



EENG372

COMMUNICATION SYSTEMS I

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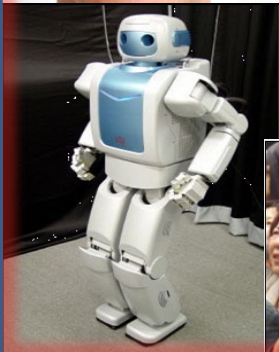
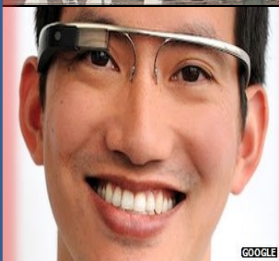
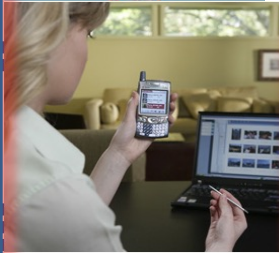
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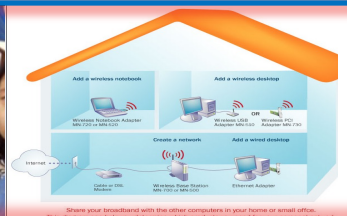
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member



Communication systems 1

EENG 372



Communication

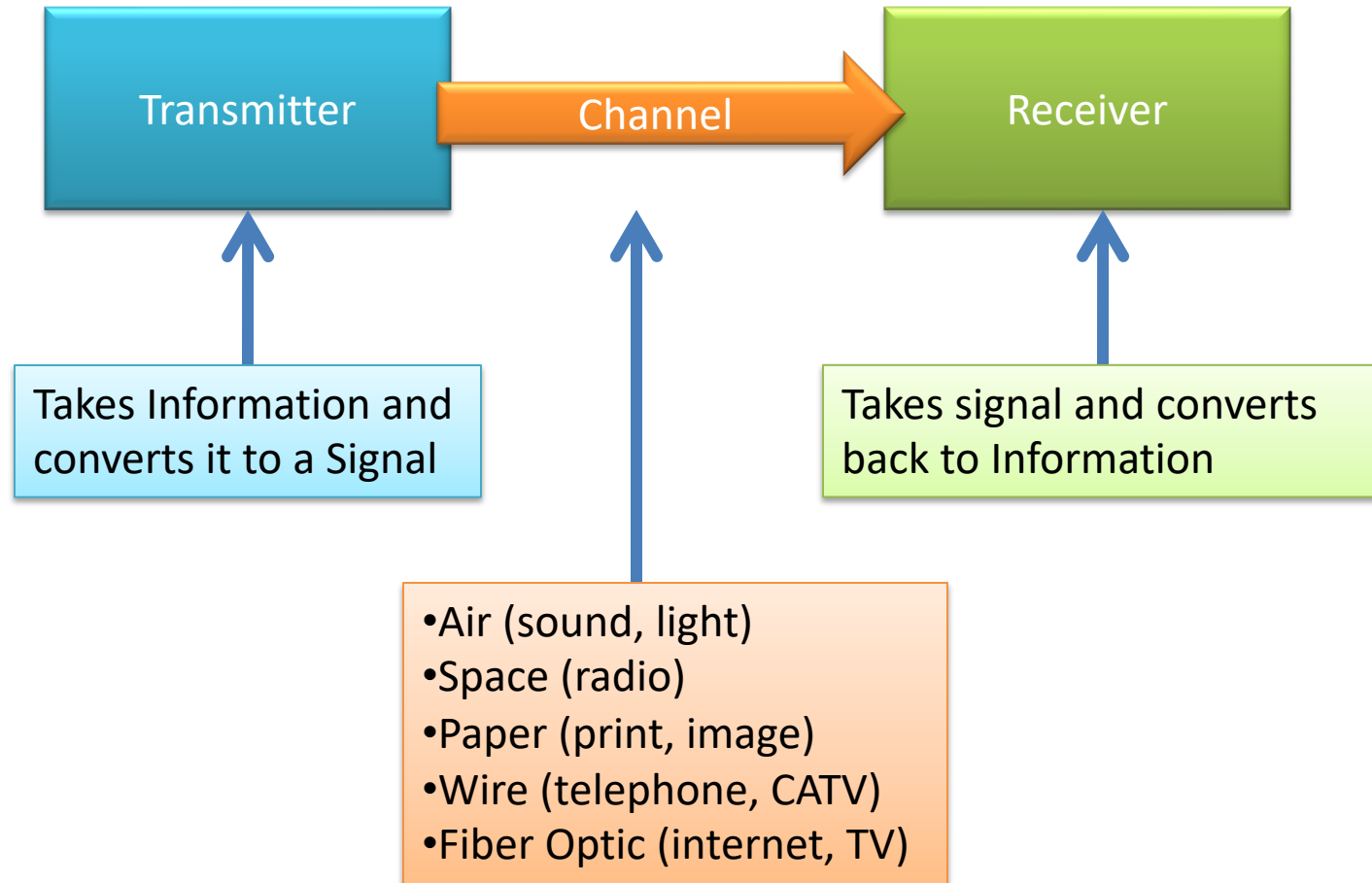
Q: What is Communication?

Communication is the process of exchange of information

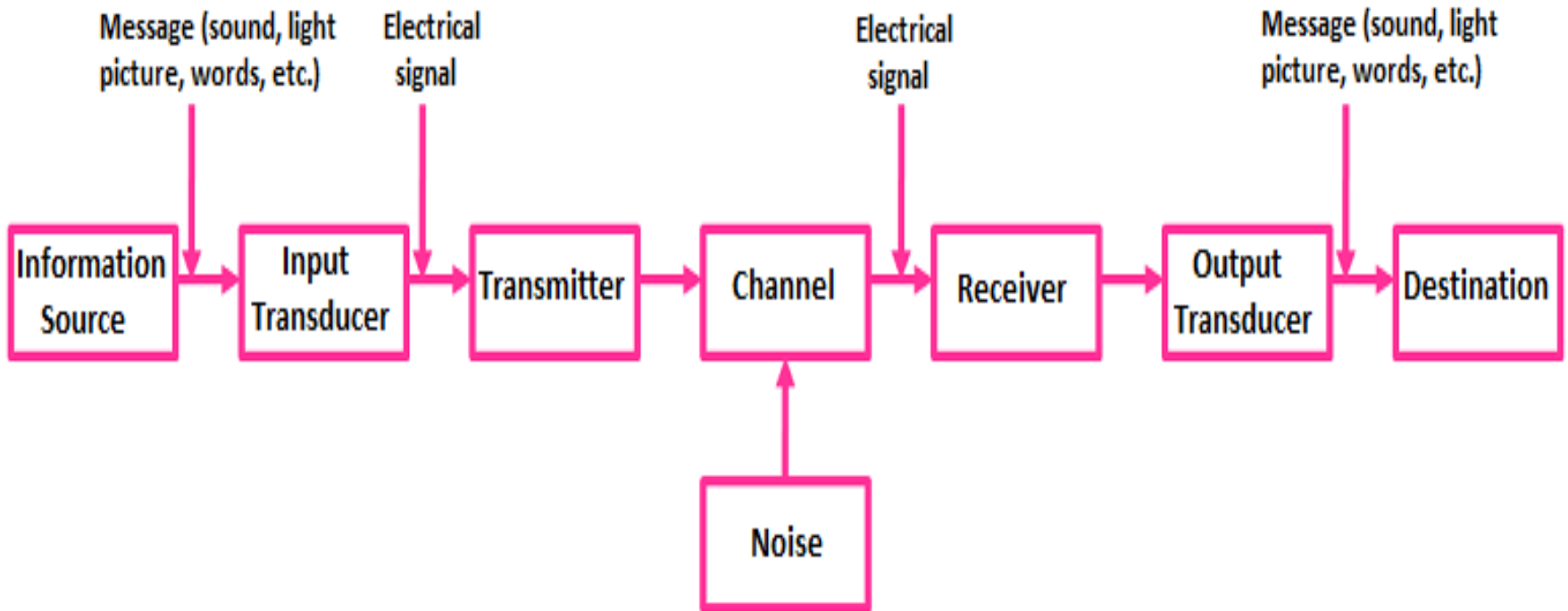
Q: What is a Communication System ?

A Communication System is a system that performs the exchange of information

Communication system



Basic Communication System



Basic Communication System

Source: originates the message (information)

Input Transducer: convert non-electrical signal to electrical signal referred to as baseband signal

Transmitter: modifies baseband signal for efficient transmission

Channel: is a medium such as wire, coaxial cable, waveguide, optical fiber or free space.

Receiver: reverses the modification done by the transmitter

Output Transducer: convert electrical signal to original non electrical signal

Destination: the unit to which the message is communicated

Generic
Communication
System

Input
Transducer

Transmitter

Transmission
Channel

Receiver

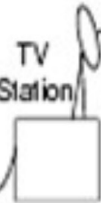
Output
Transducer

DDS
Satellite TV
System



Camera

TV
Station



Satellite

Satellite Box

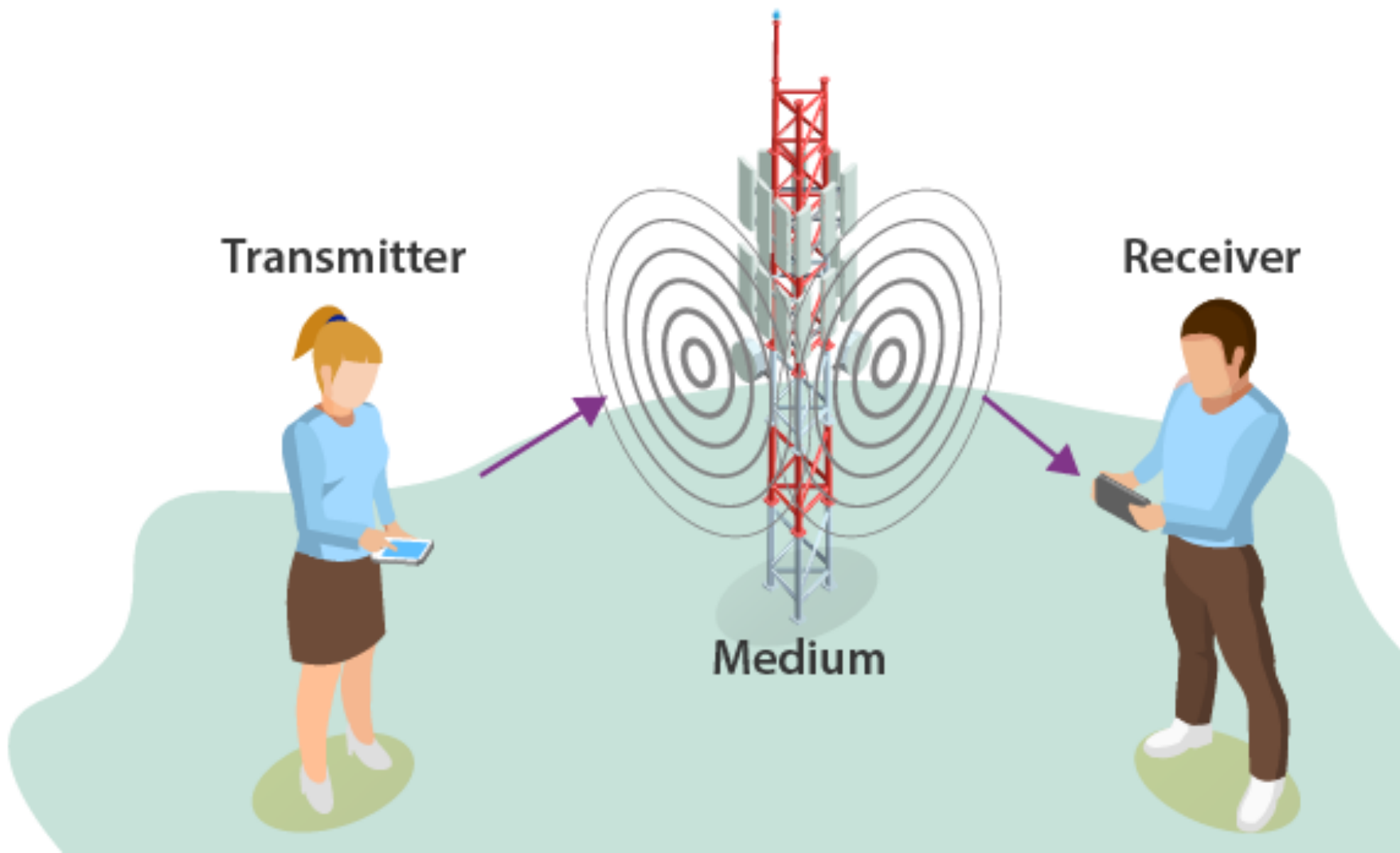
TV Monitor

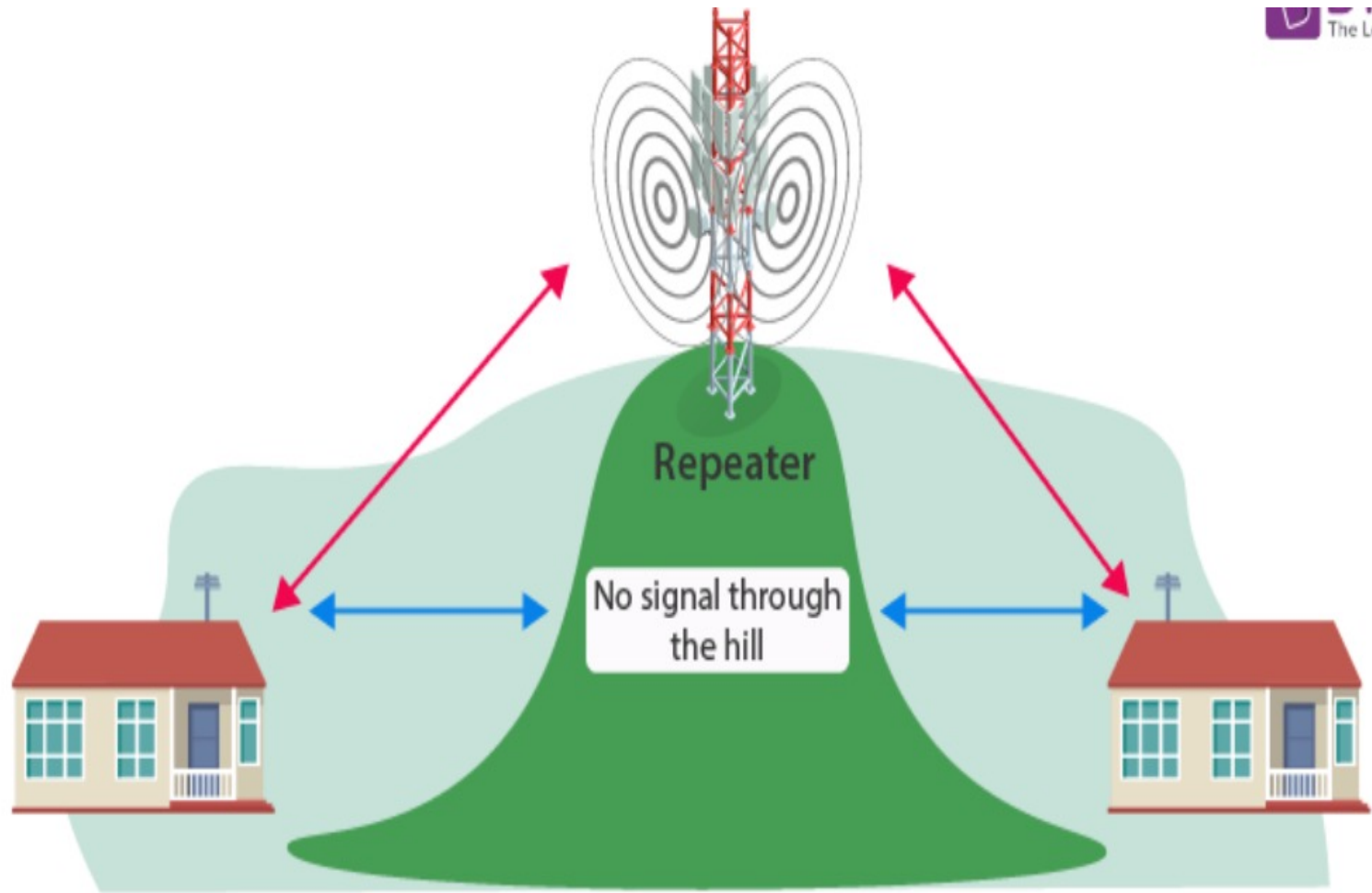


Transmitter

Receiver

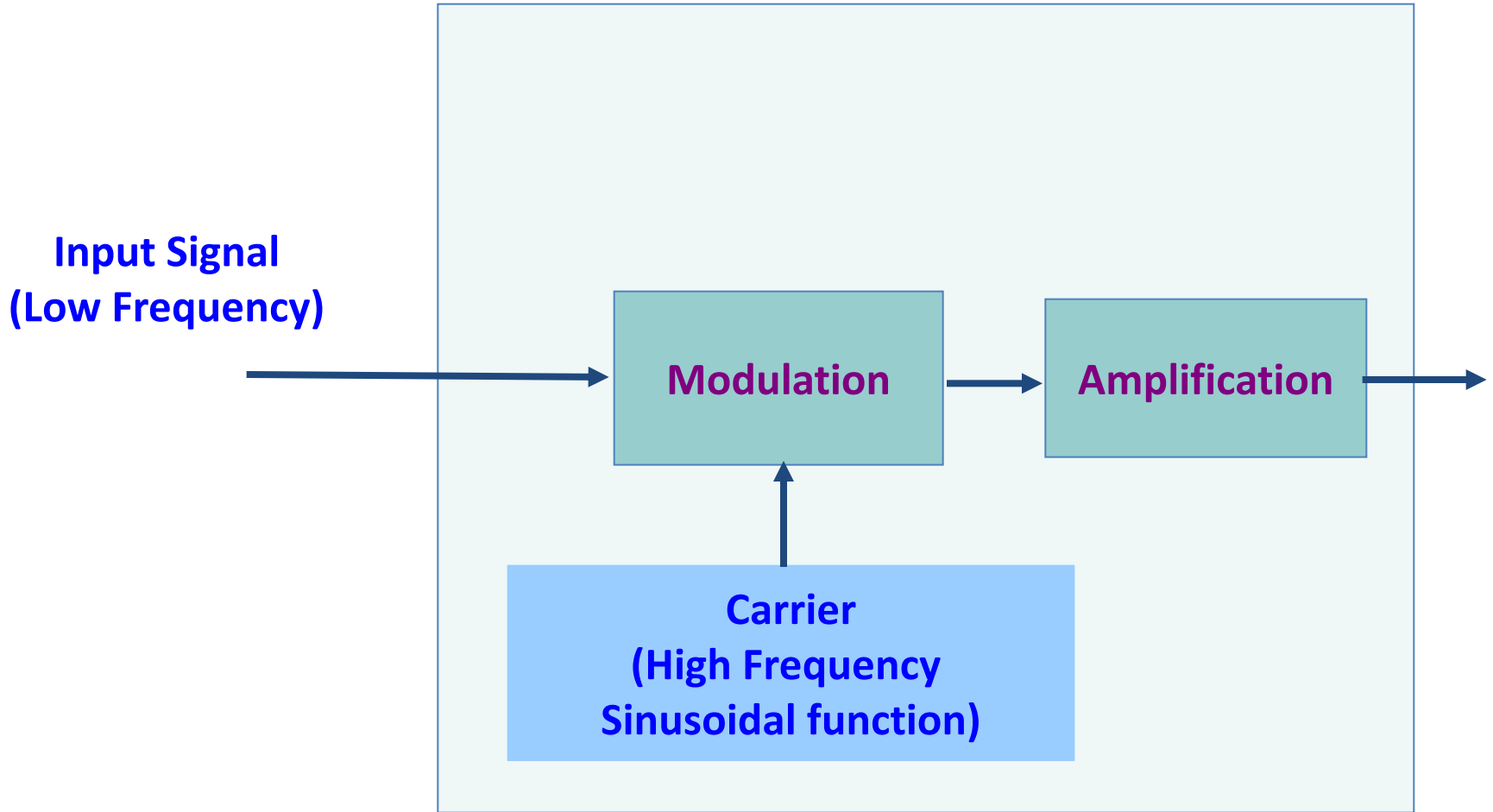
Medium



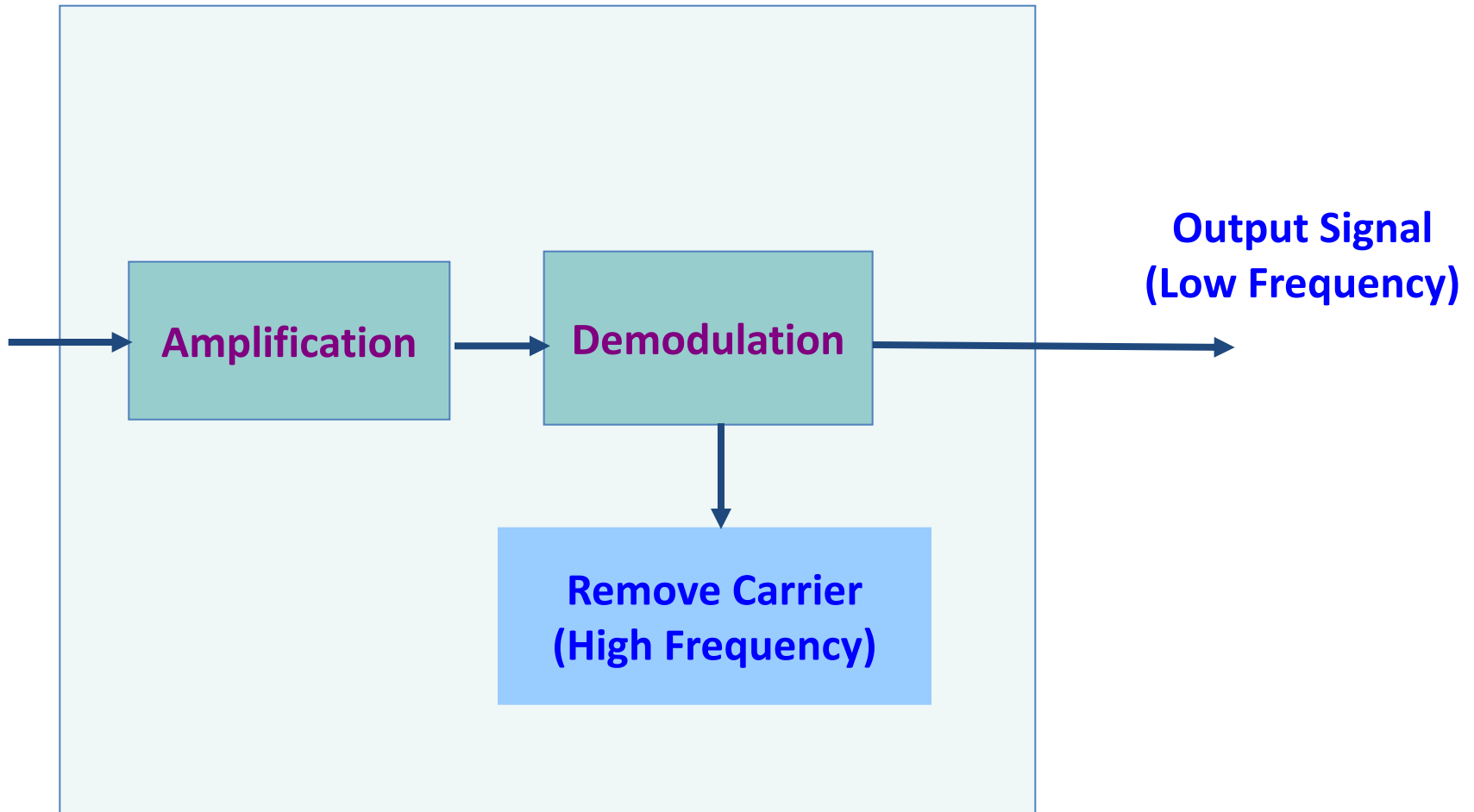


Communication only possible by bouncing the signal through the repeater

Transmitter



Receiver



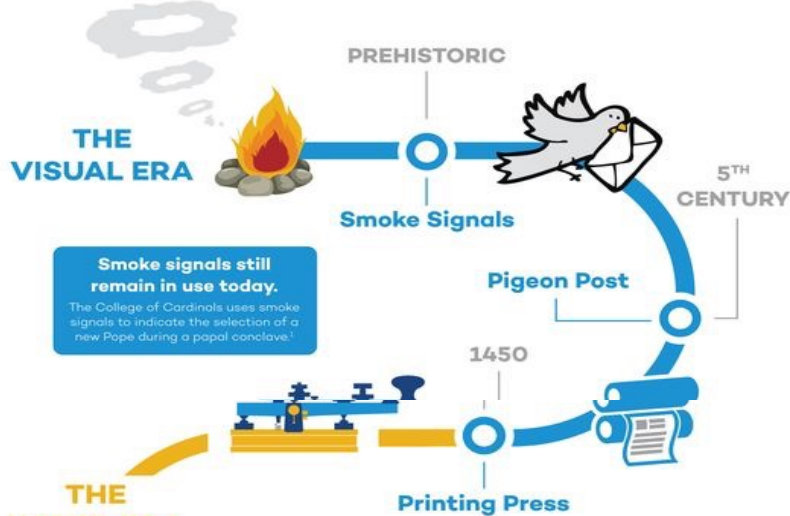
Topics covered in this course

0. Signal Analysis (Revision)
1. Amplitude Modulation and Demodulation.
2. Angular Modulation and Demodulation.
3. Noise in Analog Communication Systems.
4. Introduction to Digital Communication Systems.

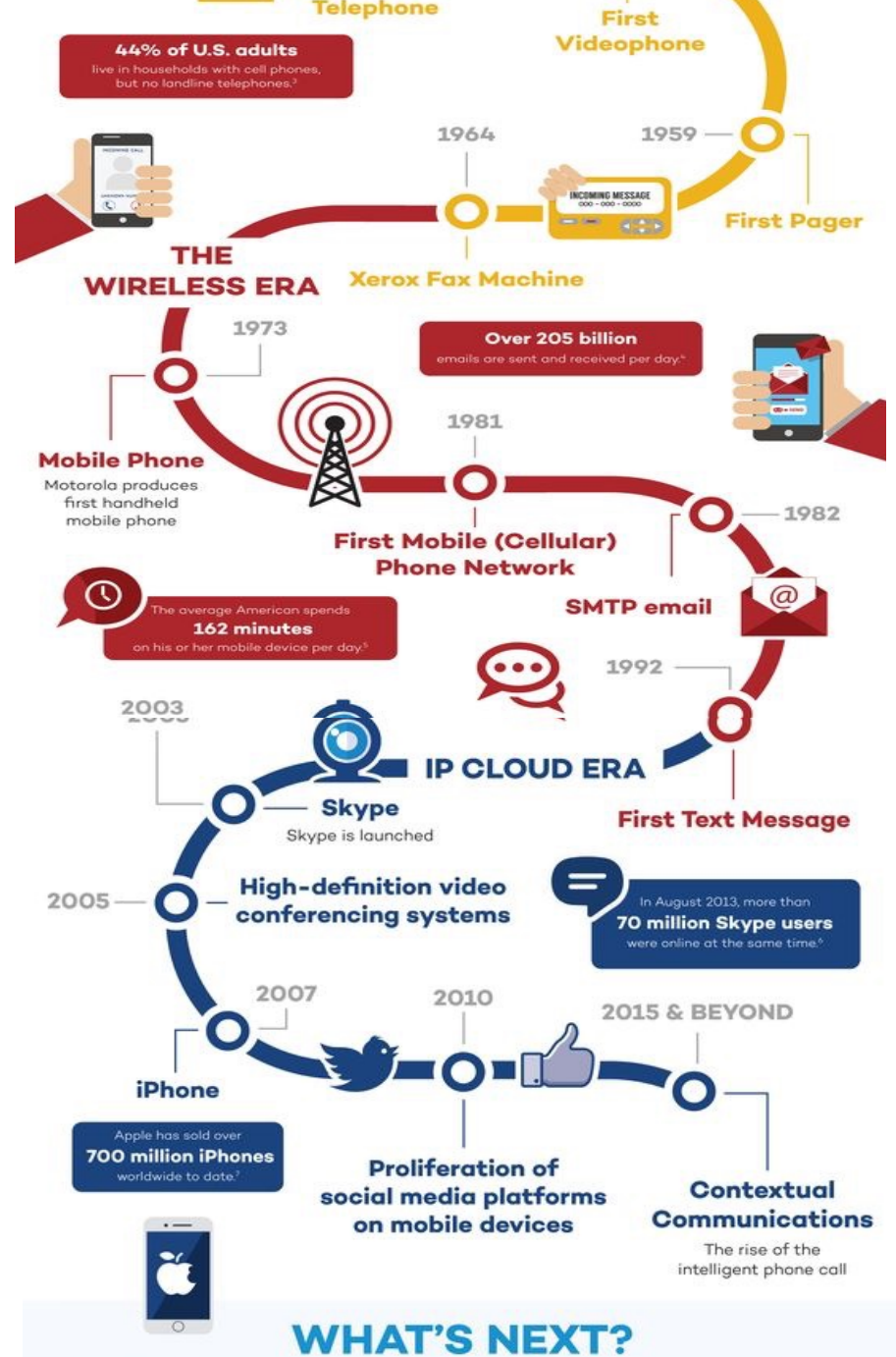
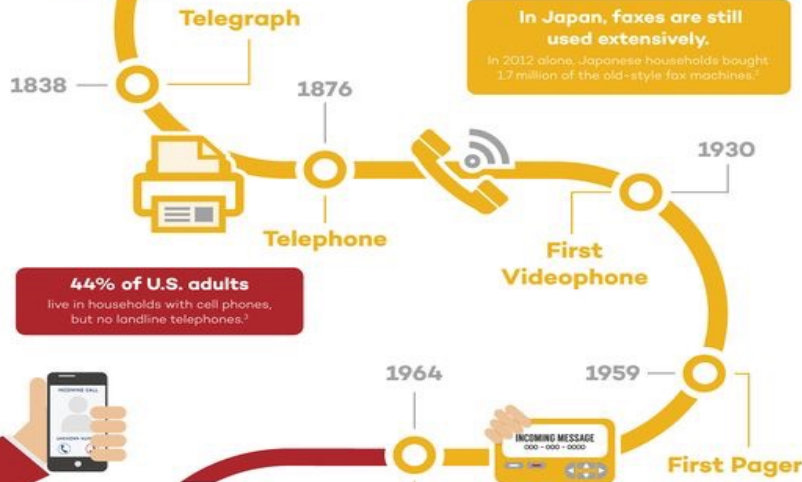
A HISTORY OF COMMUNICATION

Throughout the ages, humankind has developed various modes of communication to connect, engage, and interact with one another. As technology has evolved, so have the opportunities to communicate more rapidly and productively.

Here is a look at the evolution of communication.



THE WIRED ERA



WHAT'S NEXT?

Examples of com. systems

- Satellite
- TV
- Cordless phone
- Cellular phone
- Wireless LAN, WIFI
- Wireless MAN, WIMAX
- Bluetooth
- Zigbee
- Ultra Wide Band
- Wireless Laser
- Microwave
- GPS
- Ad hoc/Sensor Networks

1) Radio and TV broadcast



The RCA 630-TS, the first mass-produced television set, sold from 1946 to 1947.



Smart TV 2012
LED digital internet

2) Mobile Communications

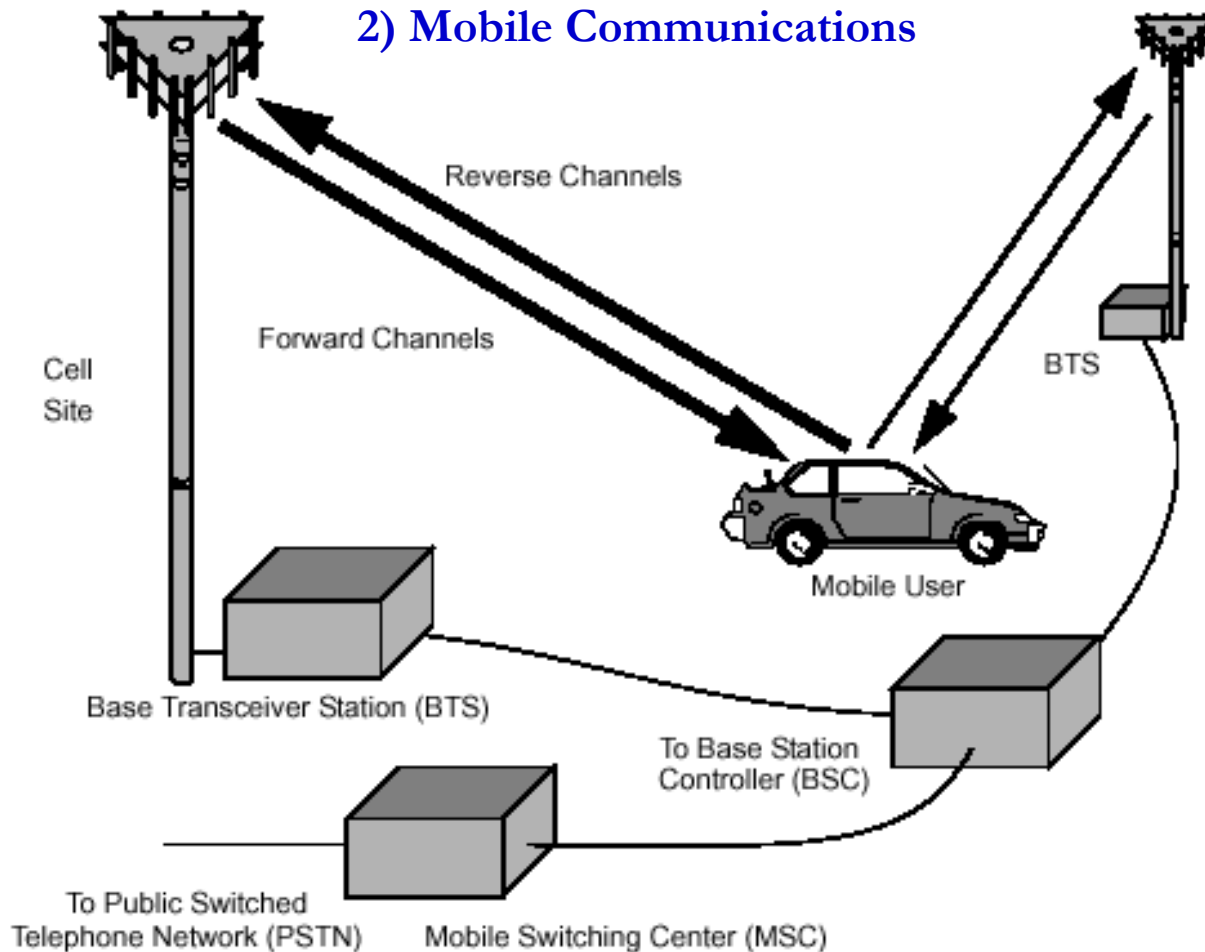


Figure 1-3 There are two main types of forward channels. Control and access channels are used to set up calls and provide security and management functions. Traffic channels are used to carry voice traffic. The reverse channels are also divided into access channels and traffic channels. In some systems, the Base Station Controller (BSC) may be integrated directly into the cell site. In other systems, as shown here, the Base Transceiver Stations (BTSs) are connected to a Base Station Controller.

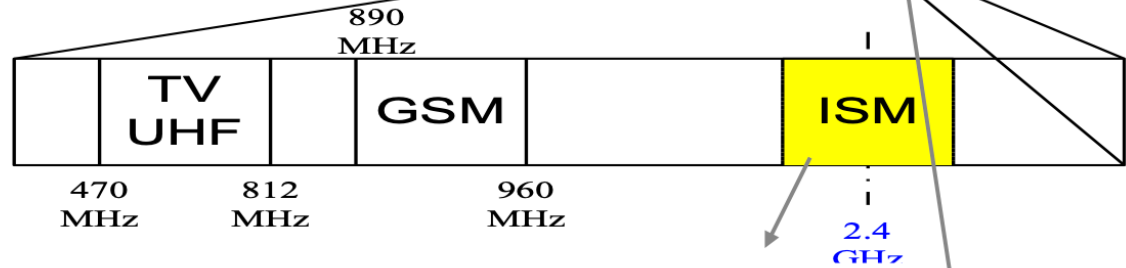
3) Satellite Communications

1. Fixed satellite service (FSS)
 - Links for existing telephone networks
 - Transmitting TV signals to cable companies.
2. Broadcasting Satellite Service (BSS)
 - Direct to home (DTH) =Direct broadcasting satellites (DBS)
3. Mobile satellite service (MSS)
 - Land mobile , maritime mobile and aeronautical mobile
4. Navigation satellite service (GPS)
 - Global positioning system (S&R)
5. Meteorological satellite service (Weather Forecast)
6. Deep Space Satellites

Frequency Allocation

30 Hz 300 Hz 3 kHz 30 kHz 300 kHz 3 MHz 30 MHz **300 MHz** **3 GHz** 30 GHz 300 GHz

ELF	Voice Frequency	VLF	LF	MF	HF	VHF	UHF	SHF	EHF
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Note: The **Industrial, Scientific and Medical (ISM)** radio bands were originally reserved internationally for non-commercial use of RF electromagnetic fields for industrial, scientific and medical purposes.

In recent years they have also been used for license-free error-tolerant communications applications such as Bluetooth and IEEE 802.11b

–Standard for 5.2 GHz NII band (300 MHz)

–**Unlicensed National Information Infrastructure (U-NII)** band , USA

Very Crowded RF spectrum

UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

RADIO SERVICES COLOR LEGEND

- AERONAUTICAL MOBILE
- INTER-SATELLITE
- RADIO ASTRONOMY
- AERONAUTICAL MOBILE SATELLITE
- LAND MOBILE
- RADIO DETERMINATION SATELLITE
- AERONAUTICAL RADIONAVIGATION
- LAND MOBILE SATELLITE
- RADIODIFFUSION
- AMATEUR
- MARITIME MOBILE
- RADIODIFFUSION SATELLITE
- AMATEUR SATELLITE
- MARITIME MOBILE SATELLITE
- RADIONAVIGATION
- BROADCASTING
- MARITIME RADIONAVIGATION
- RADIONAVIGATION SATELLITE
- BROADCASTING SATELLITE
- METEOROLOGICAL AID
- SPACE OPERATION
- EARTH ORBITATION SATELLITE
- METEOROLOGICAL SATELLITE
- SPACE RESEARCH
- FIXED
- MOBILE
- STANDARD FREQUENCY AND TIME SIGNAL
- FIXED SATELLITE
- MOBILE SATELLITE
- STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

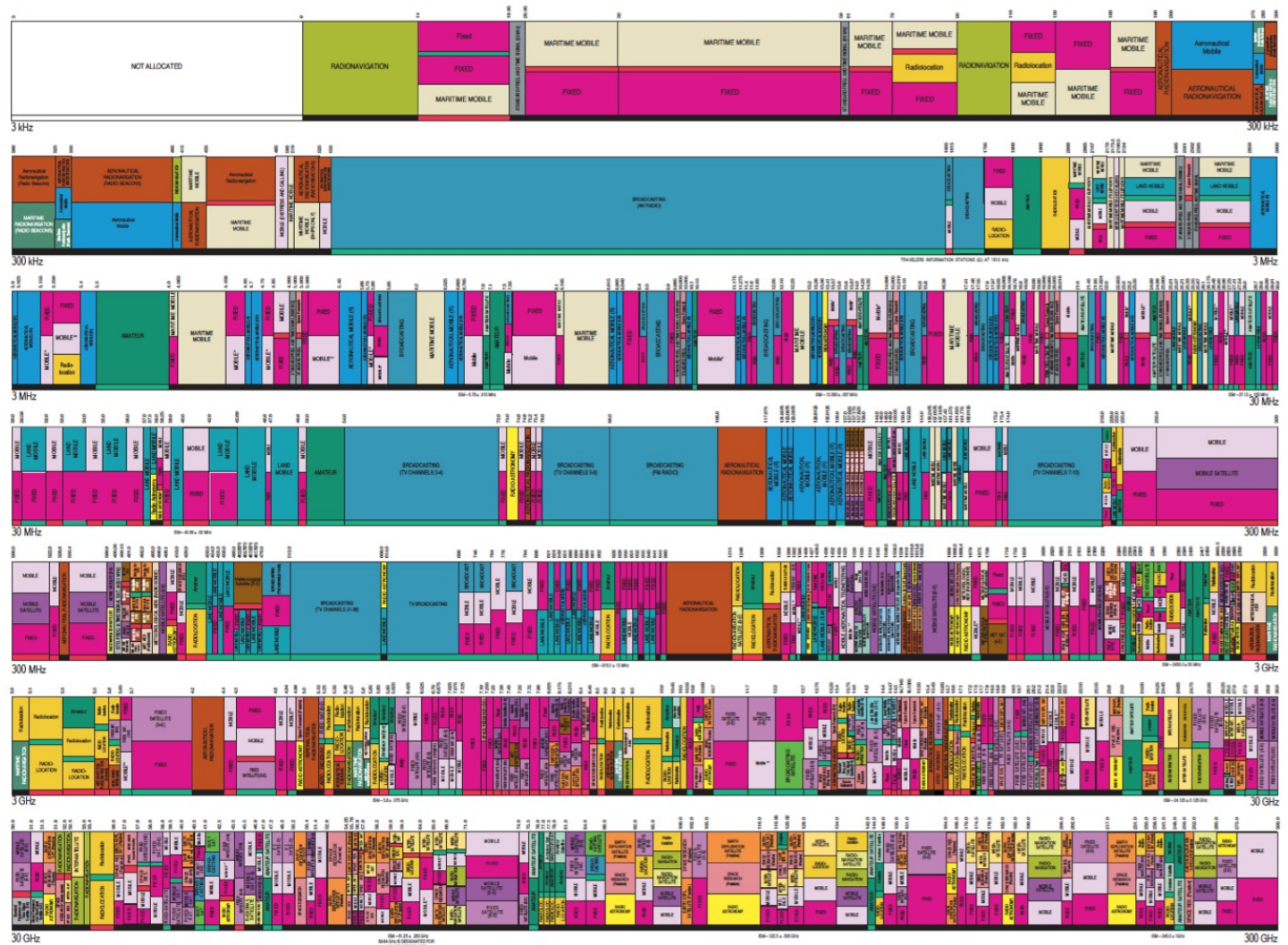
ACTIVITY CODE

- GOVERNMENT EXCLUSIVE
- GOVERNMENT/NON-GOVERNMENT SHARED
- NON-GOVERNMENT EXCLUSIVE

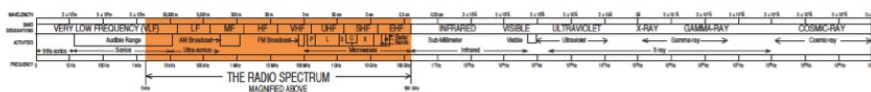
ALLOCATION USAGE DESIGNATION

SERVICE	EXAMPLE	DESCRIPTION
Primary	FIXED	Capital Letters
Secondary	MOBILE	1st Capital with lower case letters

This chart is a graphic representation of the portion of the Table of Frequency Allocations used by the FCC from 3 kHz to 30 GHz. It does not completely reflect all services. Further information is available in the Table of Frequency Allocations. Therefore, for complete information, users should consult the Table to determine the correct area of U.S. operations.



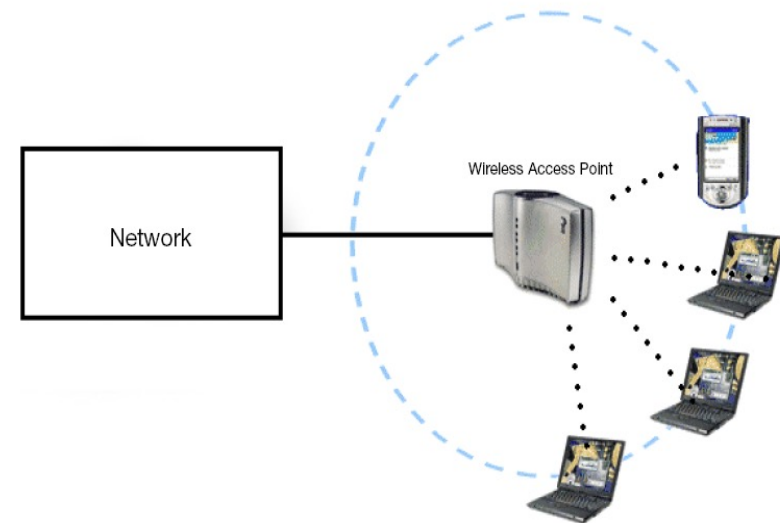
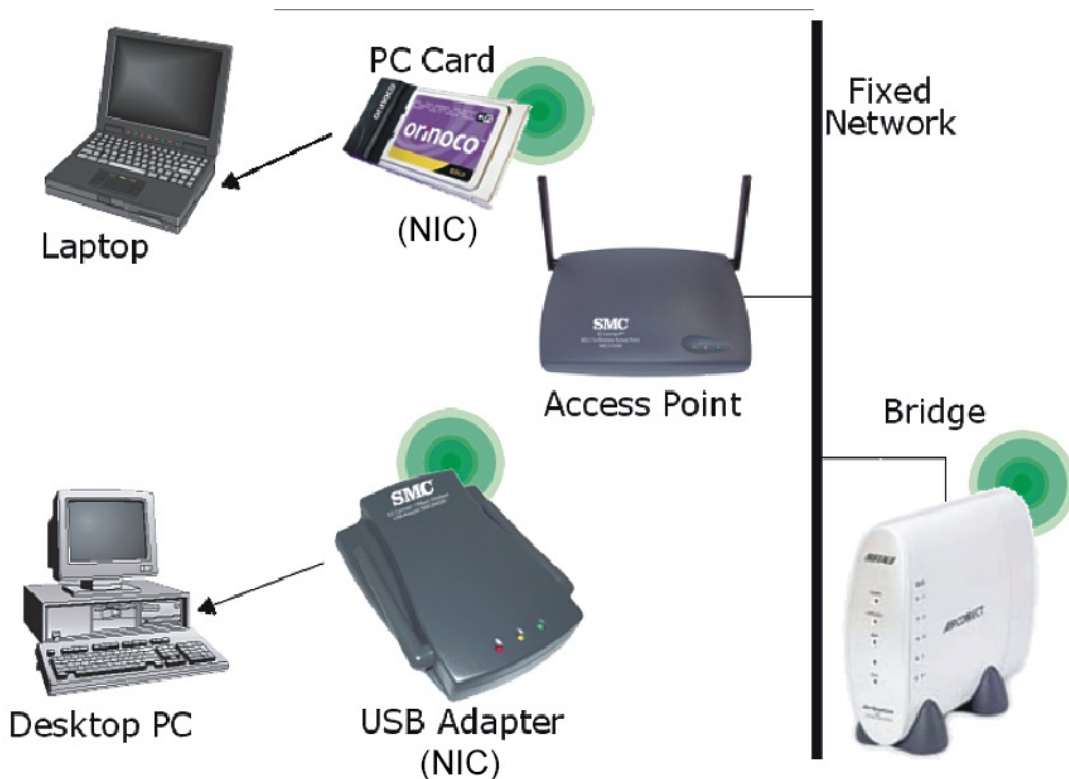
* EXCEPT WHERE SHOWN



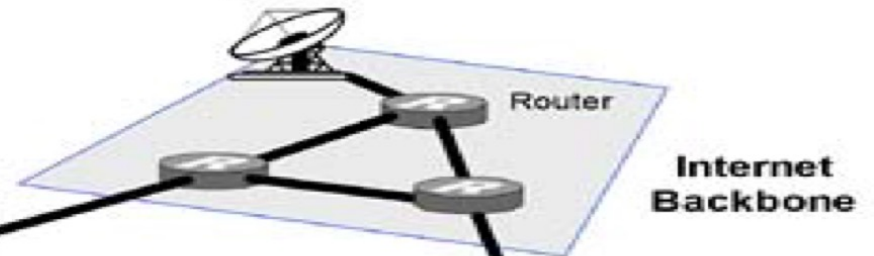
PLANES MARK THE SPECTRA ALLOTTED TO NETWORKS IN THE SPECTRUM. THE SPACING BETWEEN NETWORKS IS PROPORTIONAL TO THE ACTUAL WIDTH OF SPECTRA OCCUPIED.

4) Wireless Computer LANs

- Basically, a WLAN is simply a wireless version of an Ethernet LAN
- Main WLAN components are **Wireless Terminals** (or Stations) and **Access Points** (linking the WLAN to other networks)



Modern Telecommunications Systems



The Evolution Of mobile phone networks enables new applications



Wireless Cloud Computing

- **VoIP (VoLTE)** and high definition videos streaming



**Telemedicine
Virtual Clinics**



smart grid technologies

Types of Communication systems

Q: What are the different types of communication Systems?

Communication systems are:

1. Simplex or Duplex
2. Analogue or Digital
3. Base band or Carrier

Simplex and Duplex

Simplex: One-way Communication System-
Unidirectional

Radio and TV

Duplex: Two-way Communication System-
Bidirectional

Telephone

Simplex and Duplex

Simplex

**One-way or
Unidirectional**



**Examples:
Radio
TV**

Duplex

**Two-way or
Bidirectional**



**Half
Duplex**



**Examples:
Military Radio**

**Full
Duplex**



**Examples:
Telephone**

Analogue and Digital

Analogue

**Transmits Continuously
varying signals**



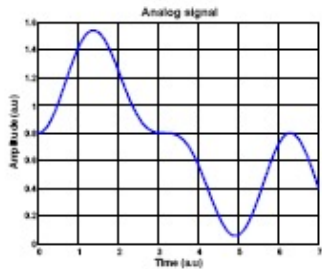
**Examples:
Radio**

Digital

Transmits digital signals



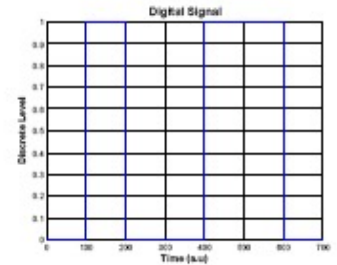
Examples:



ANALOG

Versus

DIGITAL



The signal is varied continuously in function of the information signal

Signal is encoded as a set of discrete values

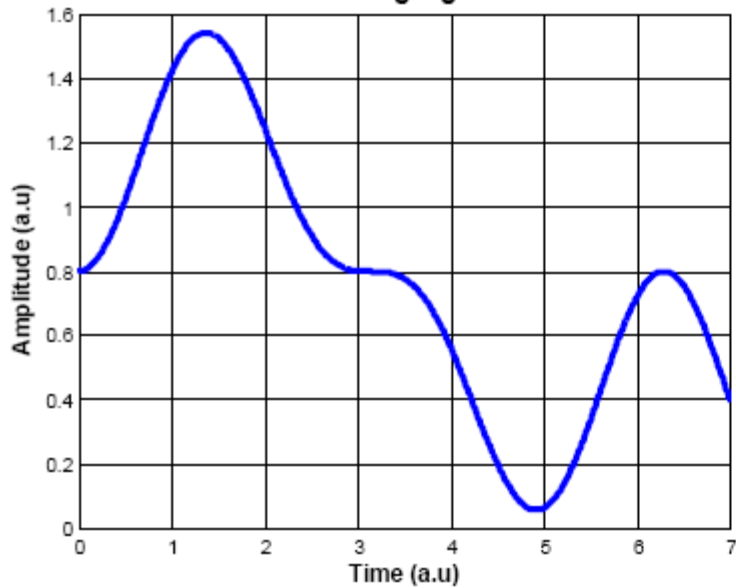
An analog signal can take on any amplitude and is well defined in Time

A Digital signal can only take on a set of Discrete values

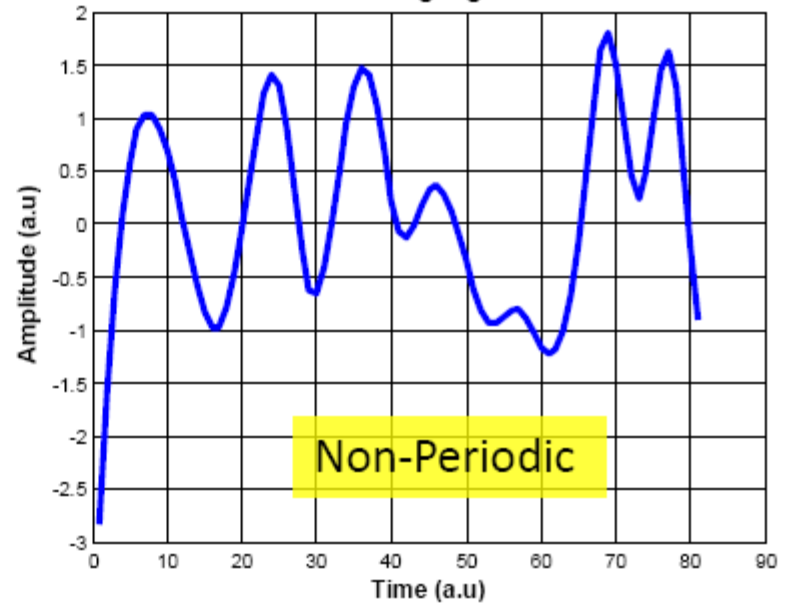
Analog is more susceptible to noise than digital

More complex system because of coding

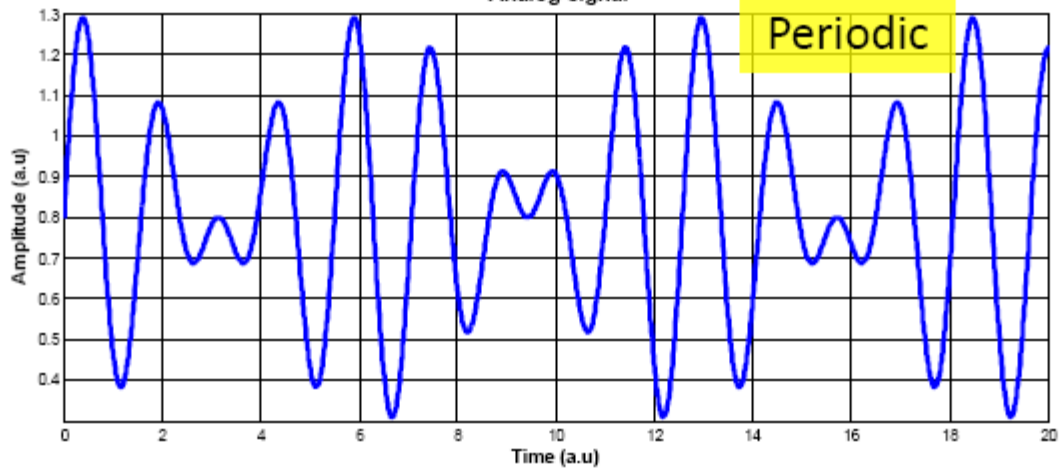
Analog signal



Analog signal



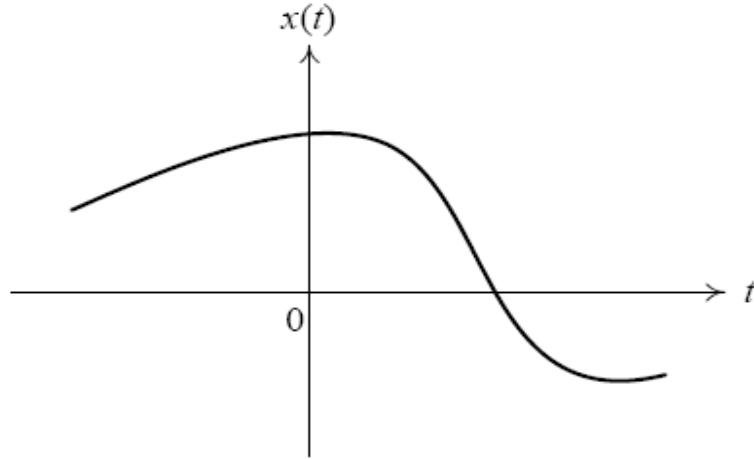
Analog signal



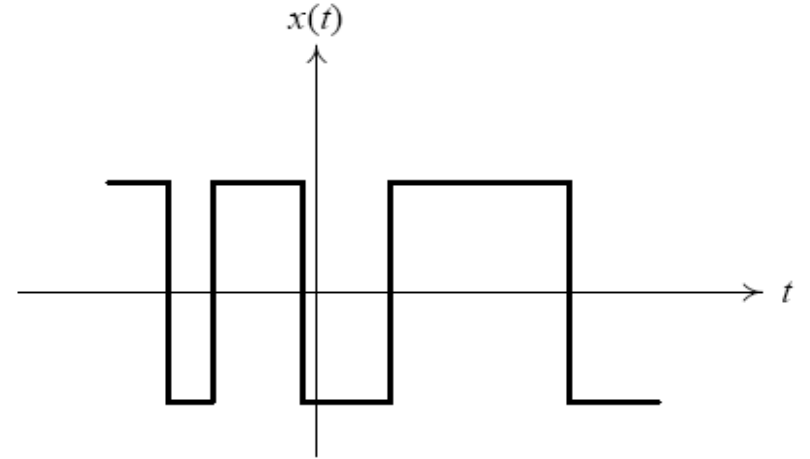
Analog Vs. Digital

- Analog Message: continuous in amplitude and over time
 - AM, FM for voice sound
 - Traditional TV for analog video
 - First generation cellular phone (analog mode)
 - Record player
- Digital message: 0 or 1, or discrete value
 - VCD, DVD
 - 2G/3G cellular phone
 - Data on your disk
 - Your grade

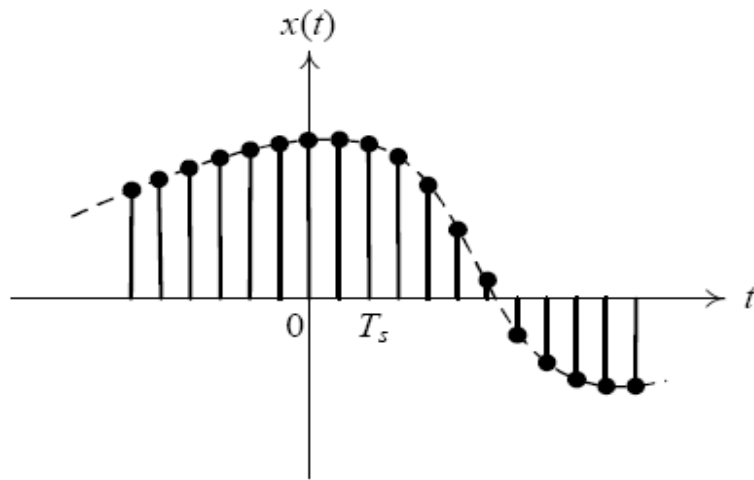
Analog Vs. Digital



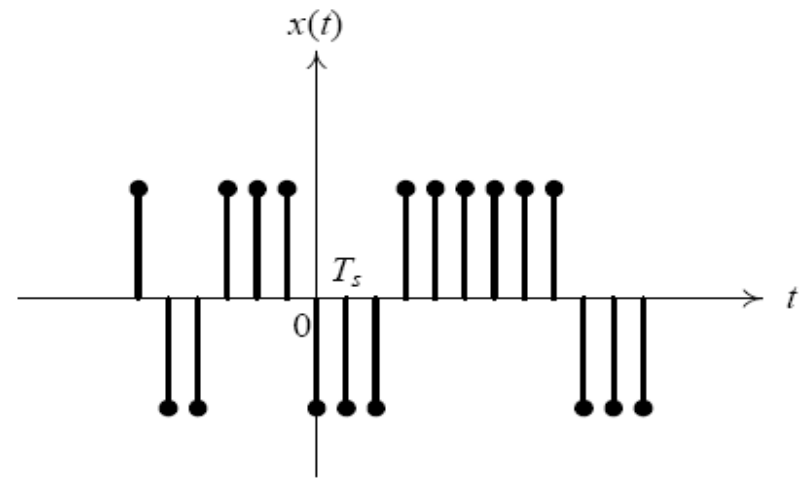
(a)



(b)



(c)



(d)

Baseband and Carrier

Baseband

Transmits the information
signal itself



Examples:
Telephone
Intercom

Carrier

Transmits the information
signal impressed on a carrier



Examples:
AM/ FM Radio

