

on



Media

Transmission
Media

Group : Silent Hunter

Group :
Silent



Hunter

Group Member :

• Syed Ahmed Zaki ID:131-15-2169 •

Fatema Khatun ID:131-15-2372 •

Sumi Basak ID:131-15-2364

• Priangka Kirtania ID:131-15-2385



• Afruza Zinnurain
ID:131-15-2345



Acknowledgement

Acknowledgement

Md. Sarwar Jahan
Morshed Assistant Professor
Dept. Of Computer Science and
Engineering
Daffodil International University

Content

☐ **Transmission Media**

☐ **Guided Media:**

- ☐ Twisted Pair

- ☐ UTP

- ☐ STP

- ☐ Co-Axial Cable

- Fibre Optic Cable
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 - **Transmission Impairment**
- **Unguided Media:**
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What is Transmission Media ?

What is Transmission Media

? In data communication,

- **Transmission media** is a pathway that carries the information from sender to receiver.
- We use different types of cables or waves to transmit data.
- Data is transmitted normally through electrical or electromagnetic signals.

Description

Description

- Transmission media are located below the physical layer
- Computers use signals to represent data.
- Signals are transmitted in form of electromagnetic energy.



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Classification of Transmission media



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Twisted-pair cable

- A twisted pair consists of two conductors

- Basically copper based
- With its own plastic insulation, twisted together.





Twisted Pair Description

- Provide protection against cross talk or interference(noise)



- One wire use to carry signals to the receiver
- Second wire used as a ground reference • For

twisting, after receiving the signal remains same.

- Therefore number of twists per unit length, determines the quality of cable.

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Twisted Pair

Advantages:

- Cheap
- Easy to work with



Disadvantages:

- Low data rate
- Short range

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Twisted Pair - Applications

- Very common medium
- Can be use in telephone



network

- Connection Within the buildings
- For local area networks (LAN)



Twisted Pair Cables

Twisted Pair cables

Twisted pair
(STP)

Unshielded Twisted Pair
(UTP)

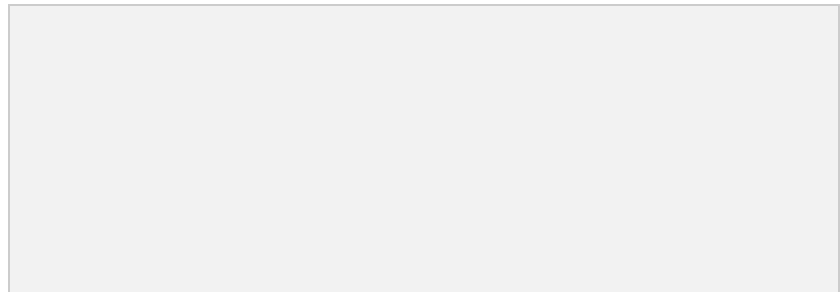
Shielded

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Unshielded Twisted Pair (UTP):

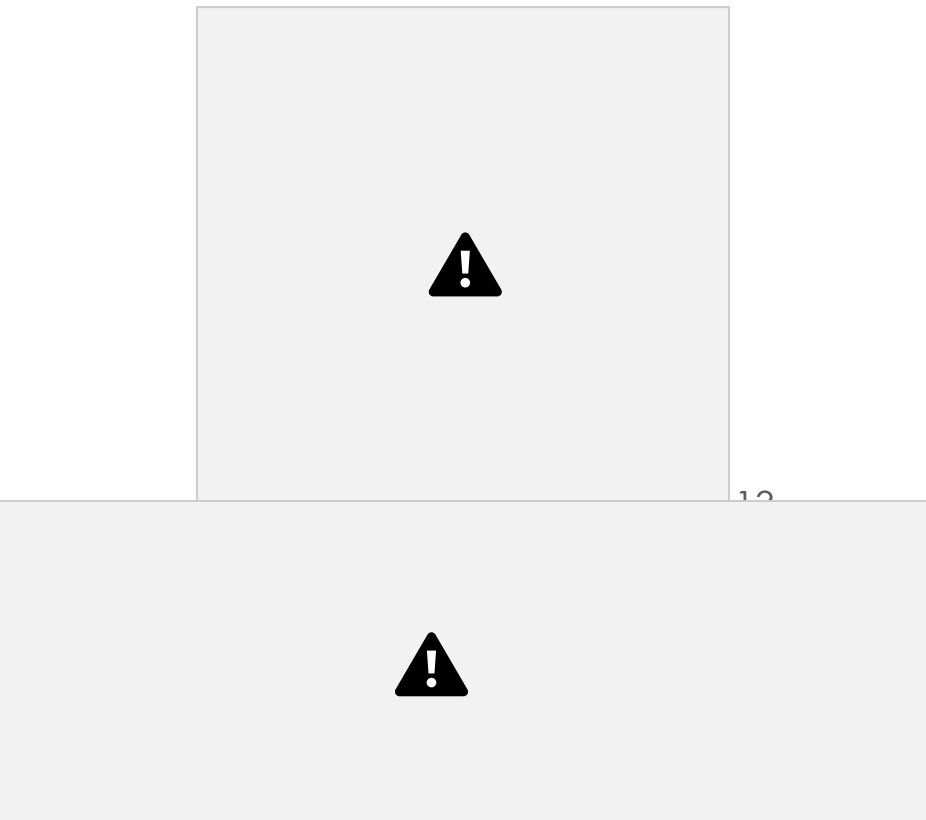
Description

- Pair of unshielded wires



wound around each
other

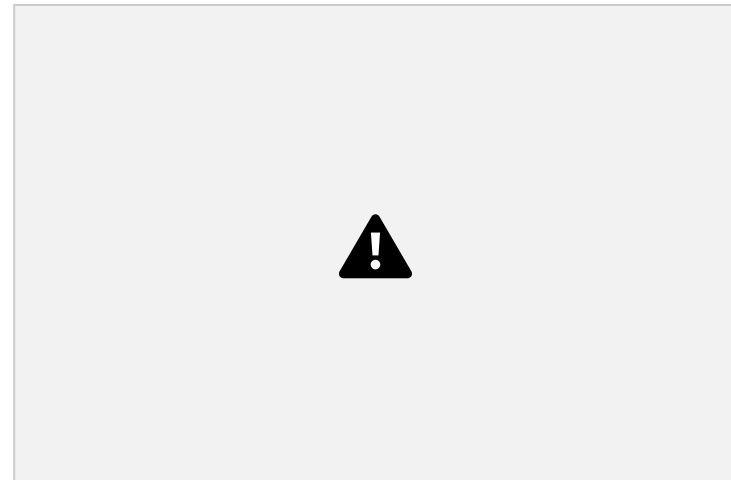
- Easiest to install



Applications

UTP :

- Telephone subscribers connect to the central telephone office
- DSL lines
- LAN – 10Mbps or 100Mbps





UTP

Cable Types

Cat 1

Cat 7

5

Cat 6

UTP Cat

Cat 2

Cat 5e

Cat 3

Cat 4

Cat means category according to IEEE standards. IEEE is de jure standard 15

Categories of UTP cables



UTP connector and Tools



RJ45 (RJ stands for registered jack) is a keyed connector, it means that it can be inserted in only one way



Crimper Tool

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Advantages of UTP:

- Affordable
- Most compatible cabling
- Major networking system



Disadvantages of UTP:

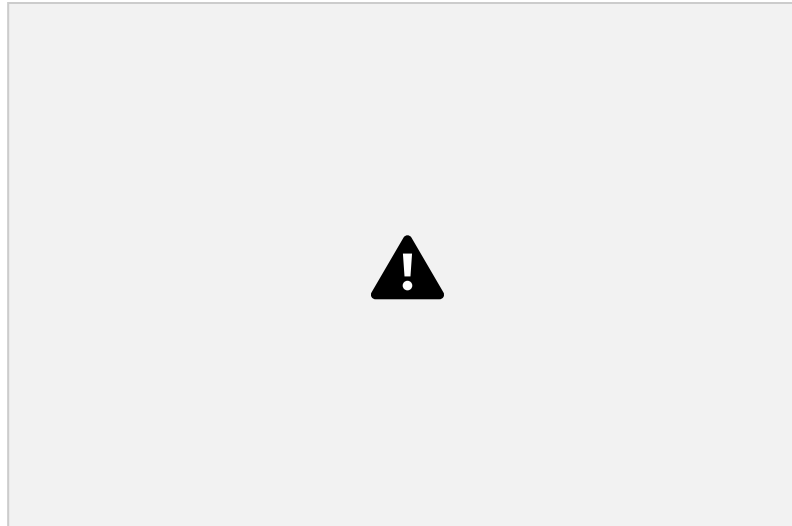
- Suffers from external Electromagnetic

interference 18

Shielded Twisted Pair (STP)

- Pair of wires wound around each other placed inside a protective foil wrap

- Metal braid or sheath foil that reduces



interference

- Harder to handle
(thick, heavy)



STP

Application





- STP is used in IBM token ring networks.
- Higher transmission rates over longer distances. 20

Advantages of STP:

- Shielded
- Faster than UTP



Disadvantages of STP:

- More expensive than UTP
- High attenuation rate

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Co-axial Cable

Co-axial cable carries signal of higher frequency ranges than twisted pair cable



- Inner conductor is a solid wire

- Outer conductor serves as a shield against noise and a second conductor

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Categories of coaxial cables



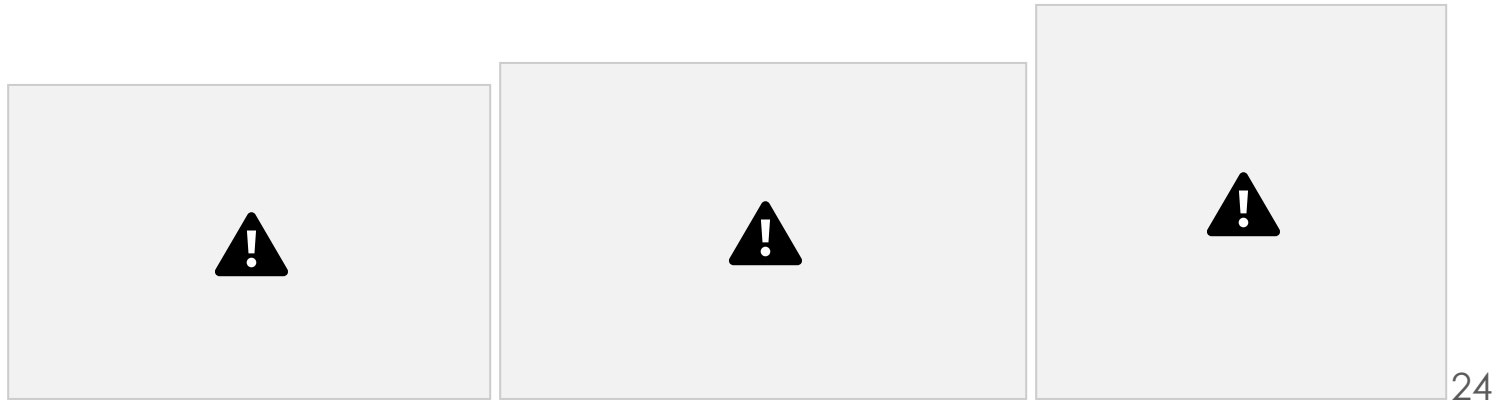
Coaxial cables are categorized by Radio Government (RG) ratings,
RG is De Jure standards

Coaxial Cable Connectors

BNC Connectors – Bayonet Neil Concelman

To connect coaxial cable to devices we need coaxial connectors

- BNC Connector is used at the end of the cable to a device
Example: TV set connection
- BNC T connector used to Ethernet networks to branch out connection to computer or other devices
- BNC terminator is used at the end of the cable to prevent the reflection of the signal

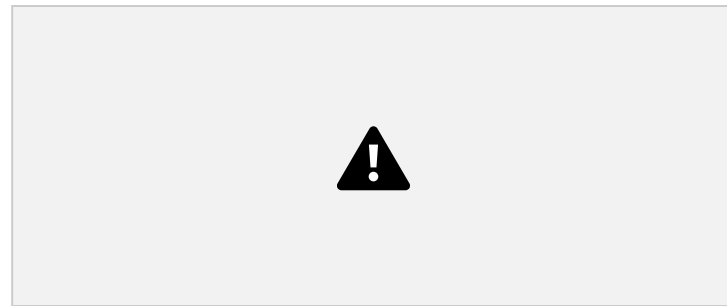


Coaxial Cable

Applications •

Most versatile medium

- Television distribution



- Long distance telephone transmission • Can carry 10,000 voice calls simultaneously • Short distance computer systems links • Local area networks

COAXIAL CABLE

ADVANTAGES



- Easy to wire
- Easy to expand
- Moderate level of Electro Magnetic Interference

DISADVANTAGE

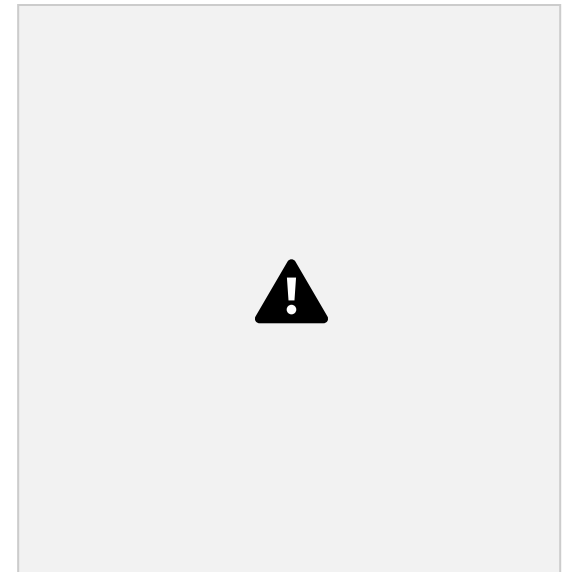
- Single cable failure can take down an entire network
- Cost of installation of a coaxial cable is high due to its thickness and stiffness
- Cost of maintenance is also high

Fiber-Optic Cable

A fiber optic cable is made of glass or plastic and transmit signals in the form of light.

Nature of light:

- Light travels in a straight line
- If light goes from one substance to another then the ray of light changes direction
- Ray of light changes direction when goes from more dense to a less dense substance



Bending of light ray

- Angle of Incidence (I): the angle the ray makes with the line perpendicular to the interface between the two substances
- Critical Angle: the angle of incidence which provides an angle of refraction of 90-degrees.



Optical fiber

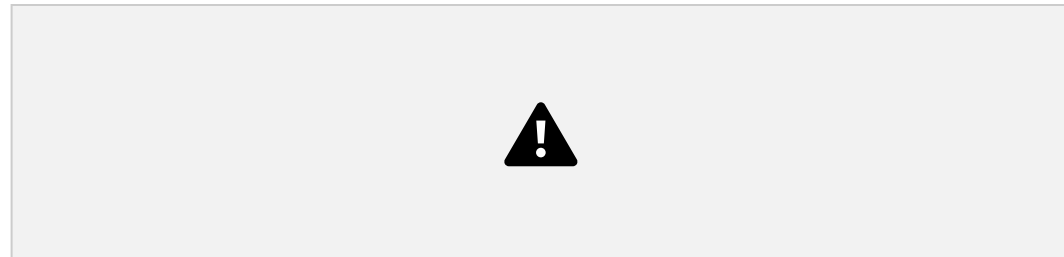
- Uses reflection to guide light through a channel

- Core is of glass or plastic surrounded by Cladding

- Cladding is of less

dense glass or plastic

Jacket



An optical fiber cable has a cylindrical shape and consists of three concentric sections: the core, the cladding, and the jacket(outer part of the cable).

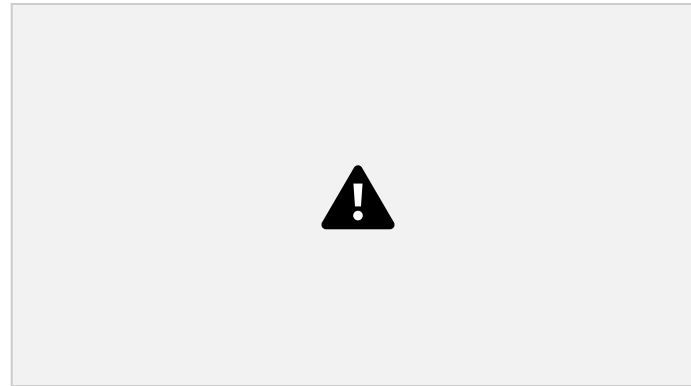
Fiber Construction



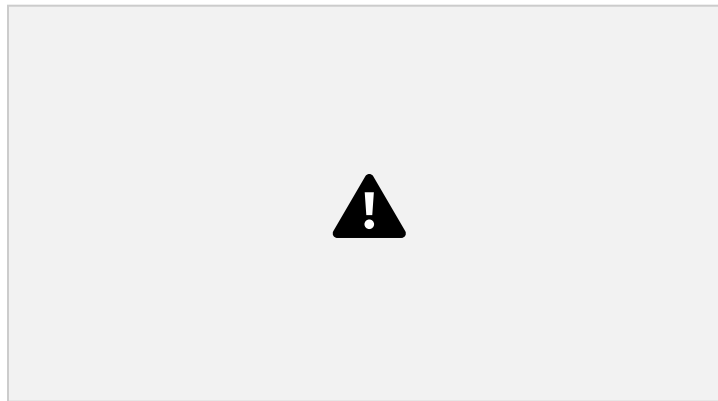
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Fiber – Optic cable

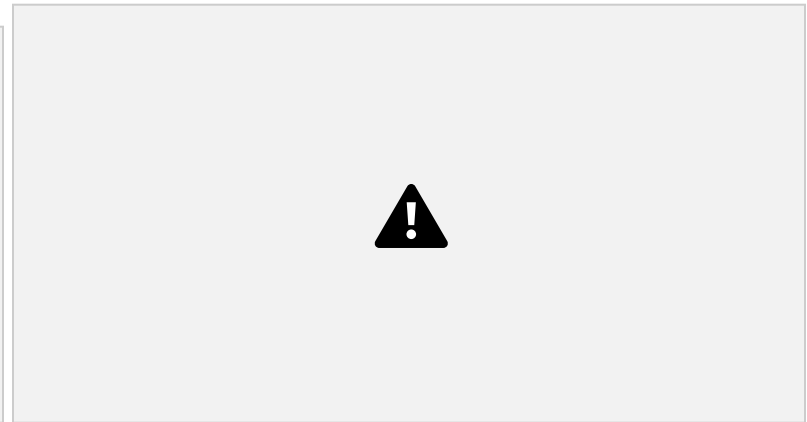
Connectors



Subscriber Channel (SC) Connector



Same size as RJ45 connector



Straight-Tip (ST) Connector



Areas of Application .

Telecommunications

- Local Area Networks
- Cable TV
- CCTV



- Medical Education

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Optical Fiber

Advantages



▪ Greater

capacity

Example: Data rates at 100 Gbps

- Smaller size & light weight
- Lower attenuation
- Electromagnetic isolation
- More resistance to corrosive materials
- Greater repeater spacing facility



Example: After every 10s of km at least

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Optical Fiber

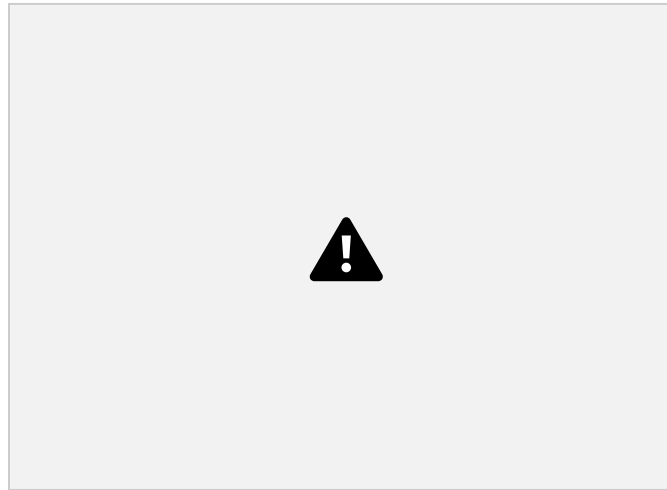
Disadvantages



- Installation and

maintenance need expertise

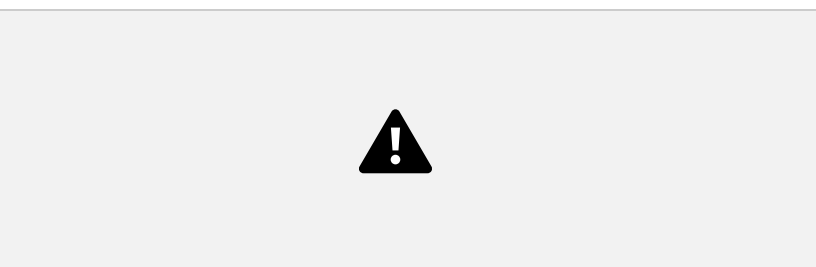
- Only Unidirectional light propagation
- Much more expensive



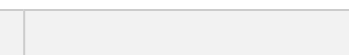
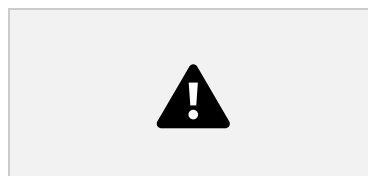
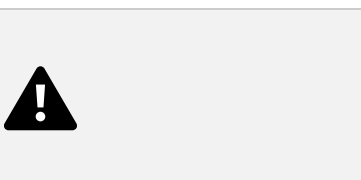
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Propagation Modes

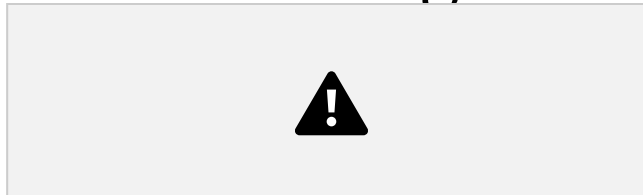
When signal goes from one point to another there are need for



Propagation Modes



Multimode Single Mode



Step -Index Graded -

Index

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Propagation Modes





Transmission Impairment

• The Imperfection in transmission media causes signal impairment

impairment are

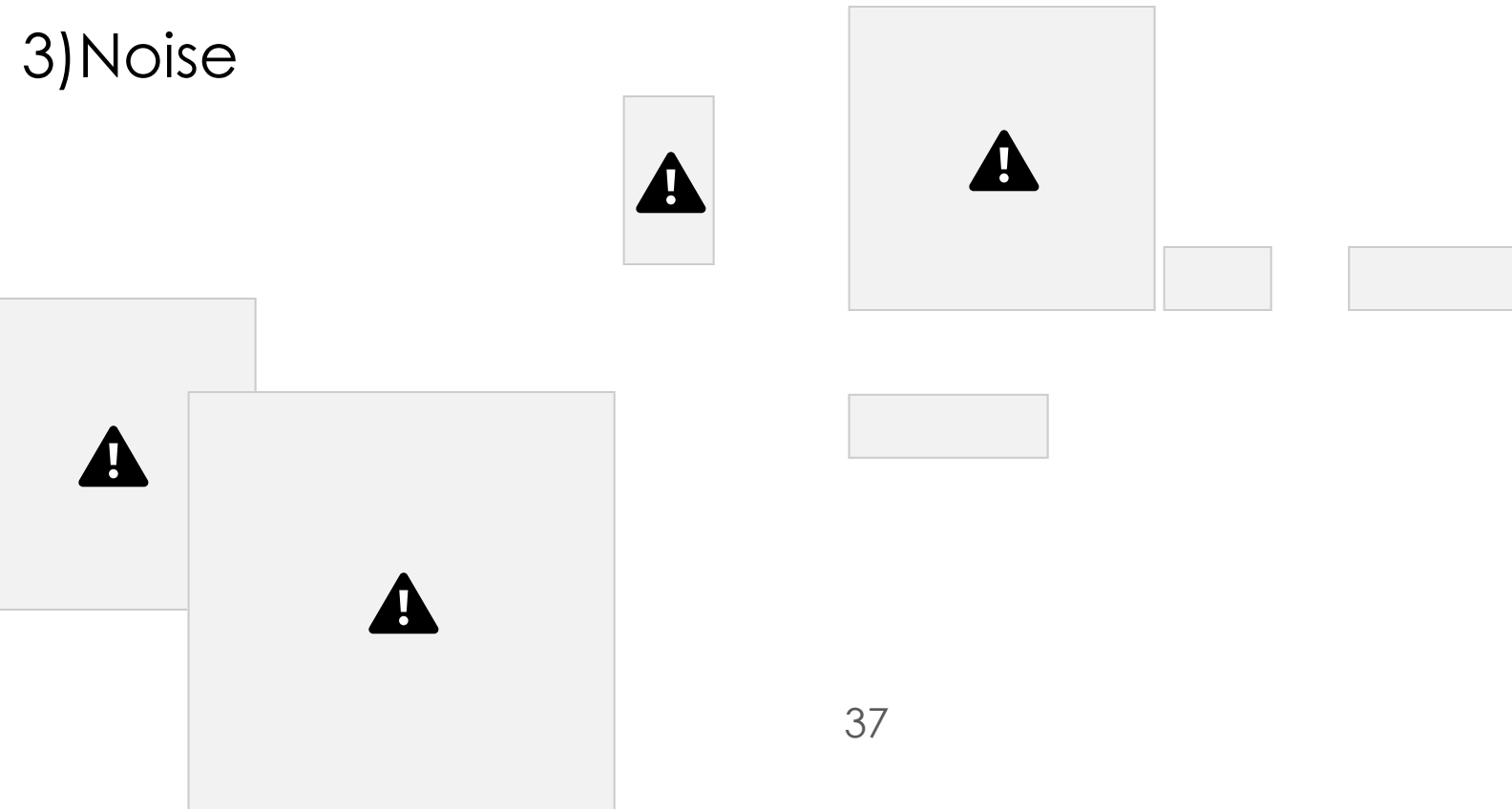


- What is sent is not what is received due to impairment

1) Attenuation,
2) Distortion

- Three causes of

3) Noise





Transmission

Impairment • Attenuation means a
loss of energy.

- Distortion means that the signal changes its form or shape.

- Noise is another cause of impairment.
- Several types of noise
Example: thermal noise, induced noise, crosstalk

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Unguided Media: Wireless Transmission

Unguided media transport electromagnetic waves without using

a physical conductor it is known as wireless communication.

Signals broadcast through free space and available to capable receiver

Electro magnetic spectrum for wireless communication: Radio
wave & Micro wave Infrared

3 kHz 300GHz 400THz 900THz 39

Propagation methods

Unguided signals travels from the source to destination in several ways it is known as propagation.

They are three types:

- Ground propagation
- Sky propagation
- Line-of-Sight Propagation



Ground propagation:

- Radio waves travel through the lowest portion of the atmosphere
- Touching the earth.

Sky propagation:

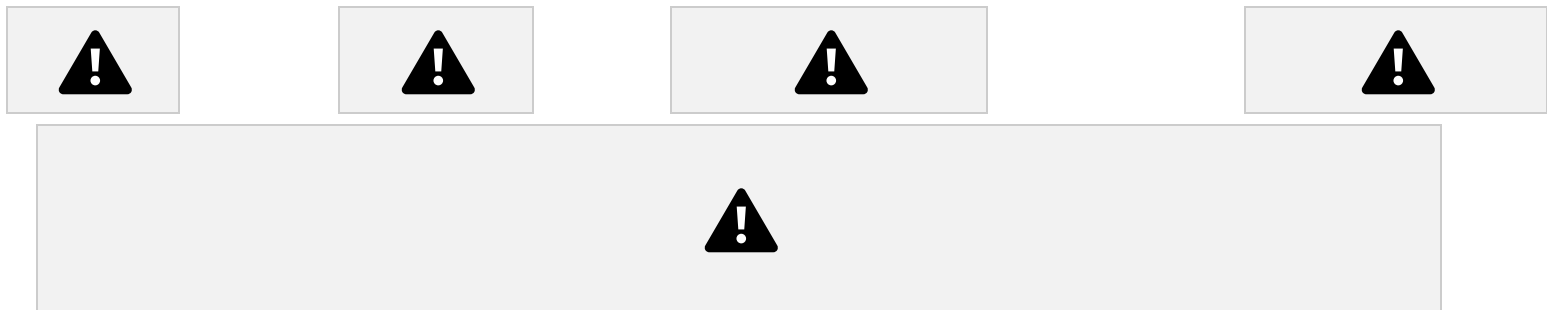
- Radio waves radiate to the ionosphere then they are reflected back to earth.

Line-of-Sight Propagation:



- In straight lines directly from antenna to antenna.

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Bands using propagation method



VLF



MF



VHF

LF

HF

UHF



SHF



EHF

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Unguided

Media

Wireless transmission waves



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Unguided
Media – Radio

Waves



Omnidirectional Antenna

- Frequencies between 3 KHz and 1 GHz.
- Used for multicasts(multiple way) communications, such as radio and television, and paging system.
- Radio waves can penetrate buildings easily,

so that widely use for
indoors & outdoors
communication.

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Antennas

An Antenna is a structure that is generally a metallic object may be a wire or group of wires, used to convert high frequency current into electromagnetic waves.

Antenna are two types:

- **Transmission antenna**
 - Transmit radio frequency from transmitter
 - Radio frequency then
Convert to electromagnetic energy by antenna



- Then, radiate into surrounding environment
- **Reception antenna**
 - Electromagnetic energy get in antenna
 - Then Antenna convert radio frequency to electrical energy ▪ Then, Goes to receiver

same antenna can be used for both purposes

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Microwaves

large areas



Microwaves are ideal when need to be covered and there are no obstacles in the path



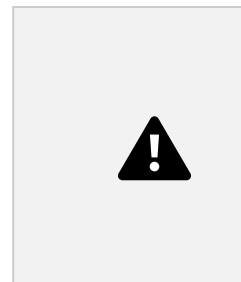
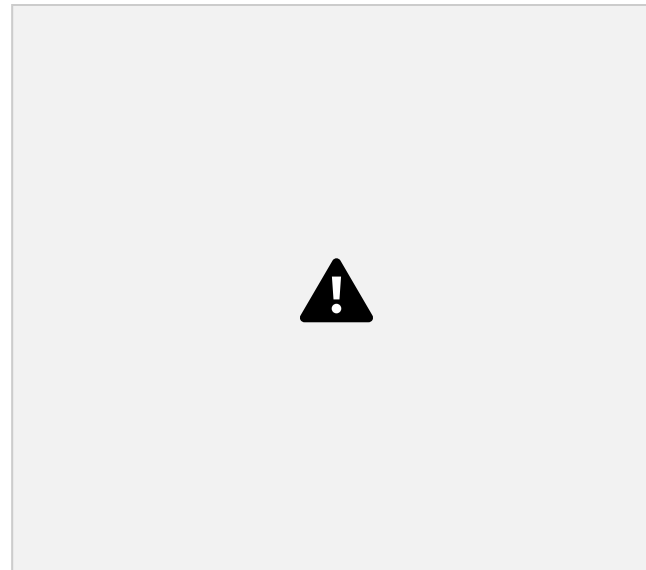
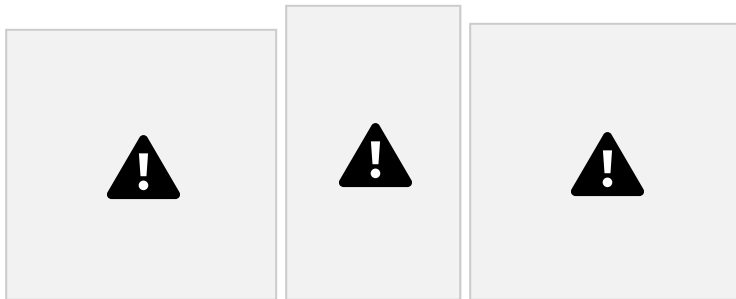
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Micro waves Transmission

- Microwaves are unidirectional
- Micro waves electromagnetic waves having frequency between 1 GHZ and 300 GHZ.
- There are two types of micro waves data communication system :

terrestrial and satellite

- Micro waves are widely used for one to one communication between sender and receiver,
example: cellular phone, satellite networks and in wireless LANs(wifi), WiMAX,GPS





Infrared

- Frequencies between 300 GHz to 400 THz.
- Used for short-range communication
- Example: Night Vision Camera, Remote control, File sharing between two phones, Communication between a PC and peripheral device,





References

- Data communication and Networking, fourth edition

By : BEHROUZ A FOROUZAN

- And various relevant websites

Any Question ?





Thank You