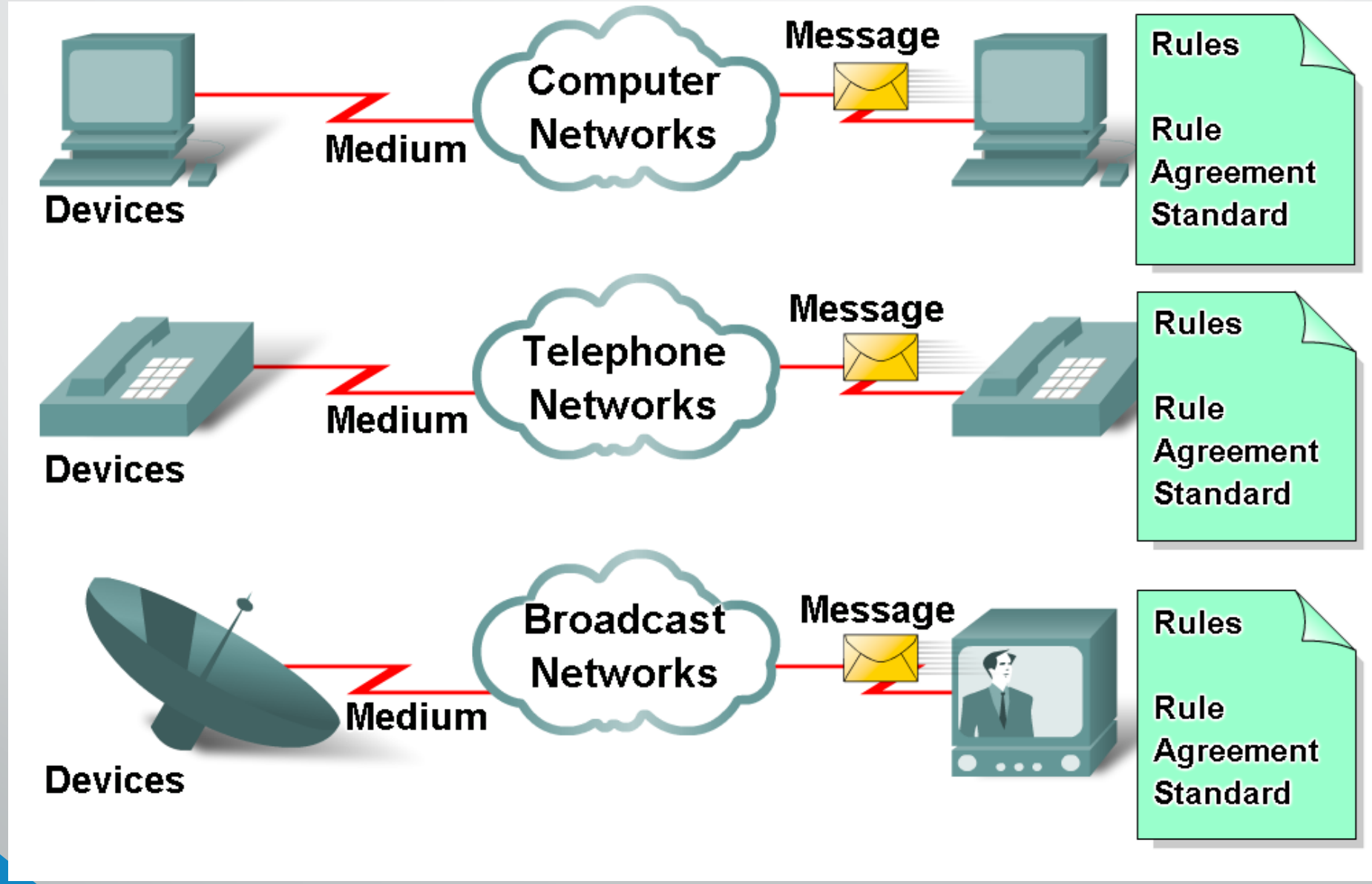
- What are the elements?

Elements of Communication

- **Devices (Sender/Receiver)**
  - These are used to communicate with one another
- **Medium**
  - This is how the devices are connected together
- **Messages**
  - Information that travels over the medium
- **Rules**
  - Governs how messages flow across network

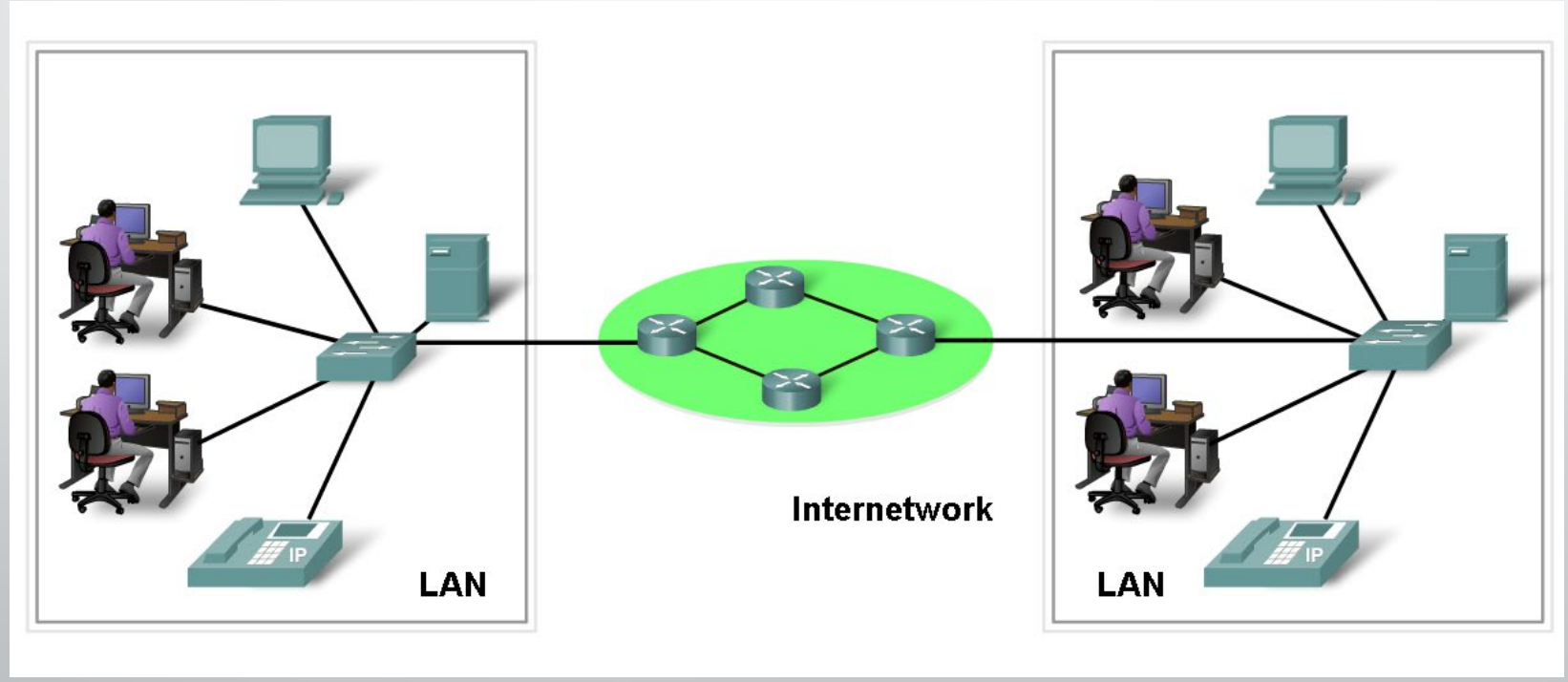


Elements of Communication



Network Elements/Components

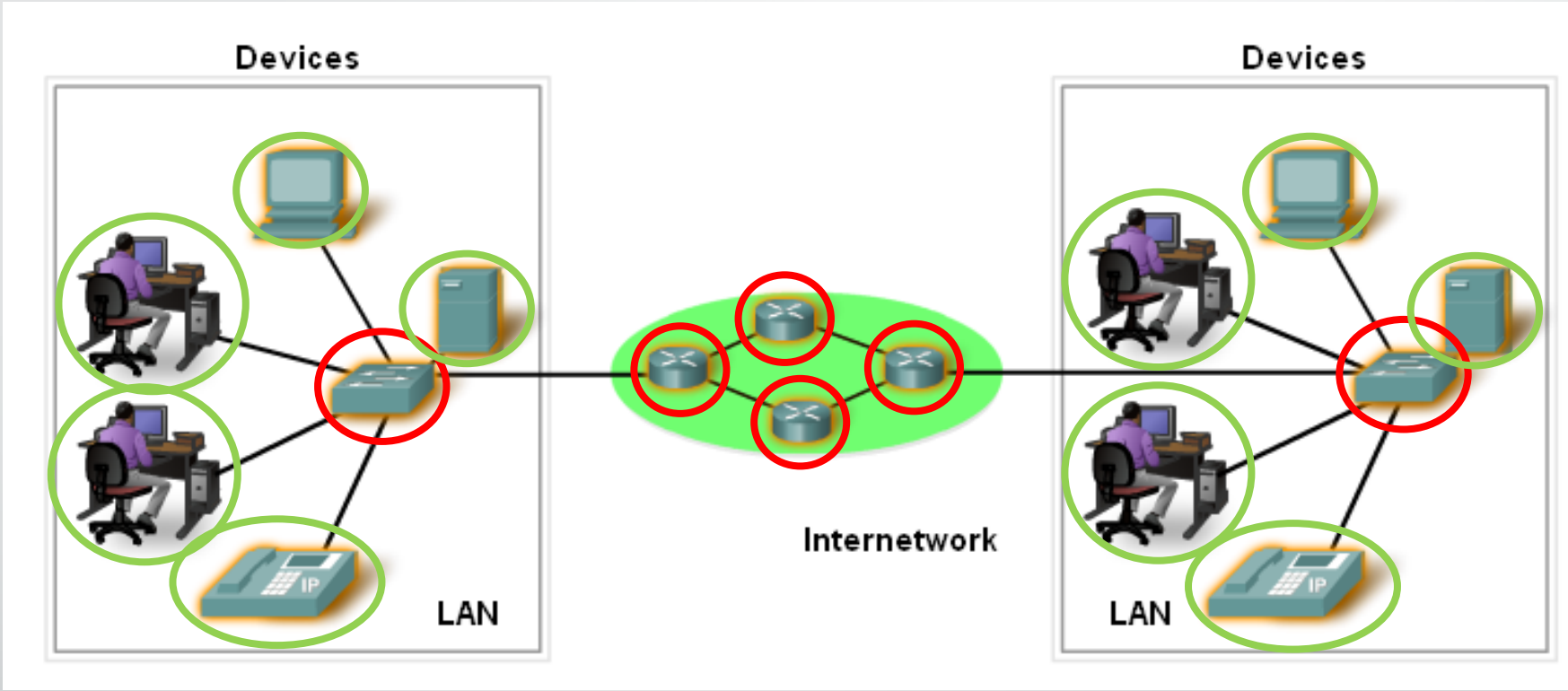
- **Network Devices**
  - Hardware (Devices)
  - Software (Services and Processes)



Network Component - Devices

- **Two types of devices:**
  - **End Devices:**
    - Interface with human network & communications network
    - Data originates with an end device and arrives at an end device
  - **Intermediary Devices:**
    - Provides connectivity between end devices.
    - Manages data as it flows through the network

Network Component - Devices



End Devices		Intermediary Devices	
Personal Computers	Server	Router	Switch
 			

Network Component –Devices

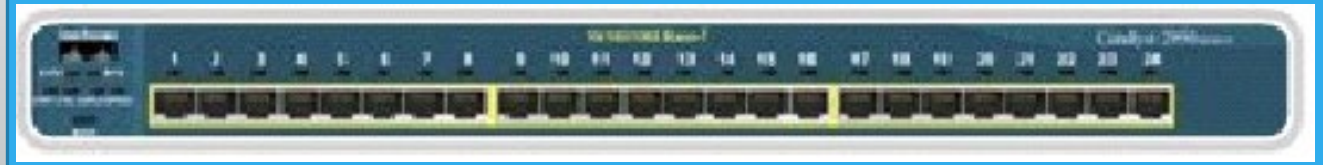
- **Examples of Intermediary Devices**

Hub

Router

Wireless Router

Switch

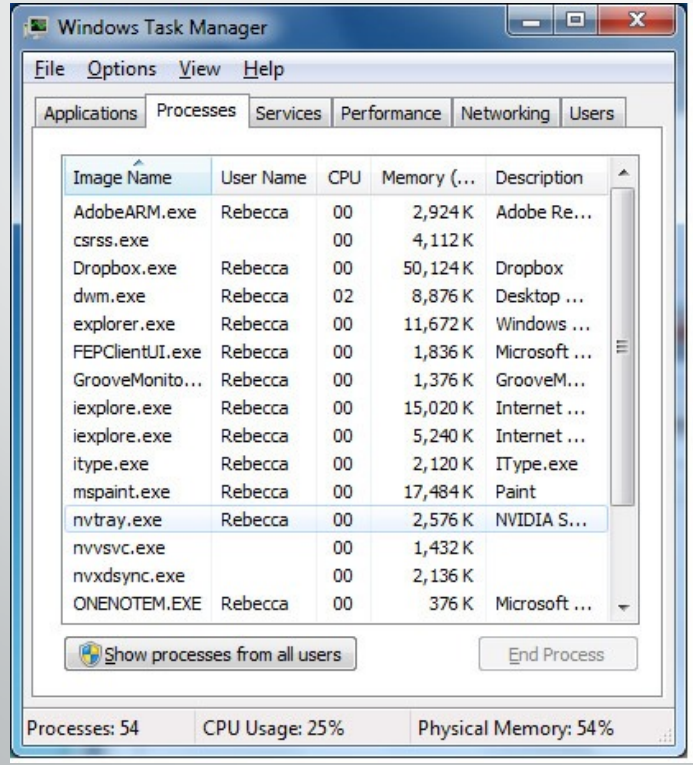


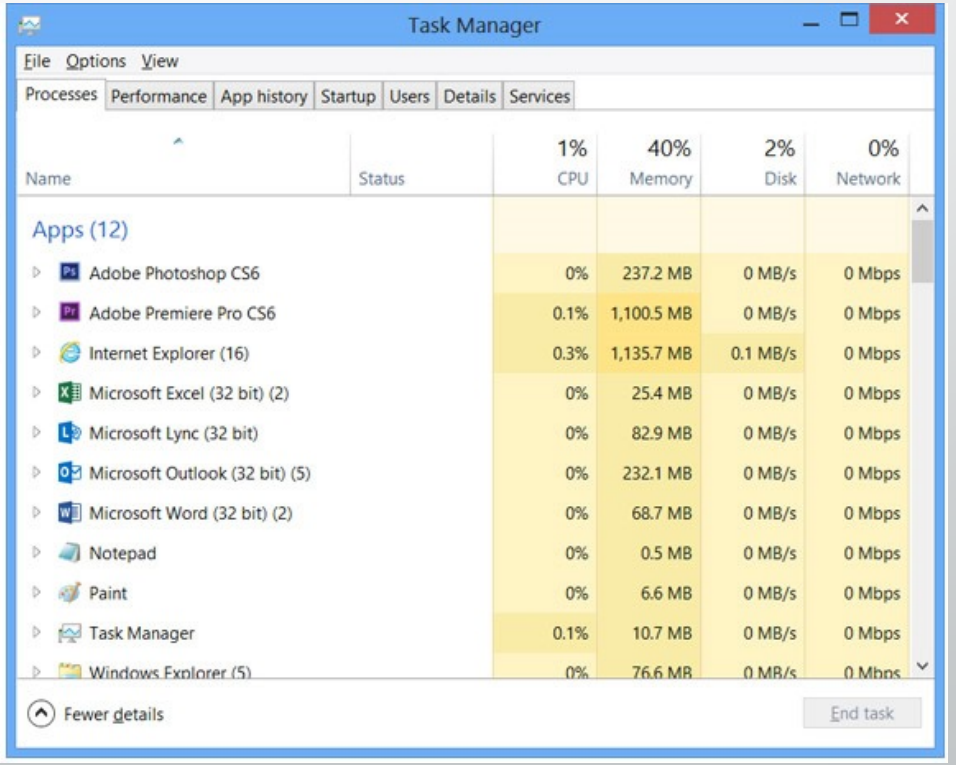
Software

- **Services :**
  - Provides information in response to a request.
  - For example **e-mail hosting services** and **web hosting services.**

Software

- **Processes :**
  - Provide the functionality that directs and moves the messages through the network.
  - Processes are less obvious to us but are critical to the operation of networks.

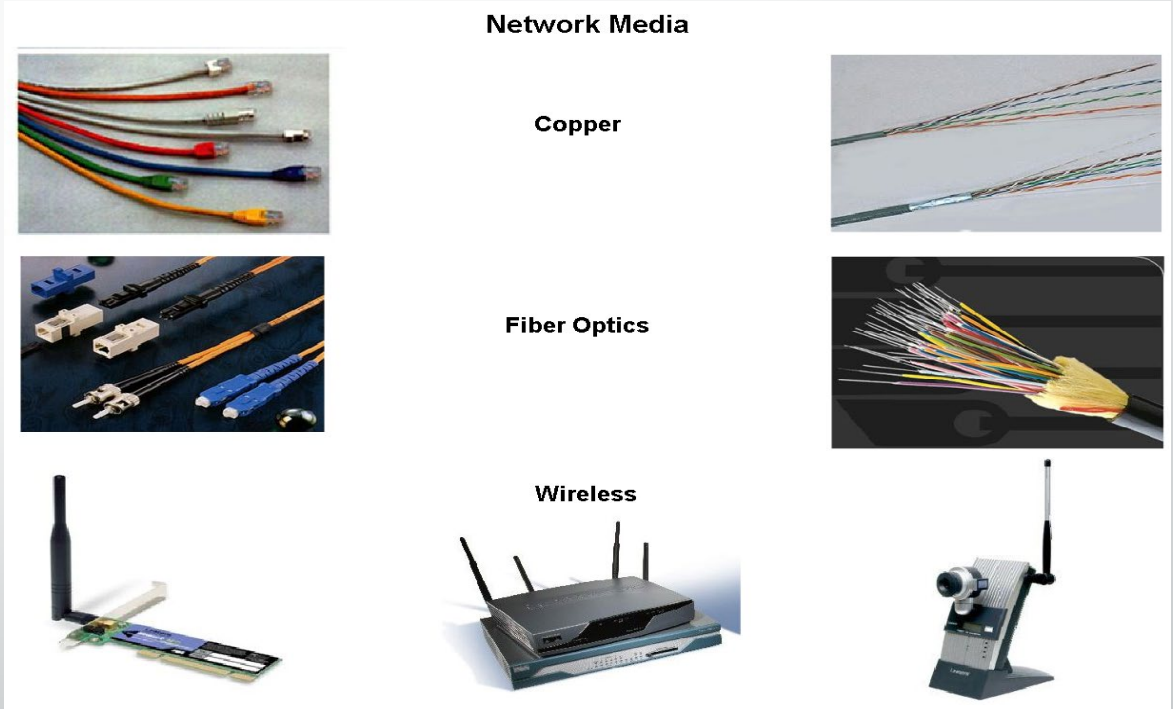




Media

- The channel over which a message travels

Media Types	Description
Metal wires within cables	Uses electrical impulses
Glass or plastic fibers within cables (fiber-optic cable)	Uses pulses of light.
Wireless transmission	Uses modulation of specific frequencies of electromagnetic waves.



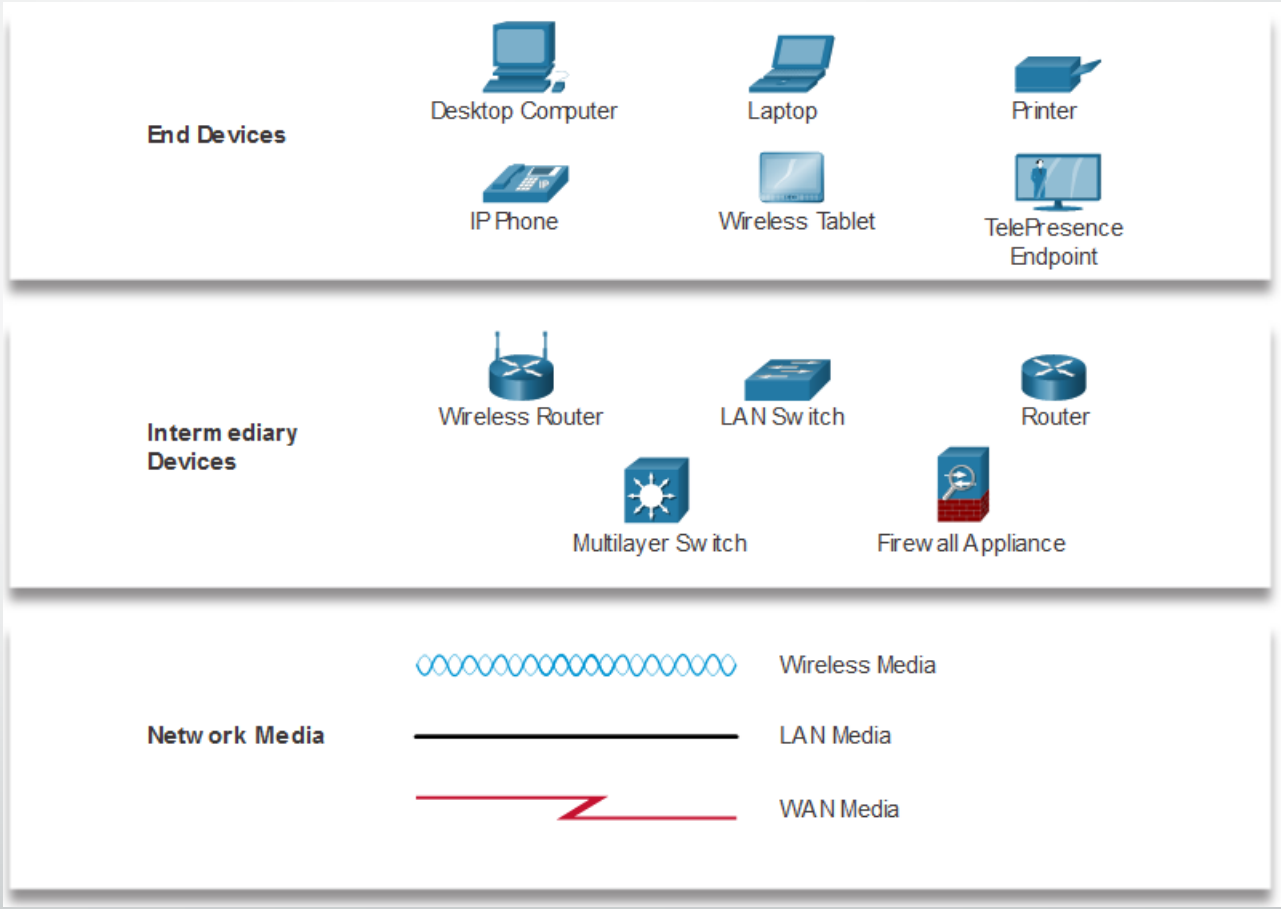
Network Representations

Network diagrams, often called **topology** diagrams, use symbols to represent devices within the network.

Important terms to know include:

- Network Interface Card (NIC)
- Physical Port
- Interface

Note: Often, the terms port and interface are used interchangeably



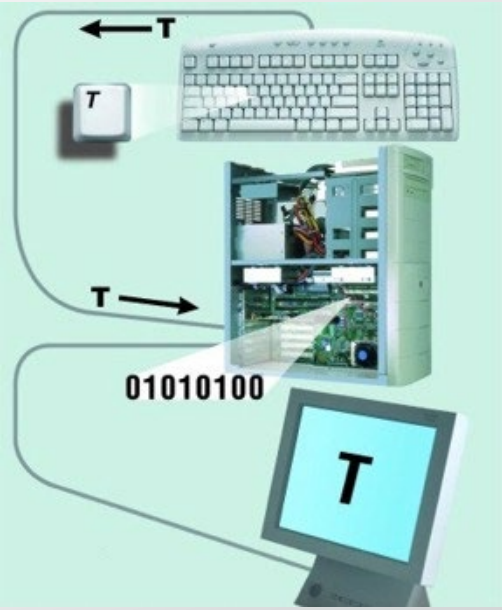
Message – Data Representation

- Information today comes in different forms such as
  - text, numbers, images, audio, and video

Type of Data	Standards
Alphanumeric	ASCII, Unicode
Image	JPEG, GIF, PCX, PNG, TIFF, BMP, etc.
Motion picture/Video	MKV, AVI, MP4, MPEG-4, etc.
Sound	WAV, AU, MP3, etc.
Outline graphics/fonts	PDF, PS, AI, PostScript

Data Representation - Text

- Different sets of bit patterns are designed to represent text symbols. Each set is called a code.
  - **ASCII**
    - American Standard Code for Information Interchange: 7-bit code/char, 1 bit for parity.
    - Constitutes the first 127 characters in Unicode and known as basic Latin.

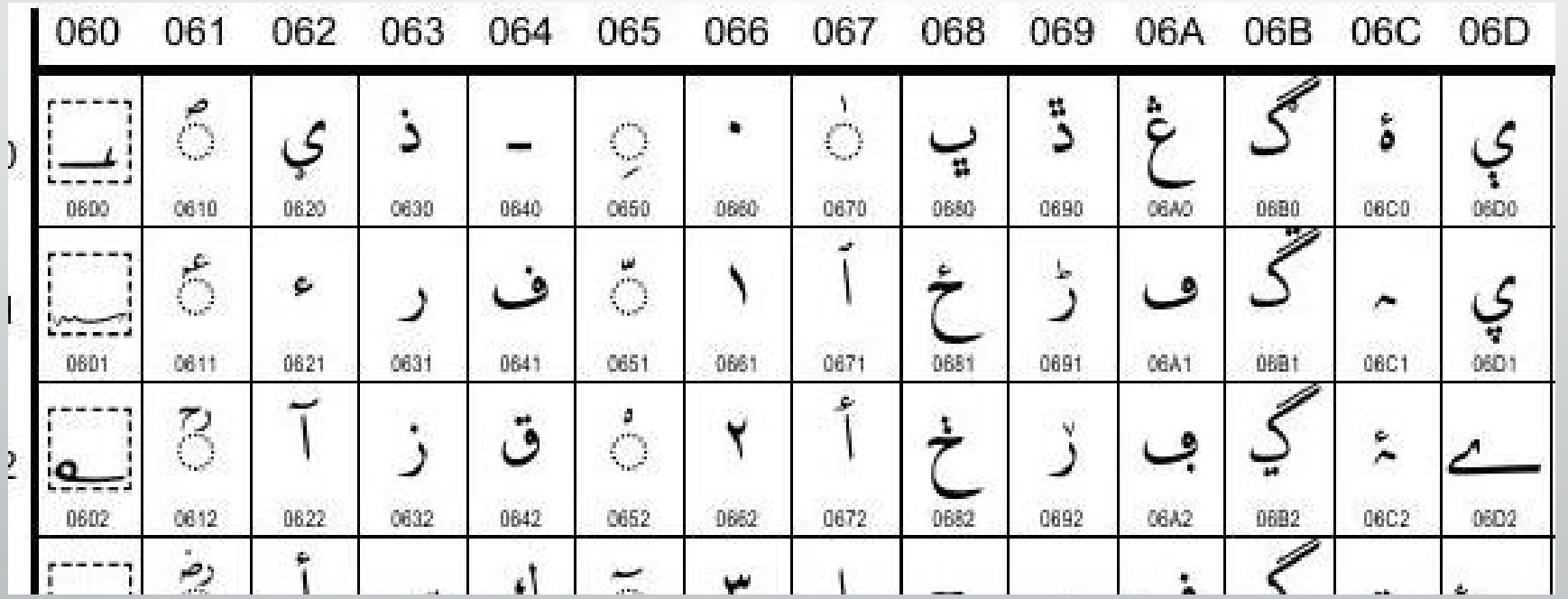


ASCII Reference Table

	000	001	010	011	100	101	110	111
0000	NULL	DLE		0	@	P	`	p
0001	SOH	DC1	!	1	A	Q	a	q
0010	STX	DC2	"	2	B	R	b	r
0011	ETX	DC3	#	3	C	S	c	s
0100	EDT	DC4	$	4	D	T	d	t
0101	ENQ	NAK	%	5	E	U	e	u
0110	ACK	SYN	&	6	F	V	f	v
0111	BEL	ETB	'	7	G	W	g	w
1000	BS	CAN	(	8	H	X	h	x
1001	HT	EM	)	9	I	Y	i	y
1010	LF	SUB	*	:	J	Z	j	z
1011	VT	ESC	+	;	K	[	k	{
1100	FF	FS	,	<	L	\	l	|
1101	CR	GS	-	=	M	]	m	}
1110	SO	RS	.	>	N	^	n	~
1111	SI	US	/	?	O	_	o	DEL

Data Representation - Text

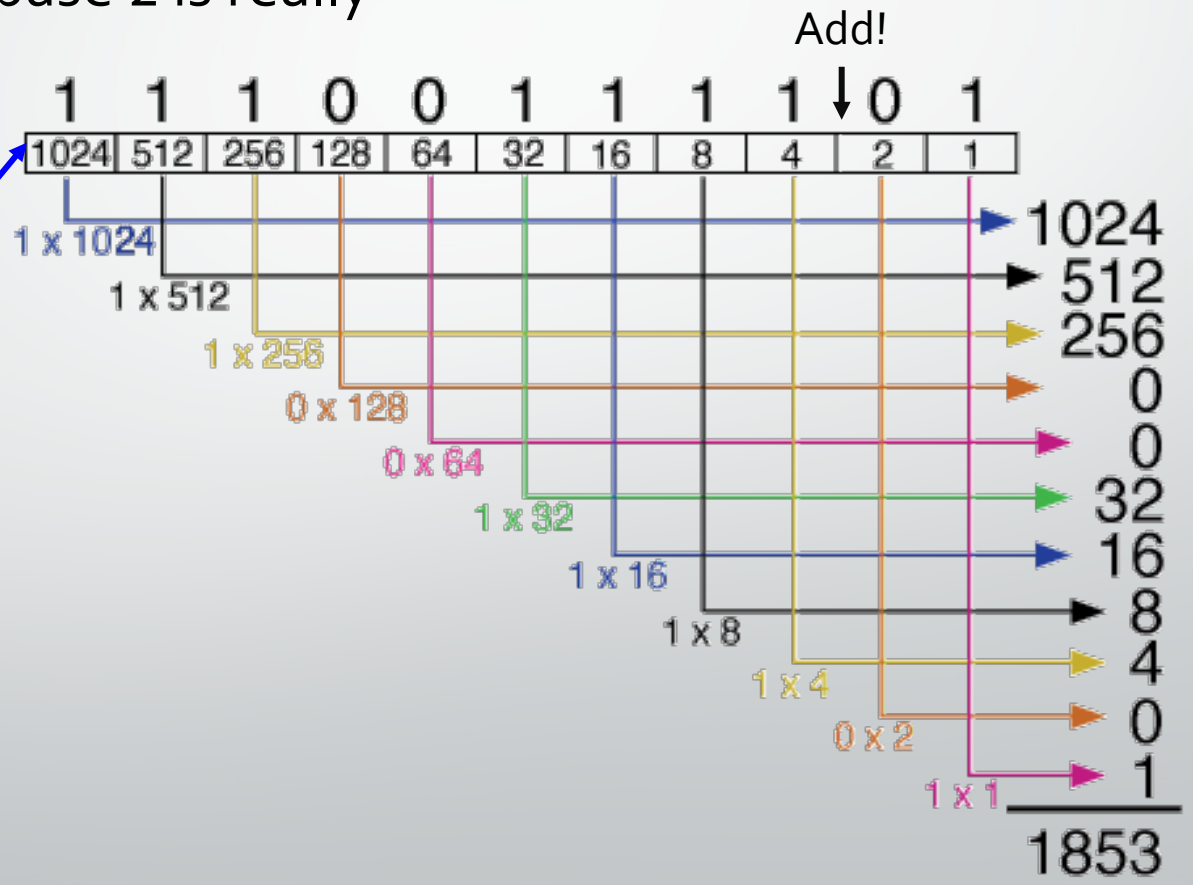
- **Unicode:**
- 16 bit codes to represent a symbol.
- More characters can be represented.
- But takes up twice the space.



Data Representation - Numbers

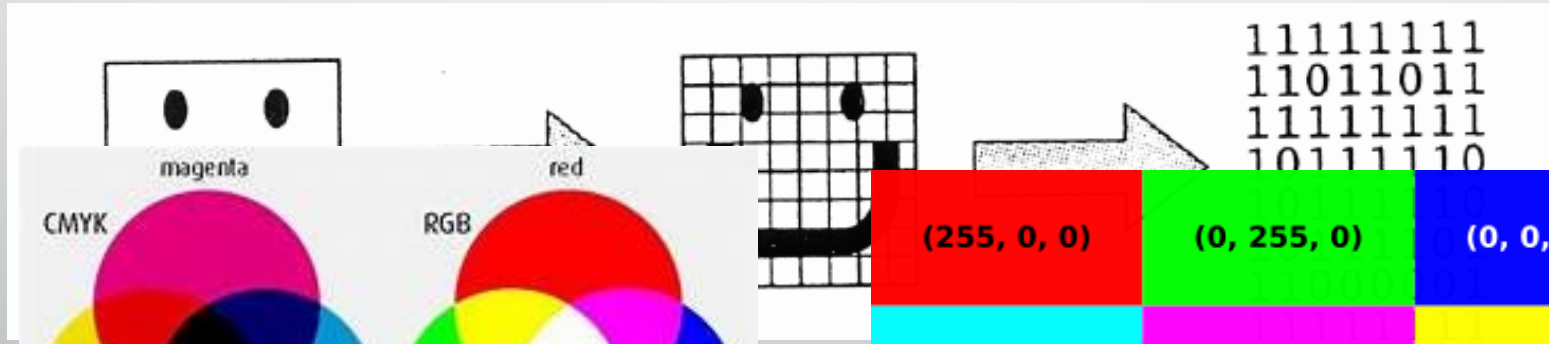
- **Numbers :**
  - Directly converted in to binary which is base 2.
  - The number 1853 in base 2 is really

All the numbers are in power of two!



Data Representation - Images

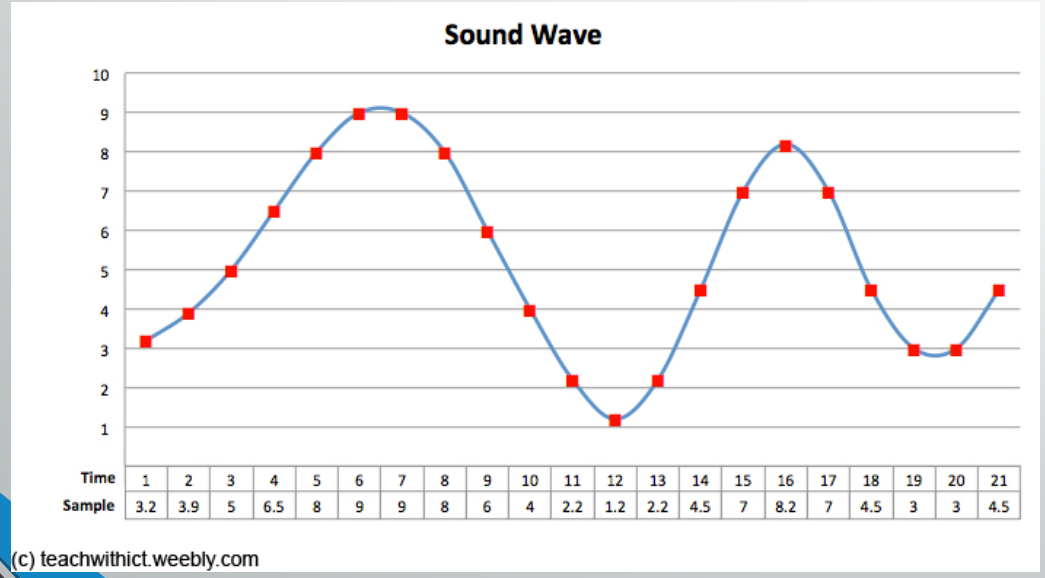
- **Images**
  - Also represented by bit patterns.
  - A digital image is made up of small units called pixels. Each pixel is assigned a bit pattern whose size depends on the nature of the image.
  - Color images uses RGB or YCM methods.



RGB

Data Representation – Audio & Video

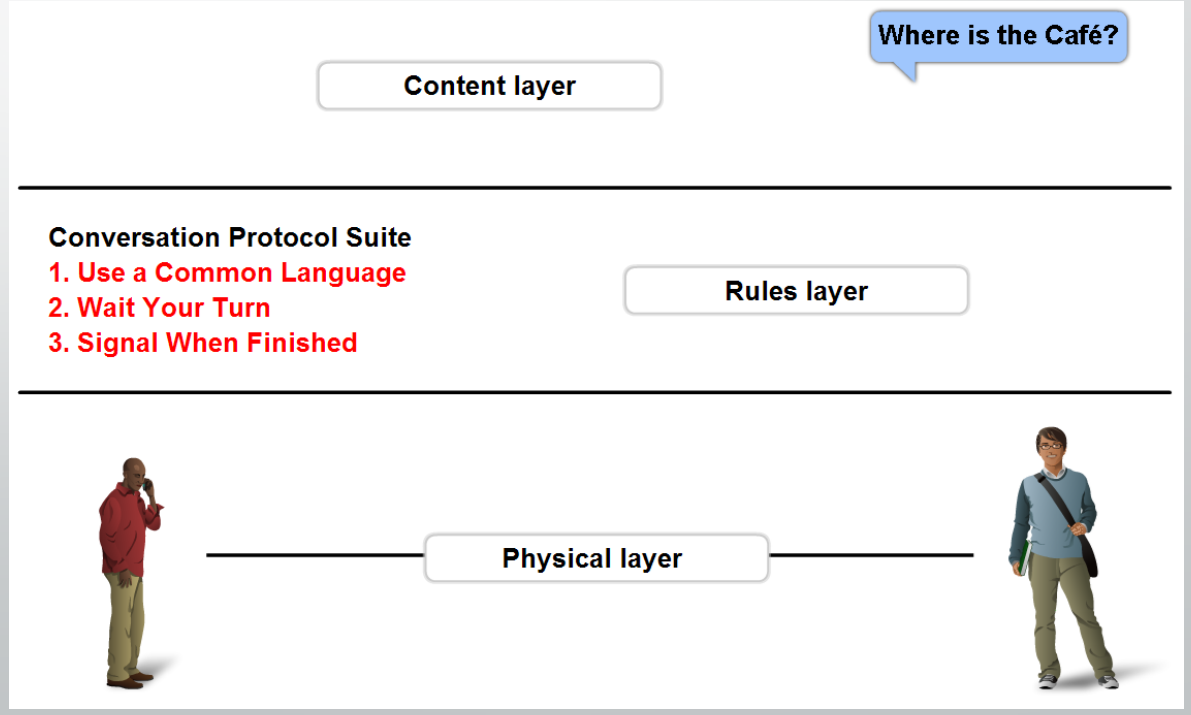
- **Audio**
- Continuous, not discrete
- Converted to digital or analog signal.



- **Video**
- Collection of frames(images) projected in sequence dynamically.
- Each image is converted to a bit pattern and stored.

Rules - Protocols

- A set of predetermined rules that govern communication.
- Defines:
  - What is communicated??
  - How it is communicated??
  - When it is communicated??



Types of Network

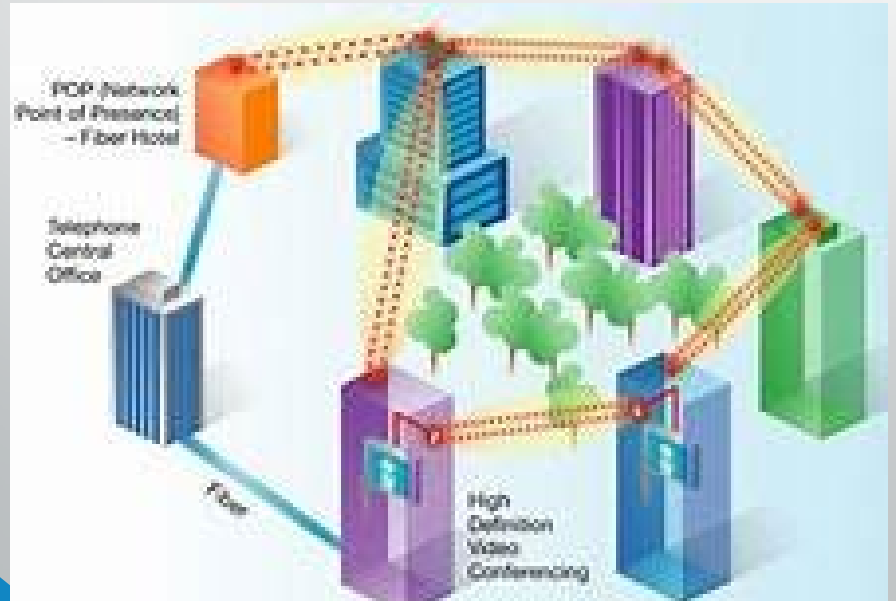
- **PAN – E.g. Bluetooth**
  - A network that connects computers, peripherals and other devices within a personal operating space.
  - Typical coverage within 10 meters
- **LAN – E.g. Ethernet, Wireless LANs**
  - Connects computers, peripherals and other devices within a building (e.g. office, home) or in a limited area.
  - Typical coverage 50 to 300 meters.

Types of Network

- **MAN – E.g. Wi-Max**

  Metropolitan area network

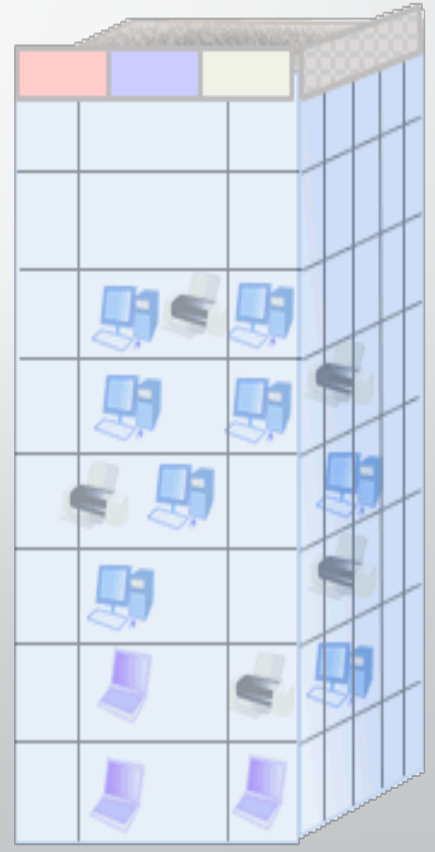
  - Is a city wide network.
  - The coverage limitation is not strict, but real implementation may have range of up to 50 km in urban, suburban, or rural area.
- **WAN – E.g. PSTN, Cellular Networks (GSM etc)**
  - A network that spans larger geographical area.
  - LANs separated by geographic distance are connected by a Wide Area Network (WAN).



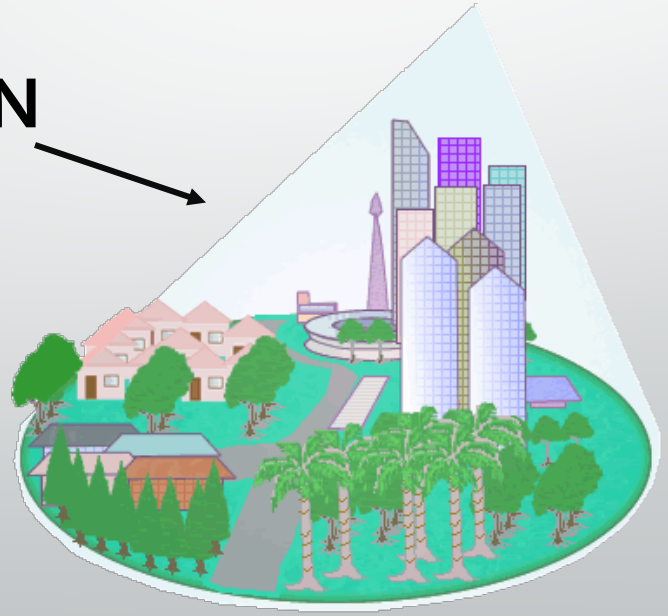
Types of Network – Can you identify?

WA
N

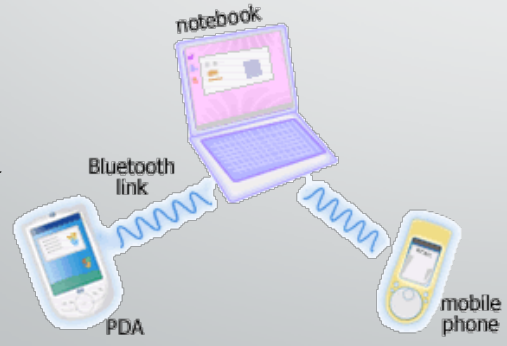
LAN



MAN

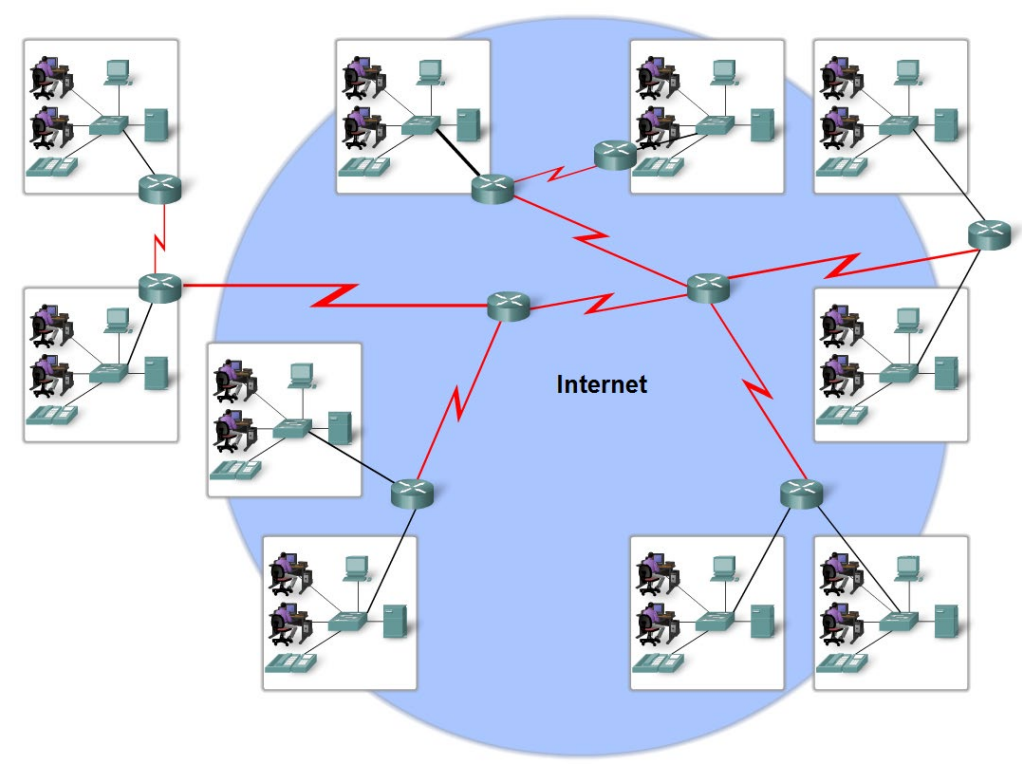


PA
N



Internet

- The **Internet** is defined as a global mesh of interconnected networks

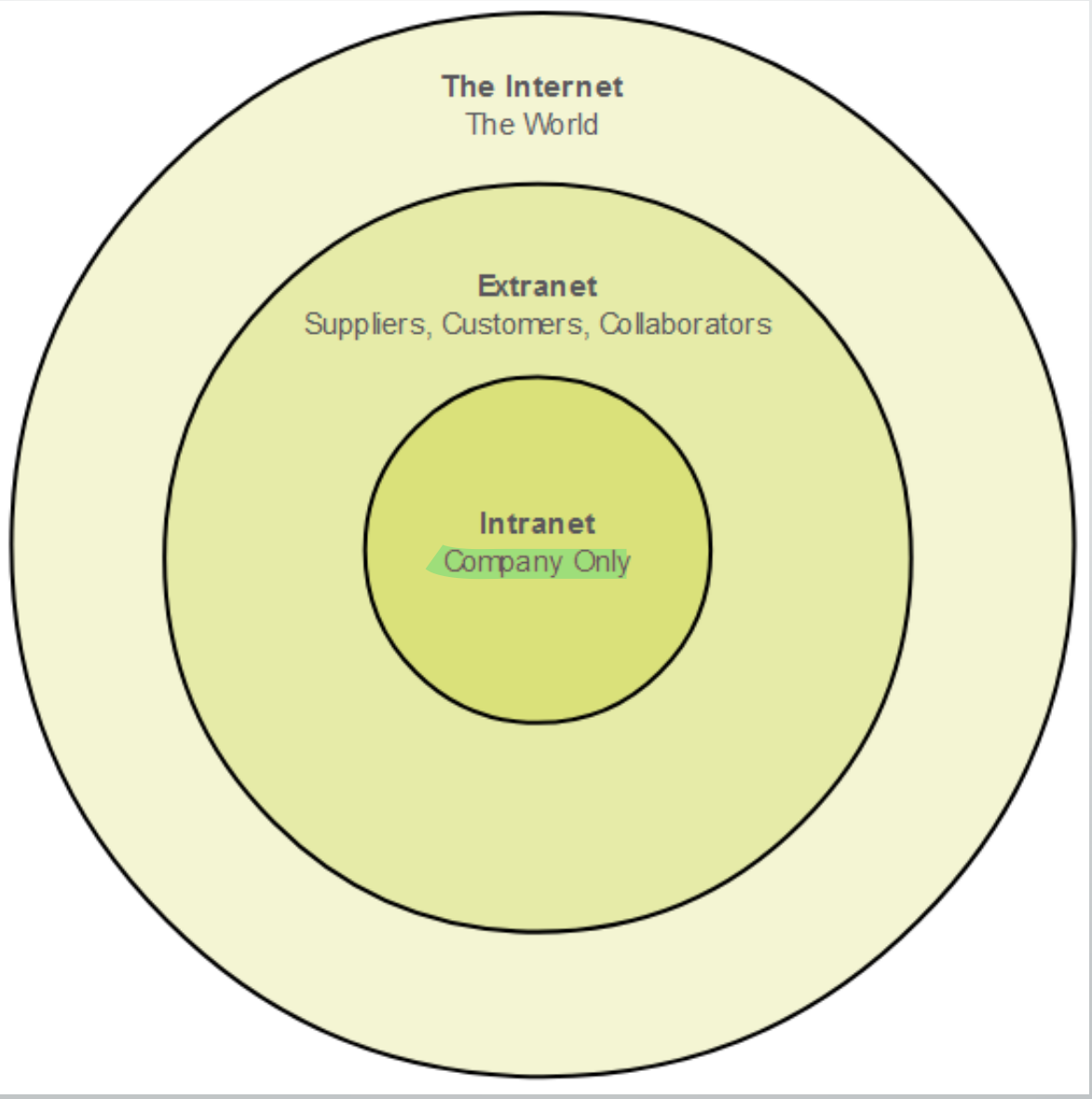


- What do you think **Intranet** is?

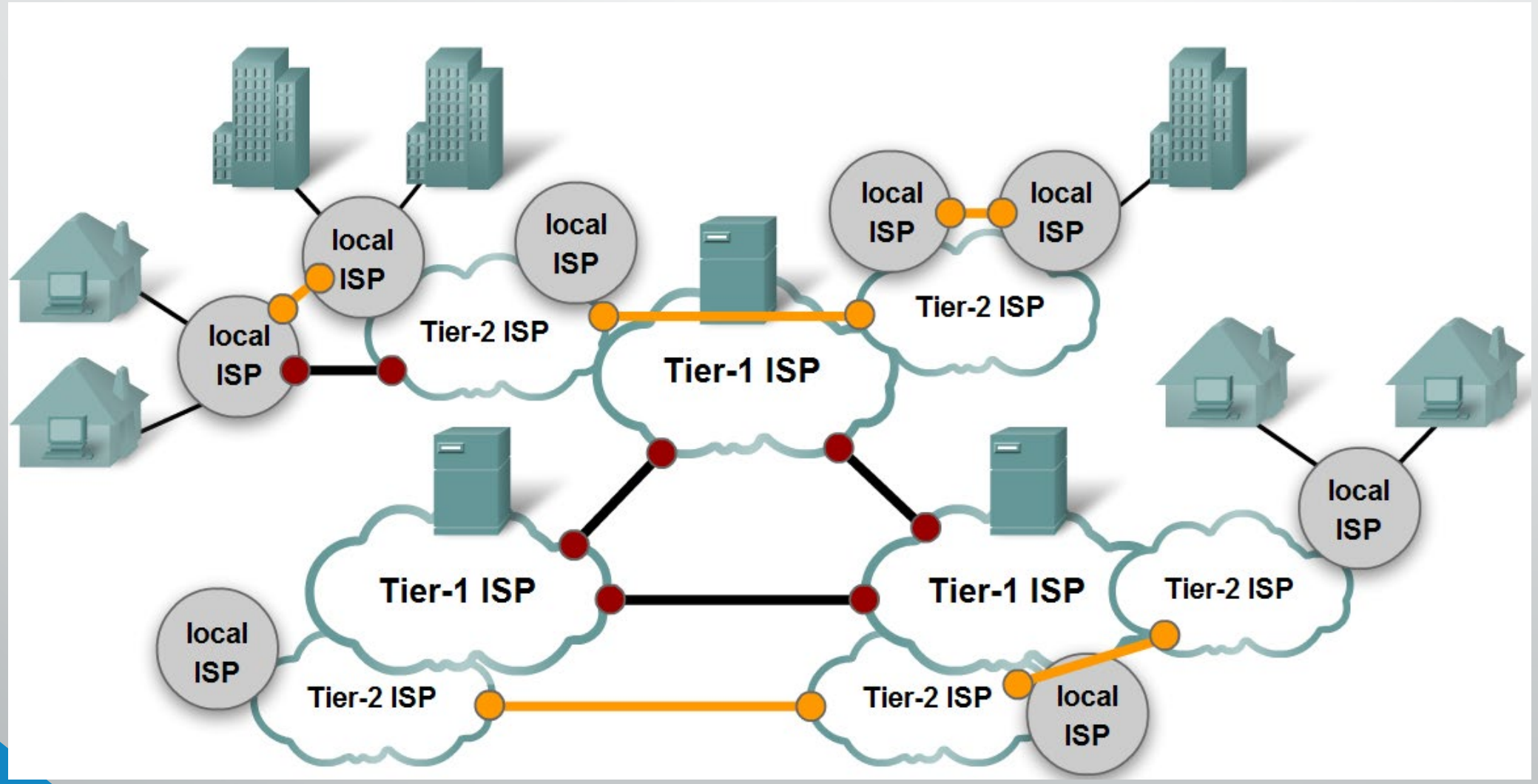
Intranets and Extranets

An **intranet** is a private collection of LANs and WANs internal to an organization

Extranet is used to provide secure access to their network for individuals who work for a different organization that need access to their data on their network.



Internet (Continued)



For Queries be present in the live sessions.
Or post your queries in the discussion board

Thank you