



# Communicating Digital Content: Wired and Wireless Networks and Devices

# DISCOVERING COMPUTERS 2018

## Digital Technology, Data, and Devices



## Module 10

# Communicating Digital Content: Wired and Wireless Networks and Devices

- [Chapter 10](#)

# Objective Overview

**1. Communications**

**2. Networks**

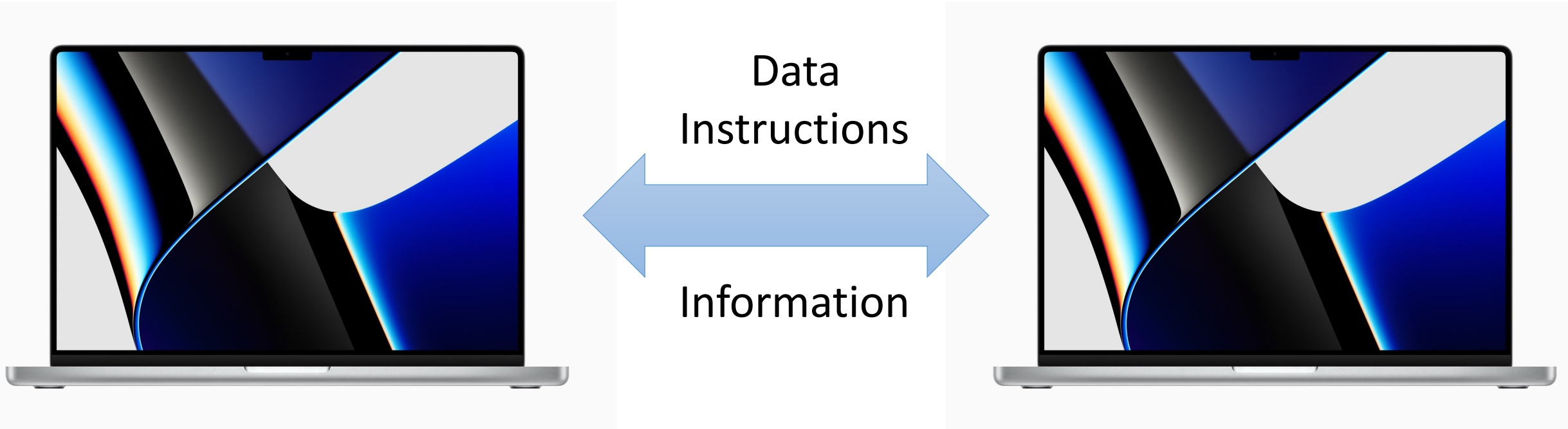
**3. Communication software**

**4. Network communication standards and protocols**

**5. Types of communication lines and devices**

**6. Physical/Wireless transmission media**

# 1. Communications





# 1. Communications



**servers**

**desktops**

**laptops**

**tablets**

**smartphones**

**headsets**

**GPS**

**game devices**

~~1. Communications~~

2. Networks

3. Communication software

4. Network communication standards and protocols

5. Types of communication lines and devices

6. Physical/Wireless transmission media

# 2. Networks





# 2. Networks-advantages

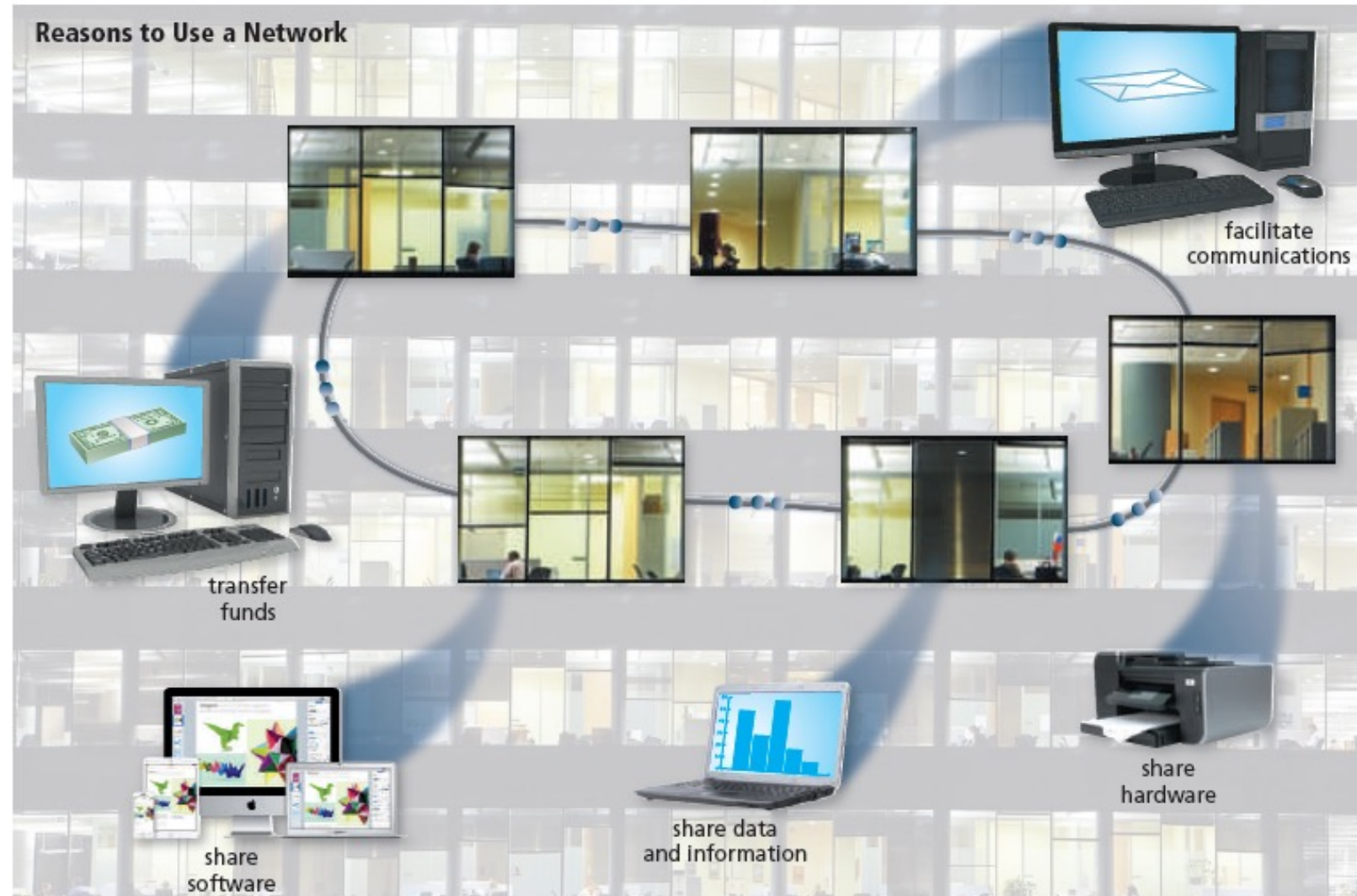
**Facilitating communications**

**Sharing hardware**

**Sharing data and information**

**Sharing software**

**Transferring funds**



# 2. Networks - LAN

## LAN

limited geographical area



# 2. Networks - WLAN

**WLAN**  
Wireless LAN

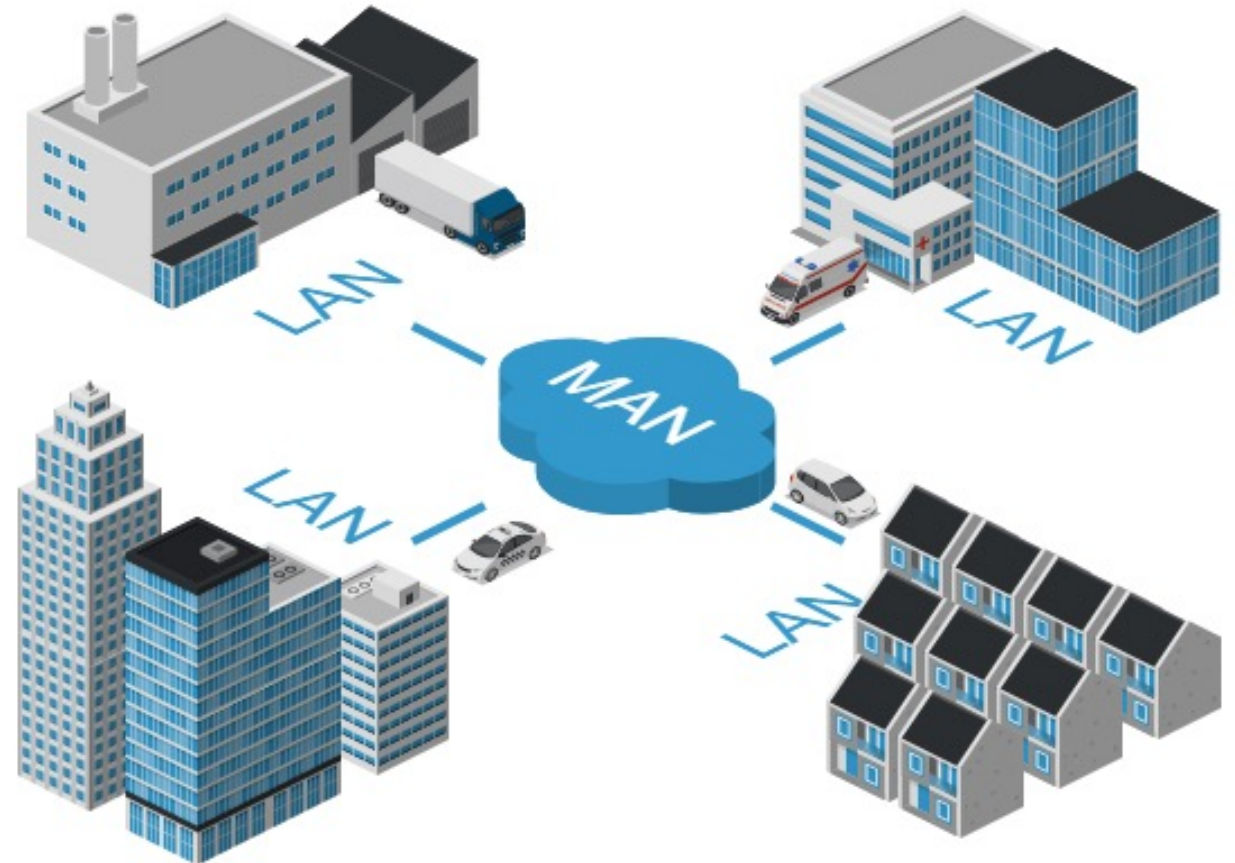


# 2. Networks - MAN

Metropolitan area network (MAN)

# MAN

Connects LANs in a metropolitan area

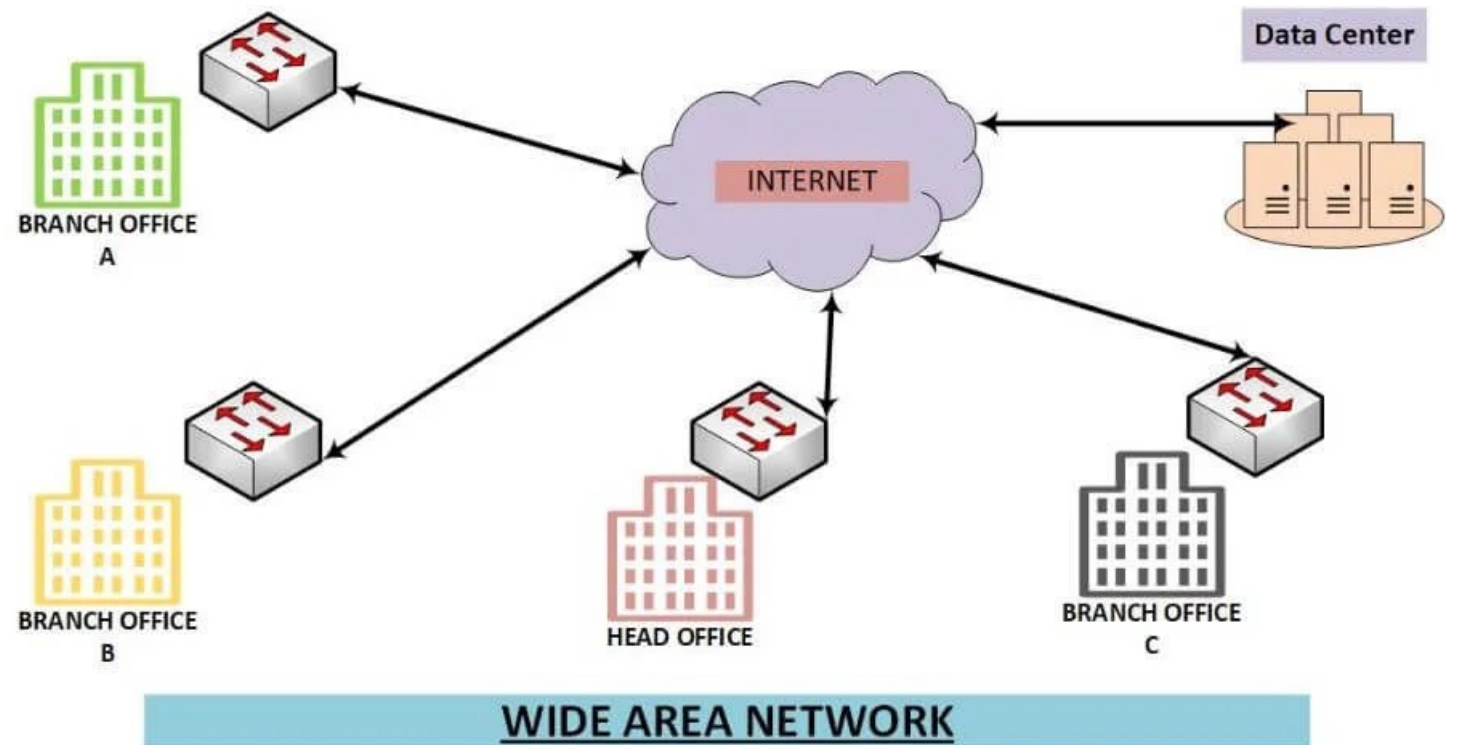




# 2. Networks - WAN

# WAN

Covers a large geographic area



## 2. Networks - PAN

**PAN**

In an individual's workspace



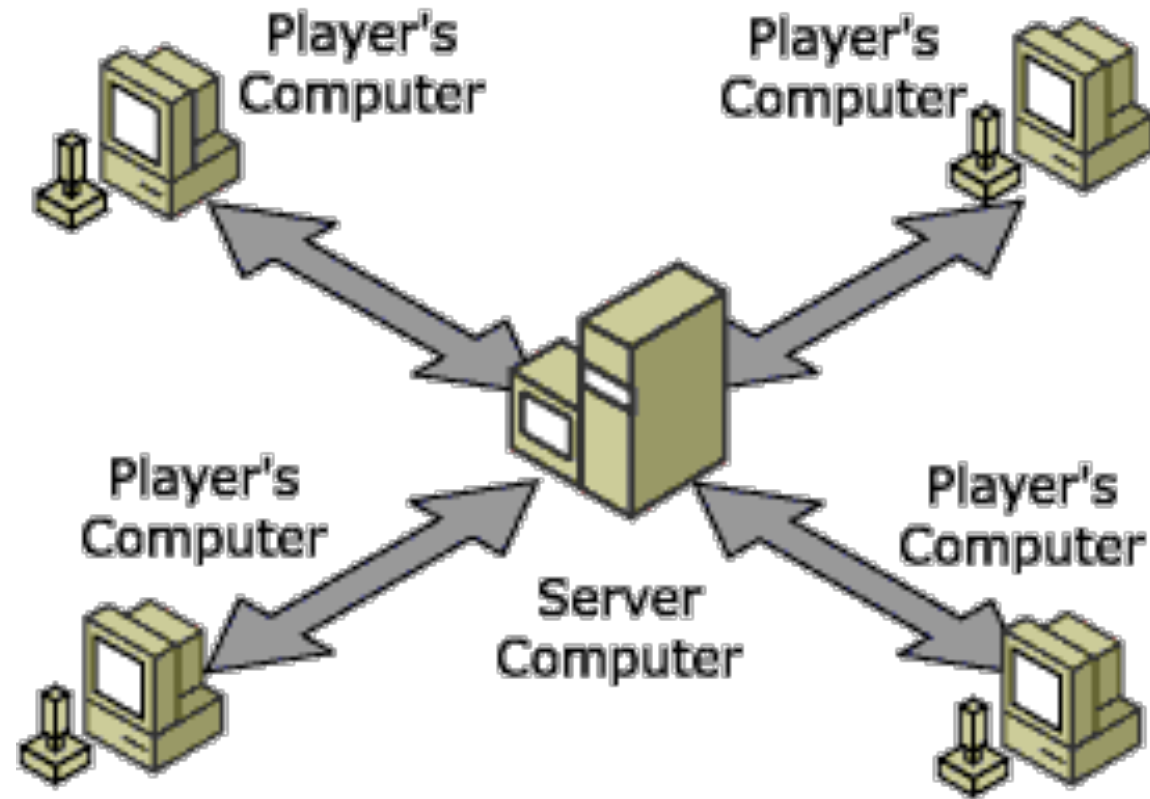


# 2. Networks – Network Architecture



network

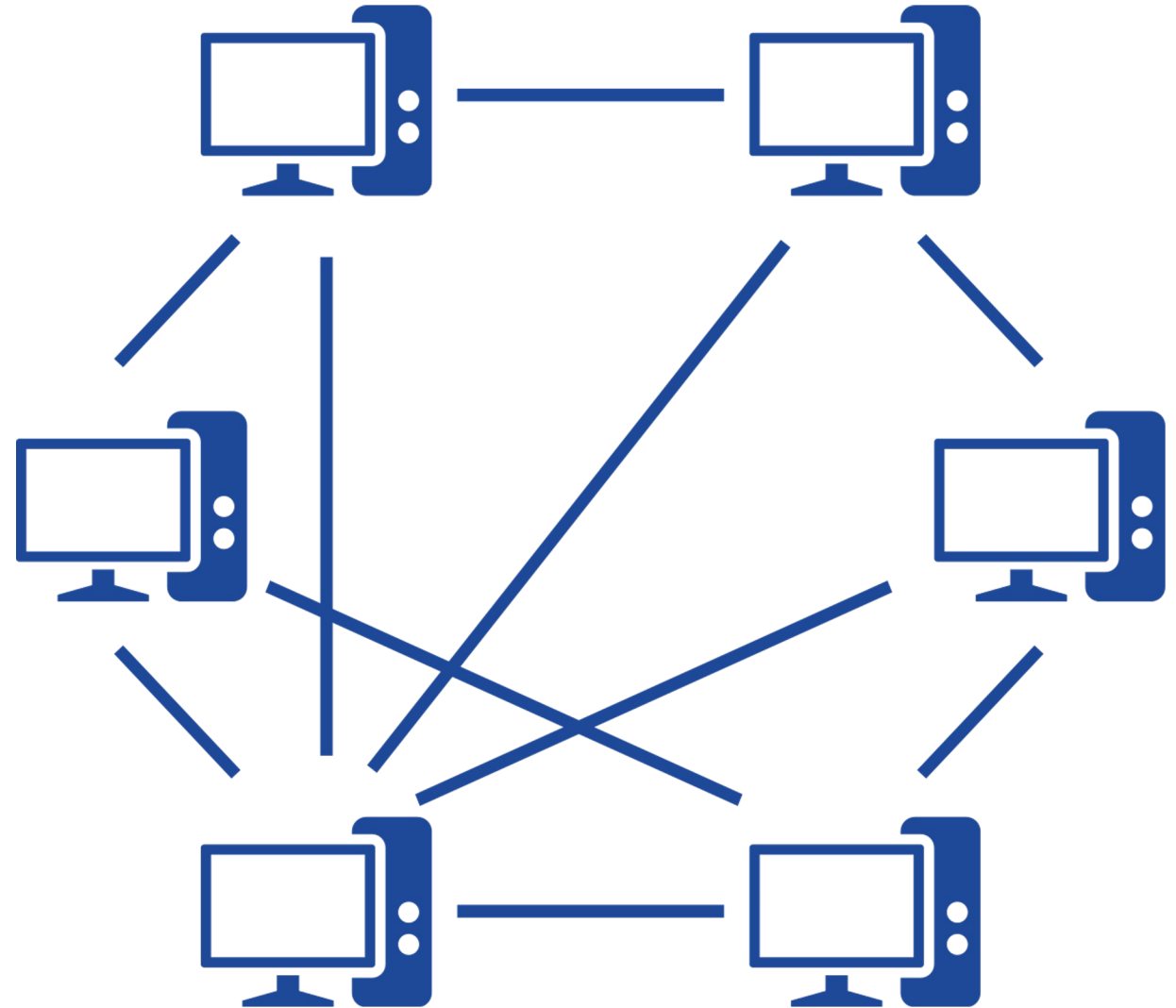
## 2. Networks - Client/server network



## 2. Networks - P2P network

### Peer-to-peer network

Shares hardware and software



**1. Communications**

**2. Networks**

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# 3. Communication software

**Help users establish a connection**

**Manage the transmission of data, instructions, and information**

**Provide an interface to communicate with others**





# \*VoIP: Voice over Internet Protocol



The central graphic features a black VoIP phone on the left and a diagram titled "Benefits of VoIP" on the right. The diagram consists of eight blue circular icons arranged in a 2x4 grid, each with a corresponding text label below it. The benefits listed are: Easy Install, Virtual Phone Numbers, Use existed Internet, Link Phone Numbers, Simple Integration, Advance Voicemail, High Audio Quality, and Power over Ethernet.

### Benefits of VoIP

- Easy Install
- Virtual Phone Numbers
- Use existed Internet
- Link Phone Numbers
- Simple Integration
- Advance Voicemail
- High Audio Quality
- Power over Ethernet



**1. Communications**

**2. Networks**

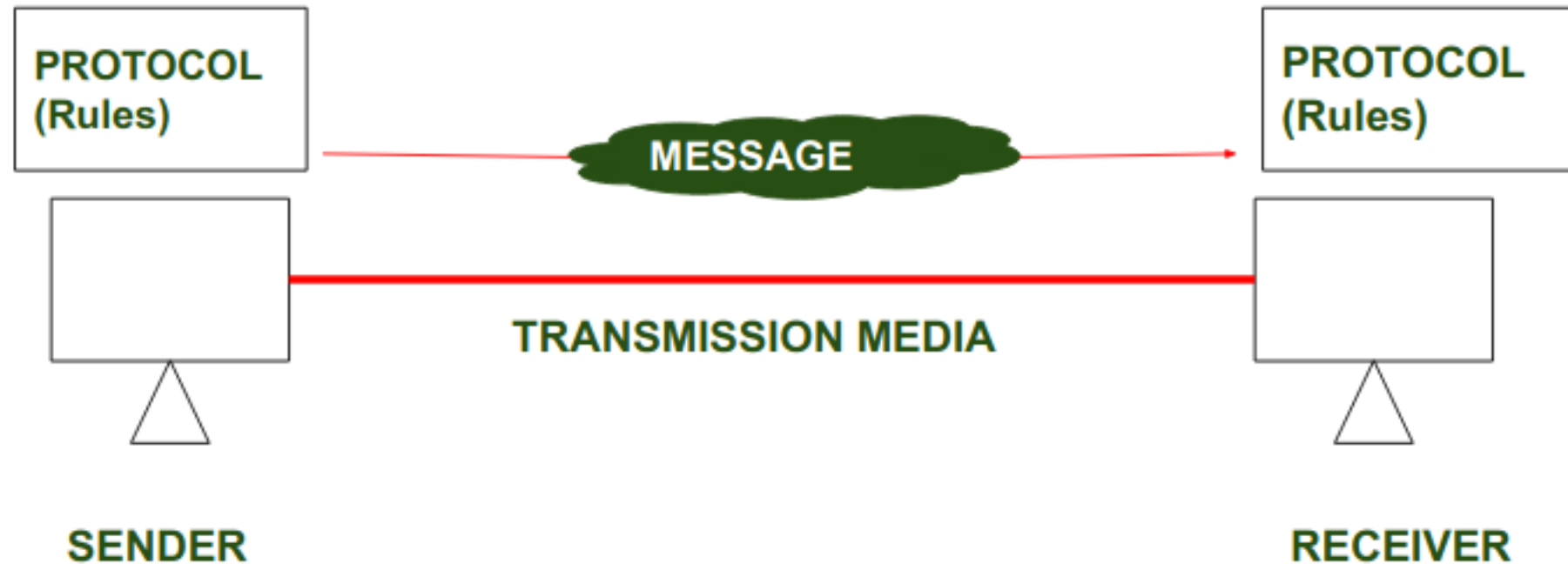
**3. Communication software**

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# 4. Network communication standards and protocols



# 4. Network communication standards and protocols

## Ethernet

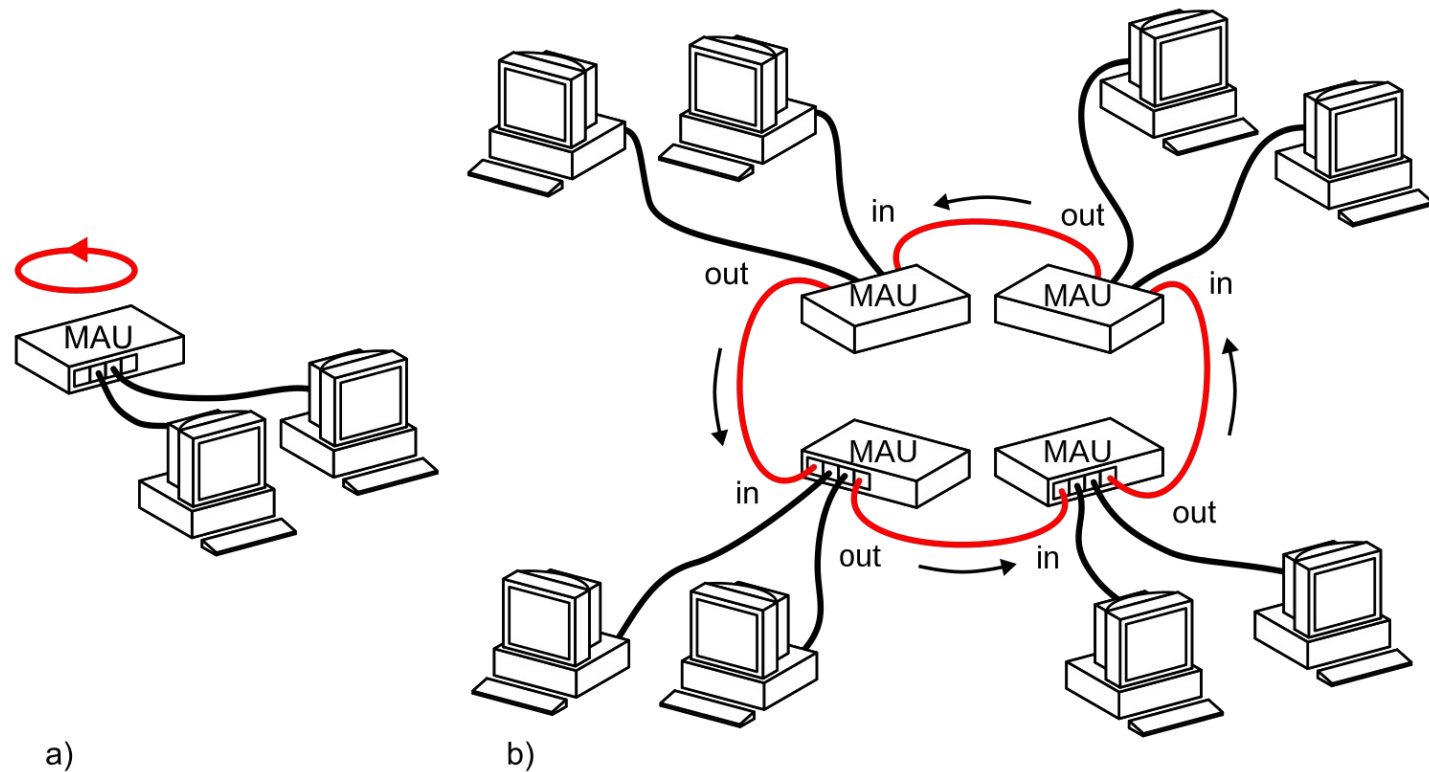
No central computer/device on the network should control when data can be transmitted



# 4. Network communication standards and protocols

## Token ring

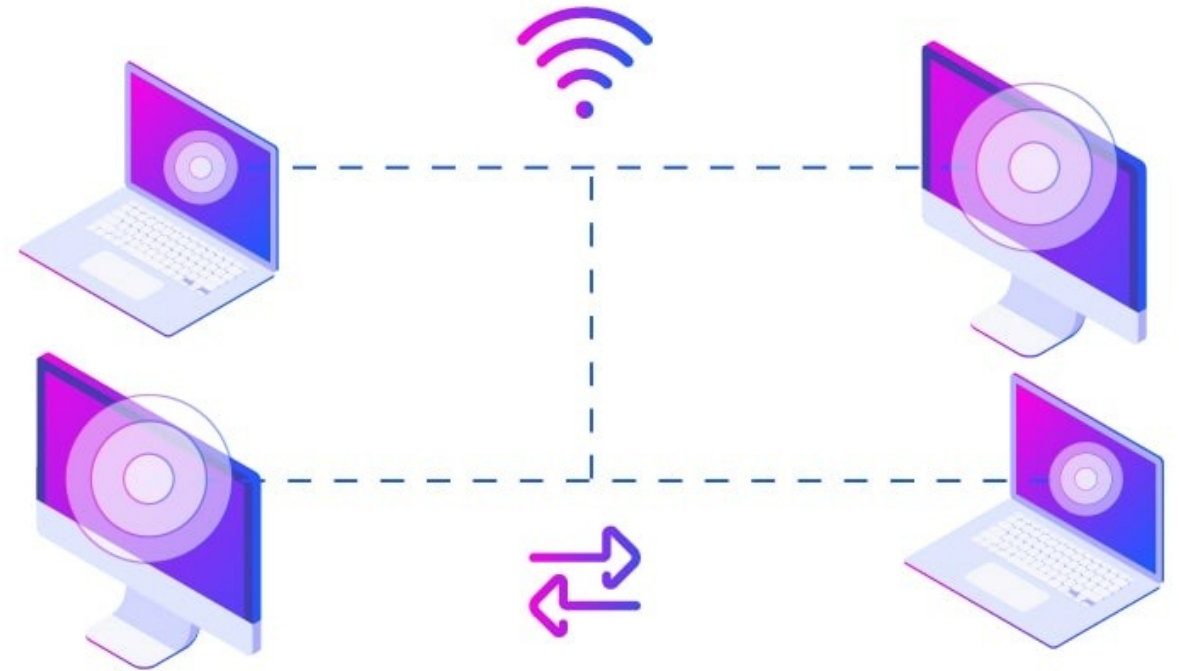
Computer/device on the network share or pass a special signal



# 4. Network communication standards and protocols

## TCP/IP

Defines how data are routed from one end of a network to another





# 4. Network communication standards and protocols

## 最新公告

### 緊急公告

## NTU COOL 平臺緊急維護公告：10/26 (四) 18:00 ~ 19:00 可能出現短暫下線的情況

2023-10-26

大家好，

非常抱歉，NTU COOL 於昨日(10/25)晚間約 21:00 至 23:00 因系統異常造成部份使用者無法正常使用，我們目前已釐清原因，將透過今日(10/26)傍晚 18:00 至 19:00 的維修來改善問題。

上述維修期間內可能有服務暫時不穩定的狀況發生，請您避免在此期間進行上傳作業等等操作，以免發生上傳失敗的問題；維修若提前完成亦會提早恢復穩定服務。

非常抱歉於中期中期間造成大家的困擾，

若有任何問題，敬請與我們聯絡，謝謝您。

NTU COOL 團隊 敬上

電話：(02) 33663367#536、(02) 33663367#560

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以計中帳號登入

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① 校外人士帳號申請

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## Request a webpage on a web server

1. Establish a connection with the web server
2. Divide webpage into packets (with address)
3. Routers send the packets
4. Reassemble when arrive at your computer

**\*\*Ethernet standard controls how devices share access to the media and how they transmit data**

# 4. Network communication standards and protocols

## Wireless Fidelity

Any network based on 802.11 standard specifies how two wireless devices communicate over the air with each other



# 4. Network communication standards and protocols

## Long-Term Evolution

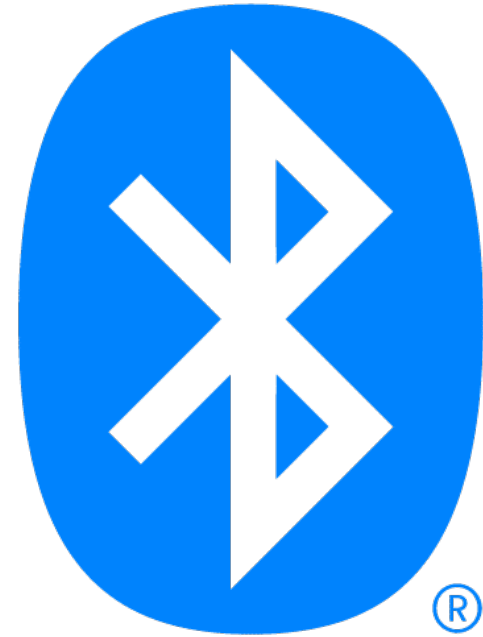
How high-speed cellular transmission use broadcast radio to transmit data



# 4. Network communication standards and protocols

**Bluetooth**

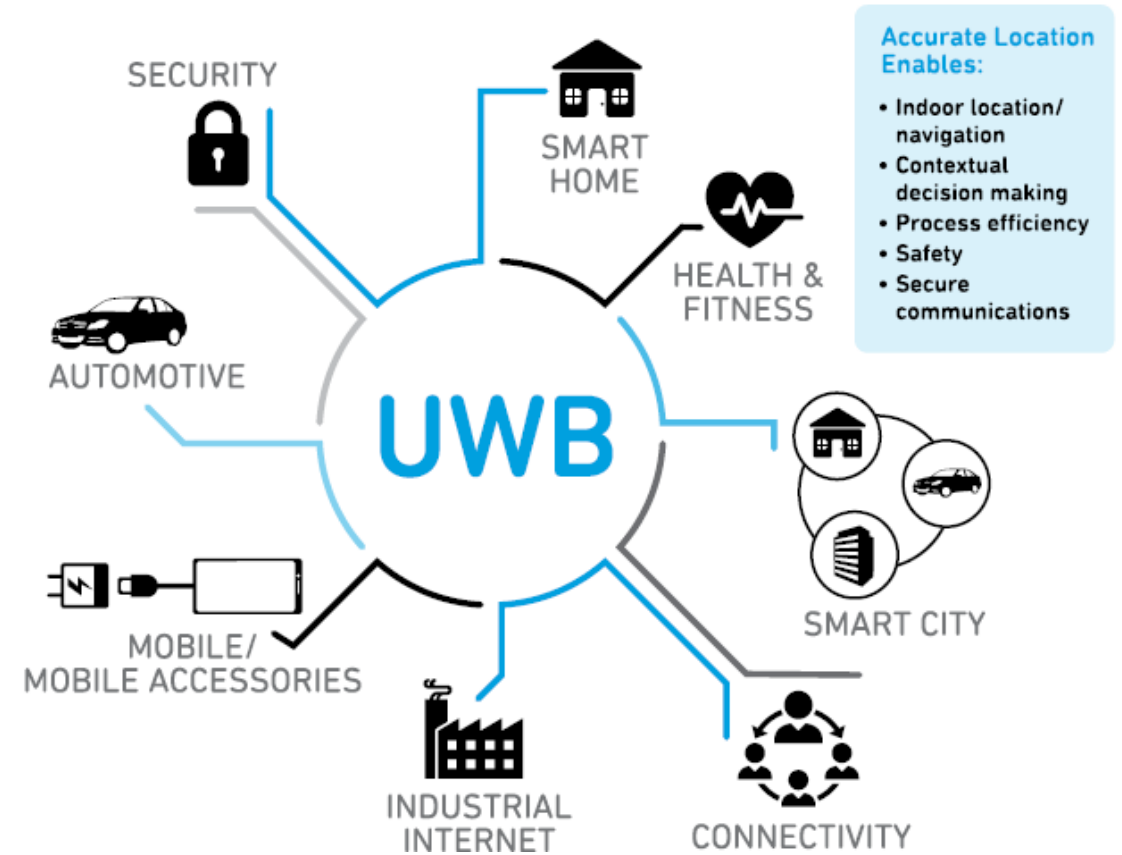
Short-range radio waves



# 4. Network communication standards and protocols

## Ultra-Wide Band

Use short-range radio waves to communicate at high speeds



# 4. Network communication standards and protocols

## Infra-red Data Association

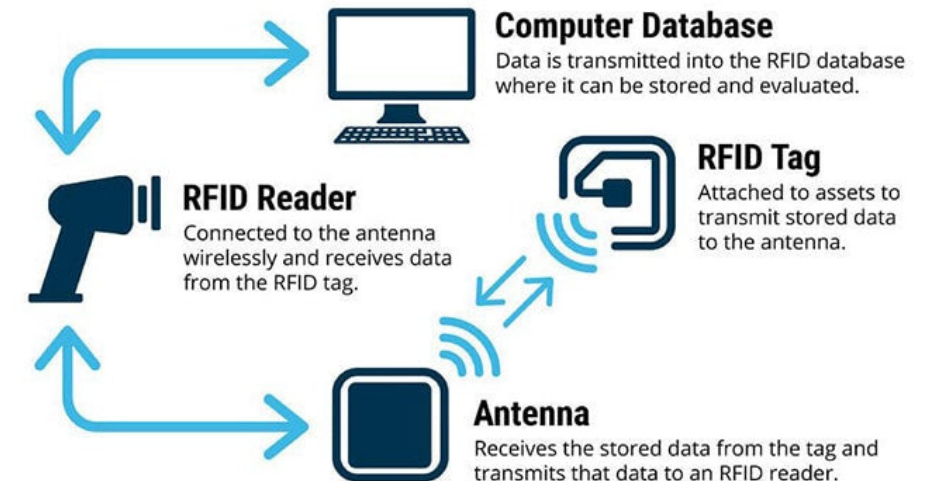




# 4. Network communication standards and protocols

## Radio Frequency Identification

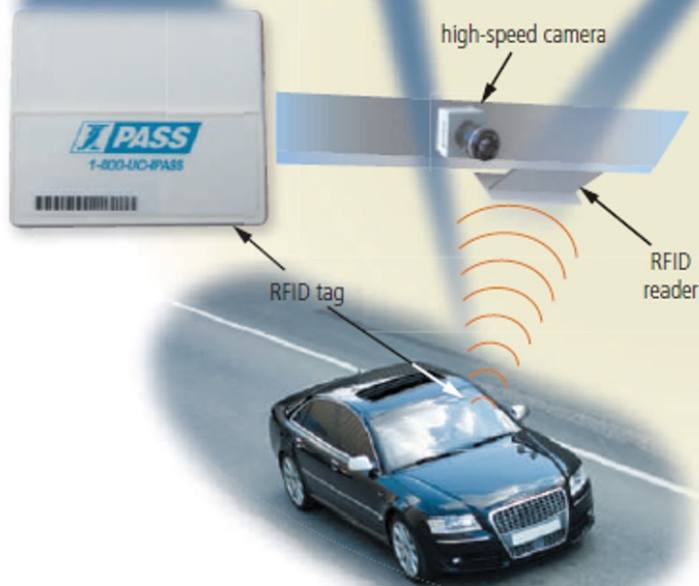
Use radio signals to communicate with a tag



# 4. Network communication standards and protocols

## Step 1

Motorist purchases an RFID transponder or RFID tag and attaches it to the vehicle's windshield.



## Step 2

As the vehicle approaches the tollbooth, the RFID reader in the tollbooth sends a radio wave that activates the windshield-mounted RFID tag. The activated tag sends vehicle information to the RFID reader.



## Step 3

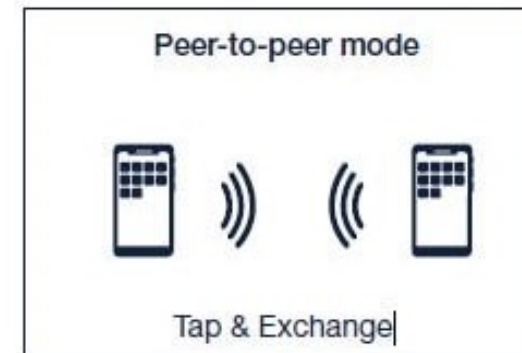
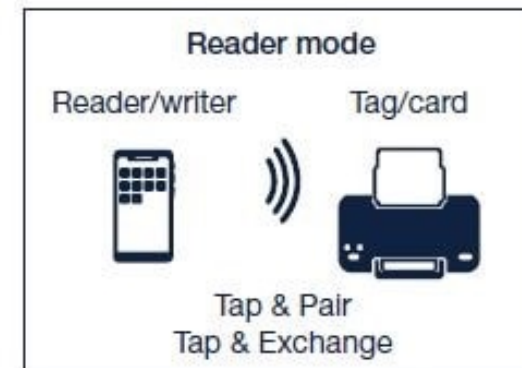
The RFID reader sends the vehicle information to the lane controller. The lane controller, which is part of a local area network, transmits the vehicle information to a central computer that subtracts the toll from the motorist's account. If the vehicle does not have an RFID tag, a high-speed camera takes a picture of the license plate and the computer prints a violation notice, which is mailed to the motorist.



# 4. Network communication standards and protocols

## Near-Field Communication

Defines how a network uses close-range radio signals to communicate between devices equipped with NFC tech



**1. Communications**

**2. Networks**

**3. Communication software**

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**5. Types of communication lines and devices**

**6. Physical/Wireless transmission media**

# 5. Types of communication lines and devices

|               |   |
|---------------|---|
| <b>Cable</b>  | 256 Kbps to 100 Mbps or higher          |
| DSL           | 256 Kbps to 8.45 Mbps                   |
| FTTP          | 5 Mbps to 300 Mbps                      |
| Fractional T1 | 128 Kbps to 768 Kbps                    |
| T1            | 1.544 Mbps                              |
| T3            | 44.736 Mbps                             |
| ATM           | 155 Mbps to 622 Mbps, can reach 10 Gbps |

# 5. Types of communication lines

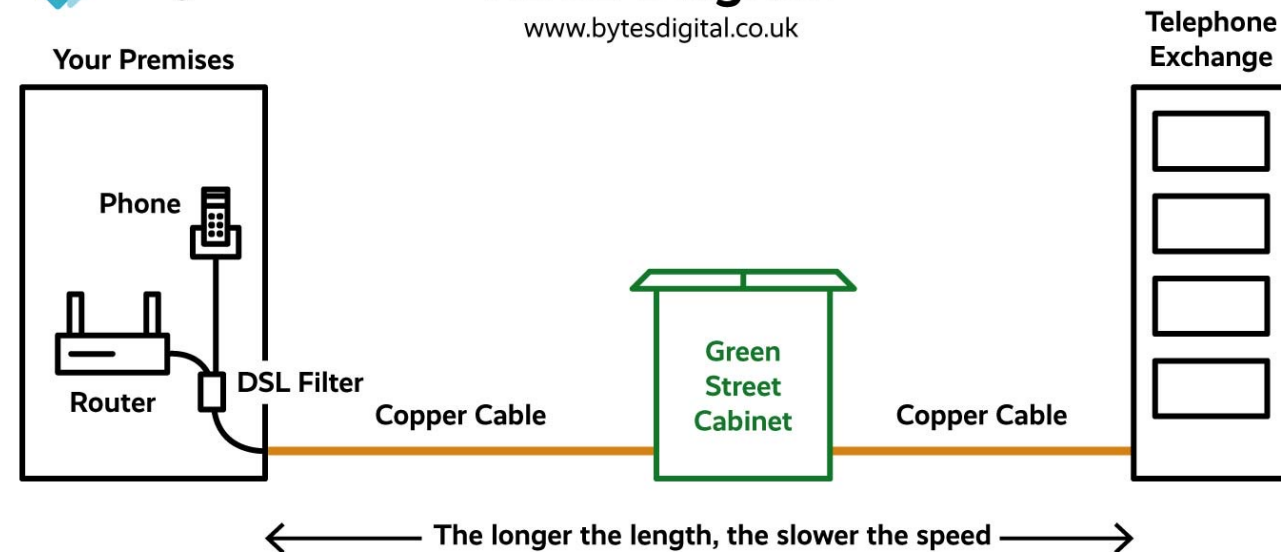
## ASDL

Faster downstream rates than upstream rates

bytesdigital

### ADSL Diagram

[www.bytesdigital.co.uk](http://www.bytesdigital.co.uk)







# 5. Types of communication devices

## Broadband modem

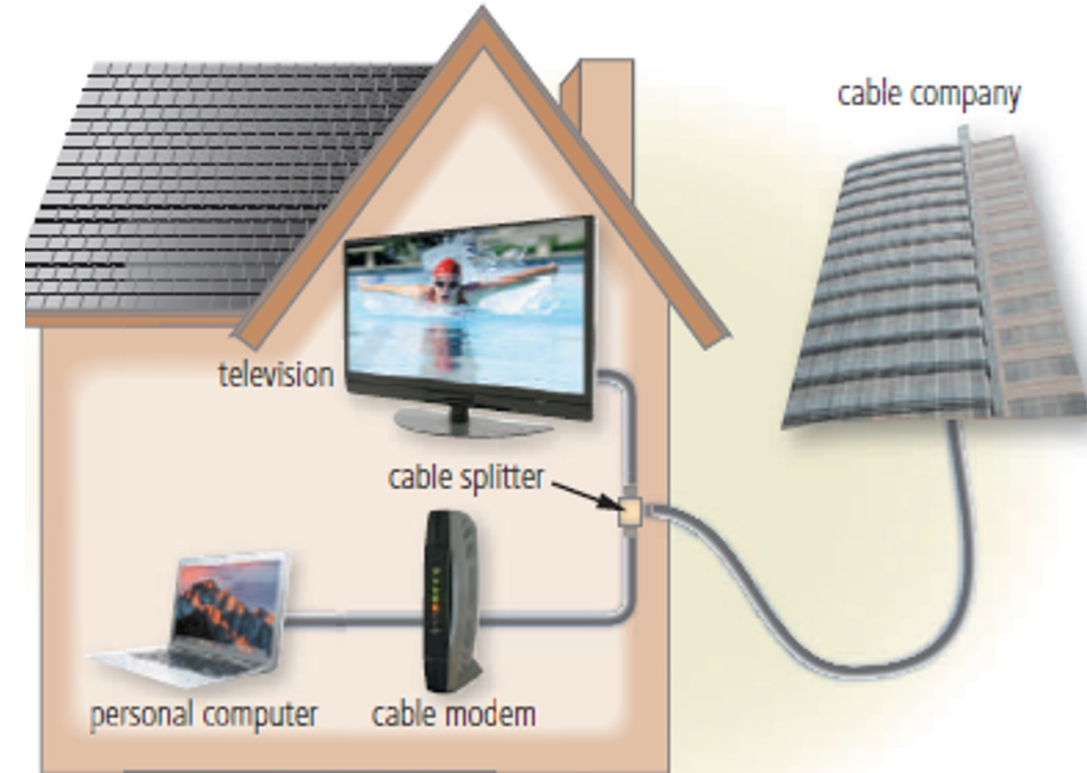
Sends and receives data and information to and from a digital line



# 5. Types of communication devices

## Broadband modem

Cable modem



# 5. Types of communication devices

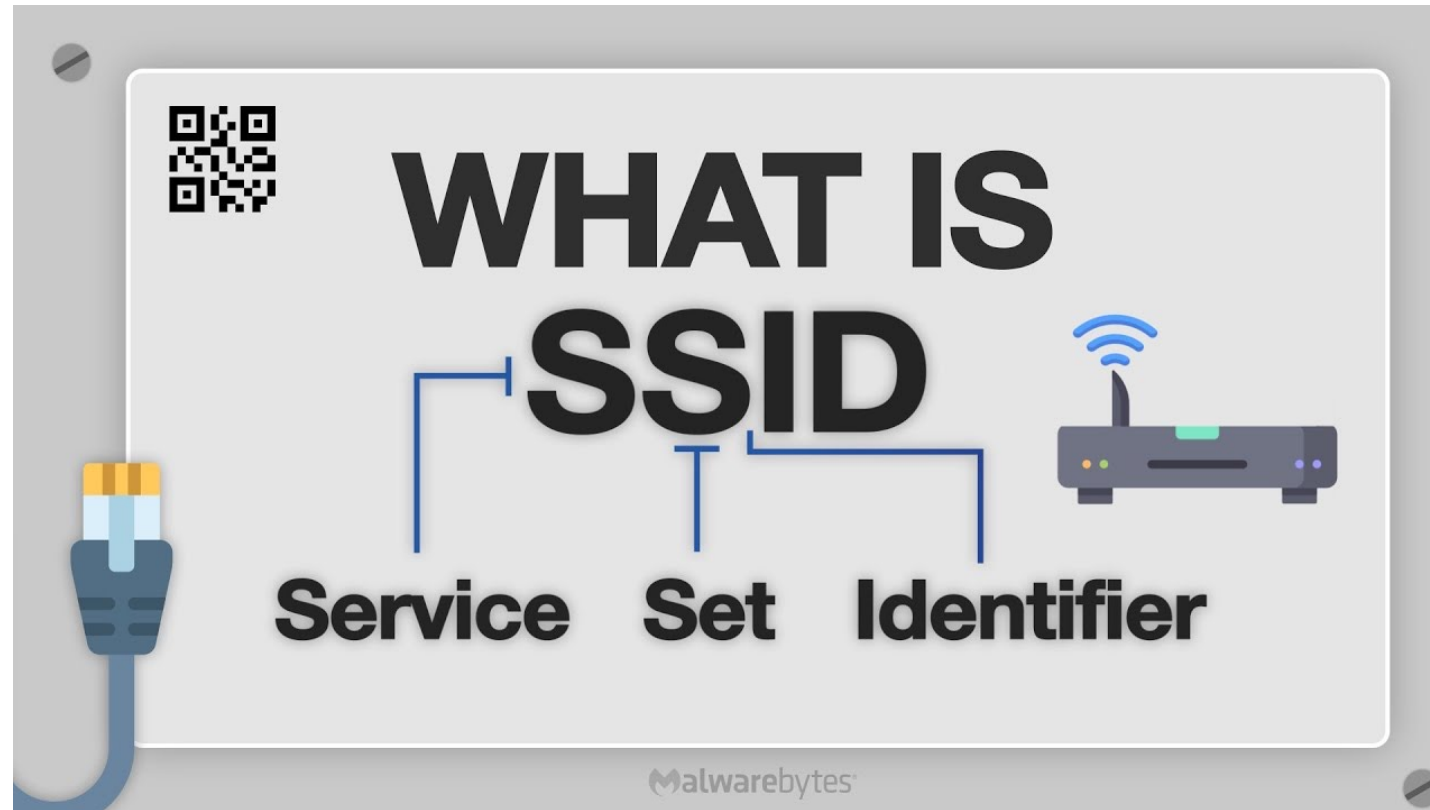
## Broadband modem

wireless modem

Uses a mobile phone provider's network to connect to the Internet wirelessly from a computer or mobile device



# 5. Types of communication devices



# 5. Types of communication devices

## WAP

Central communication device  
Transfer data wirelessly





# 5. Types of communication devices

## Range Extender



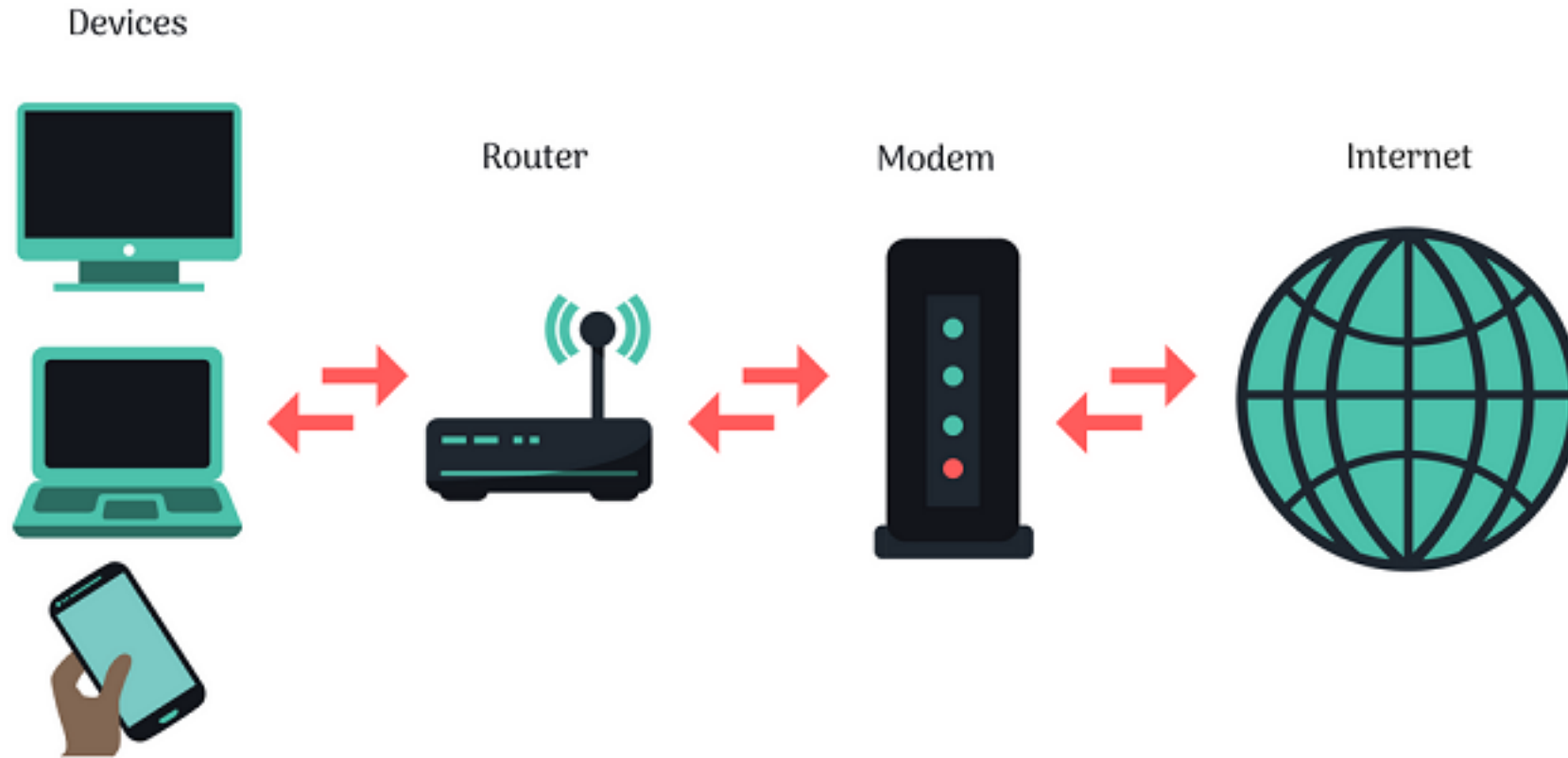
# 5. Types of communication devices

## Router

Connects multiple computers, routers and transmit data to its correct destination  
Ex. wireless, broadband ,mobile



# 5. Types of communication devices



# 5. Types of communication devices

## Network Card

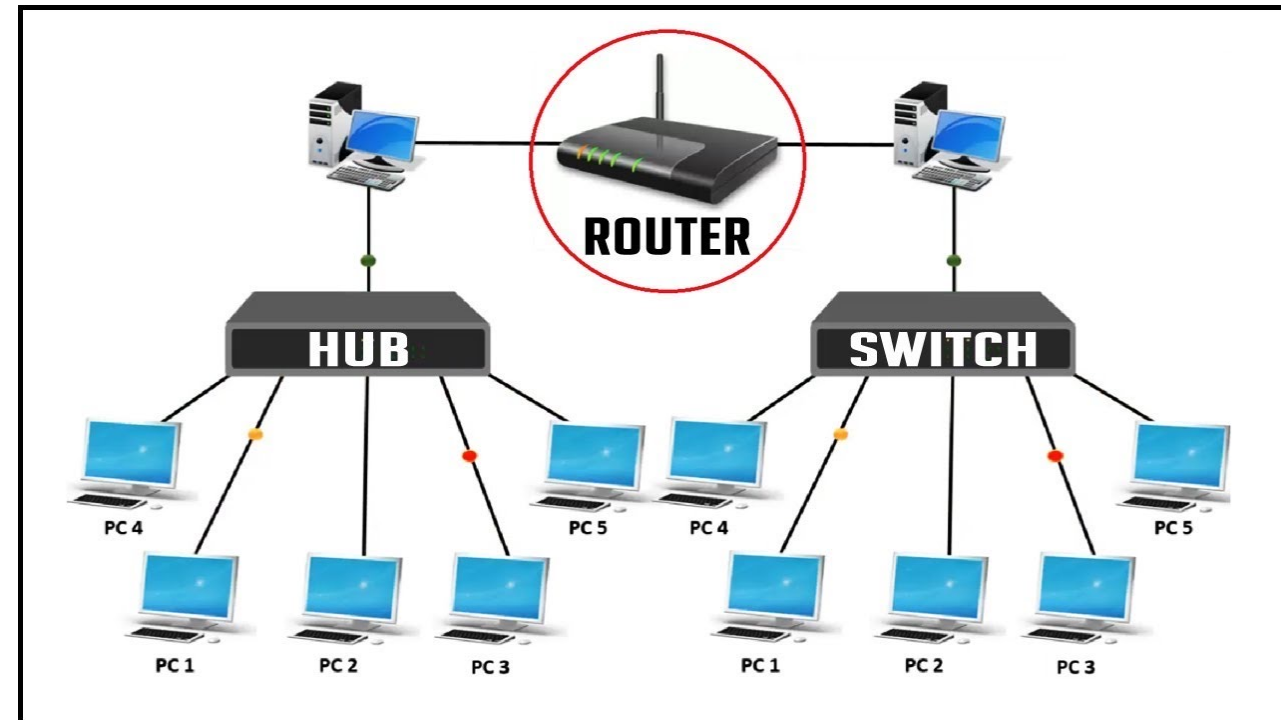
Enables a computer or device that does not have built-in networking capability to access a network



# 5. Types of communication devices

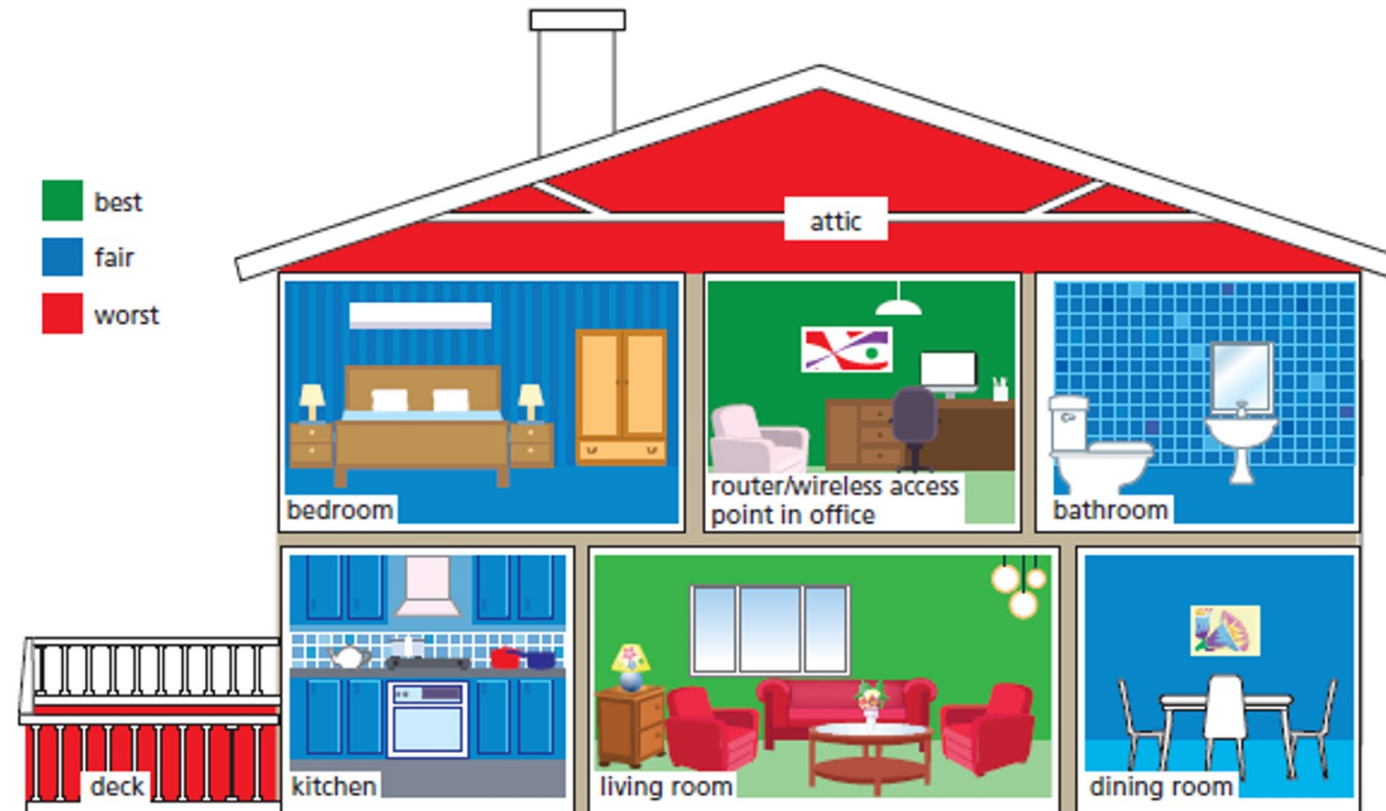
## Hub / Switch

Provides a central point for cables in a network



# 5. Types of communication devices

- Many home users connect multiple computers and devices together in a **home network**





**1. Communications**

**2. Networks**

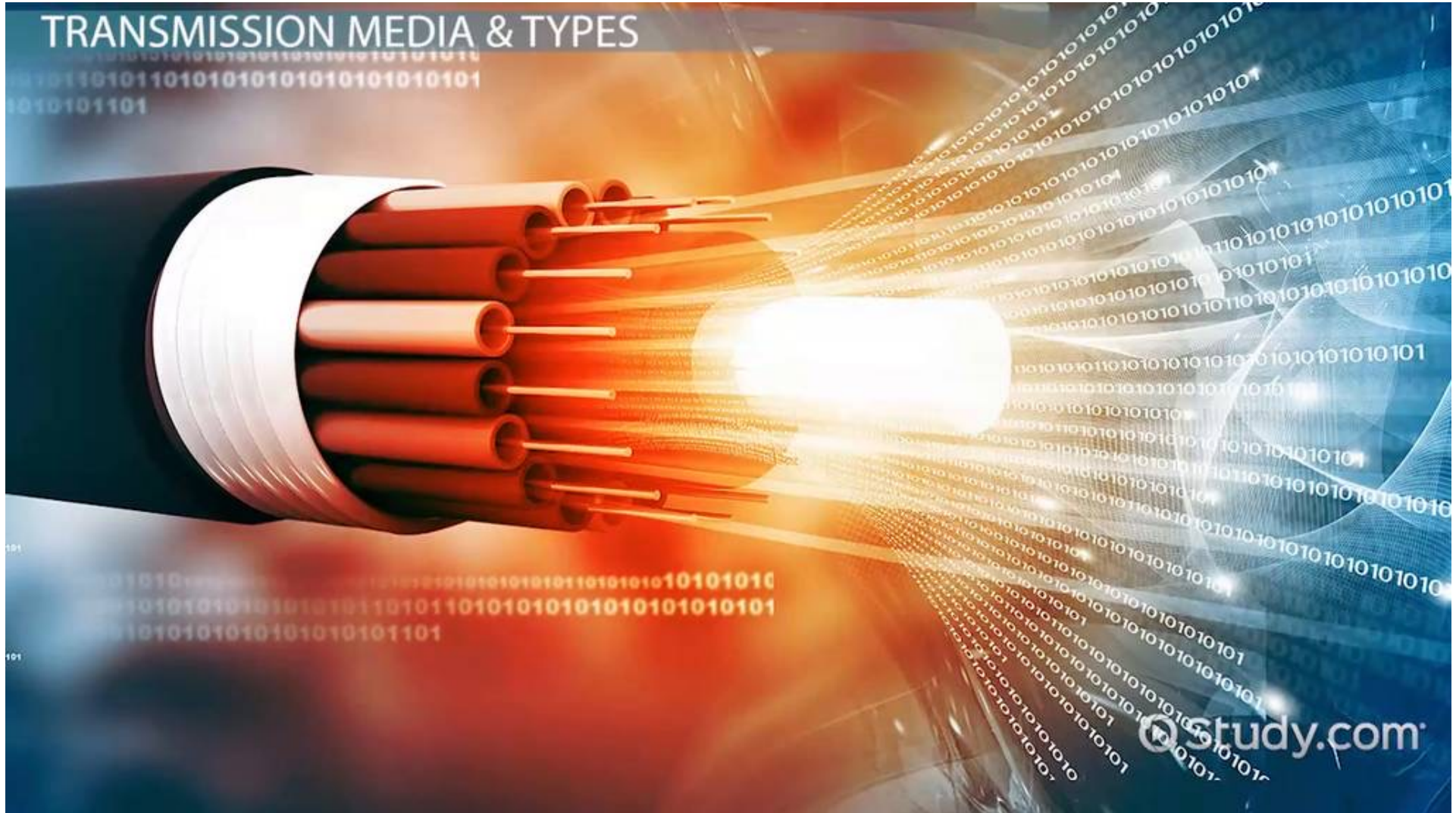
**3. Communication software**

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# 6. Physical/Wireless transmission media



**Carries communication signals**

# 6. Physical/Wireless transmission media

## Broadband media

Transmit multiple signals simultaneously



# 6. Physical/Wireless transmission media

## Bandwidth

The amount of data, information, instructions that can travel over transmission media





# 6. Physical/Wireless transmission media

## Latency

The time a signal travels from one location to another

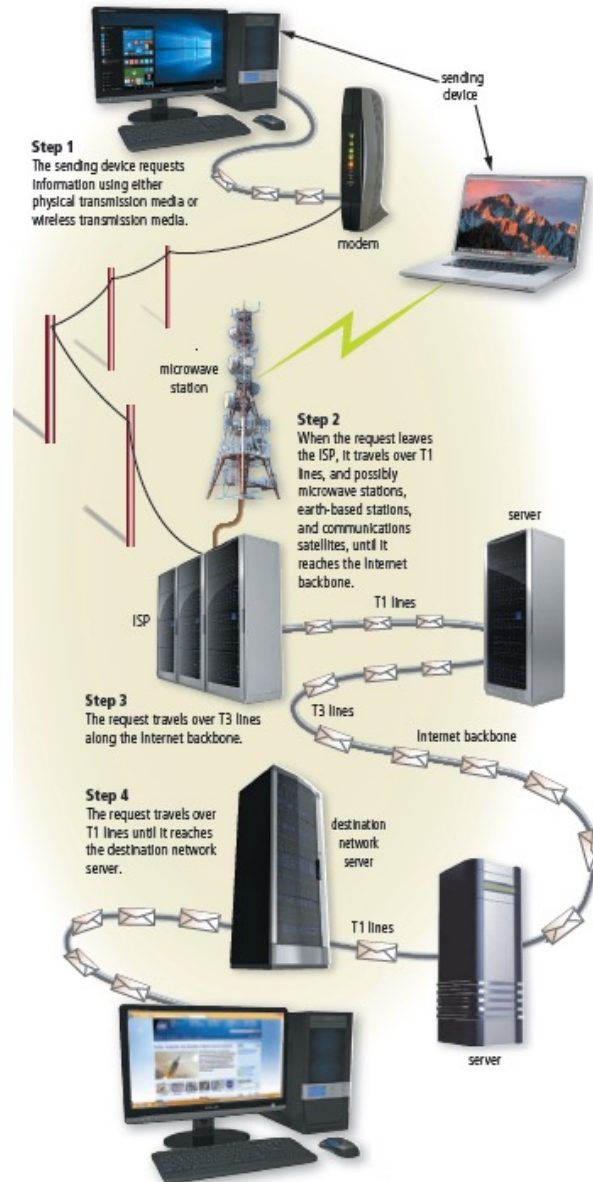


## Latency



Time it takes for a request to go from the client to the server and back to the client

# 6. Physical/Wireless transmission media





# 6. Physical transmission media

| Type of Cable and LAN                                | Maximum Transfer Rate |
|--|-----------------------|
| <b>Twisted-Pair Cable</b>                            |                       |
| • 10Base-T (Ethernet)                                | 10 Mbps               |
| • 100Base-T (Fast Ethernet)                          | 100 Mbps              |
| • 1000Base-T (Gigabit Ethernet)                      | 1 Gbps                |
| • Token ring   | 4 Mbps to 16 Mbps     |
| <b>Coaxial Cable</b>                                 |                       |
| • 10Base2 (Thin Wire Ethernet)                       | 10 Mbps               |
| • 10Base5 (Thick Wire Ethernet)                      | 10 Mbps               |
| <b>Fiber-Optic Cable</b>                             |                       |
| • 10Base-F (Ethernet)                                | 10 Mbps               |
| • 100Base-FX (Fast Ethernet)                         | 100 Mbps              |
| • FDDI (Fiber Distributed Data Interface) token ring | 100 Mbps              |
| • Gigabit Ethernet                                   | 1 Gbps                |
| • 10-Gigabit Ethernet                                | 10 Gbps               |
| • 40-Gigabit Ethernet                                | 40 Gbps               |
| • 100-Gigabit Ethernet                               | 100 Gbps              |

# 6. Physical transmission media

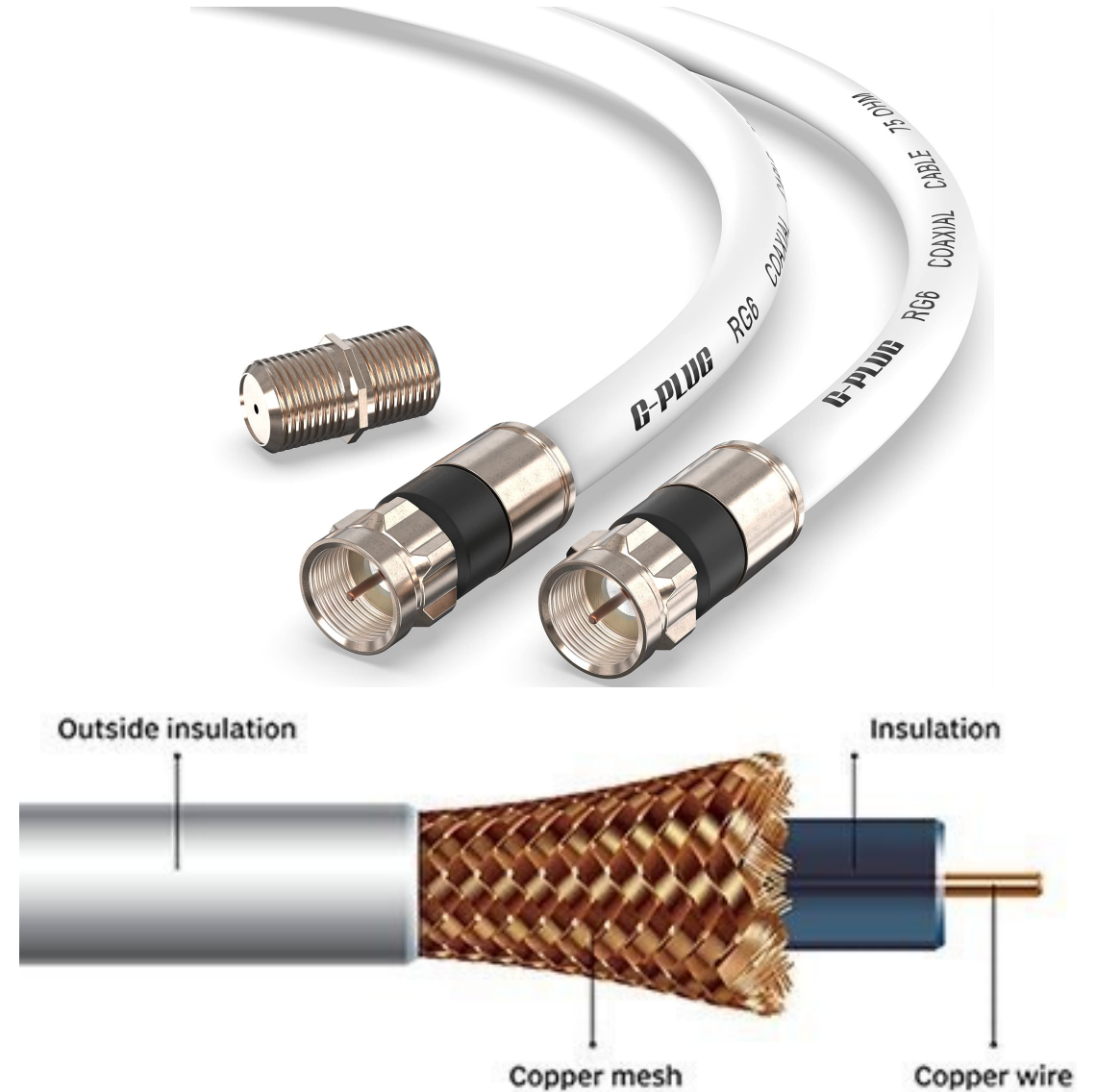
## Twisted Pair Cable

Ex. LANs, Landline phone networks



# 6. Physical transmission media

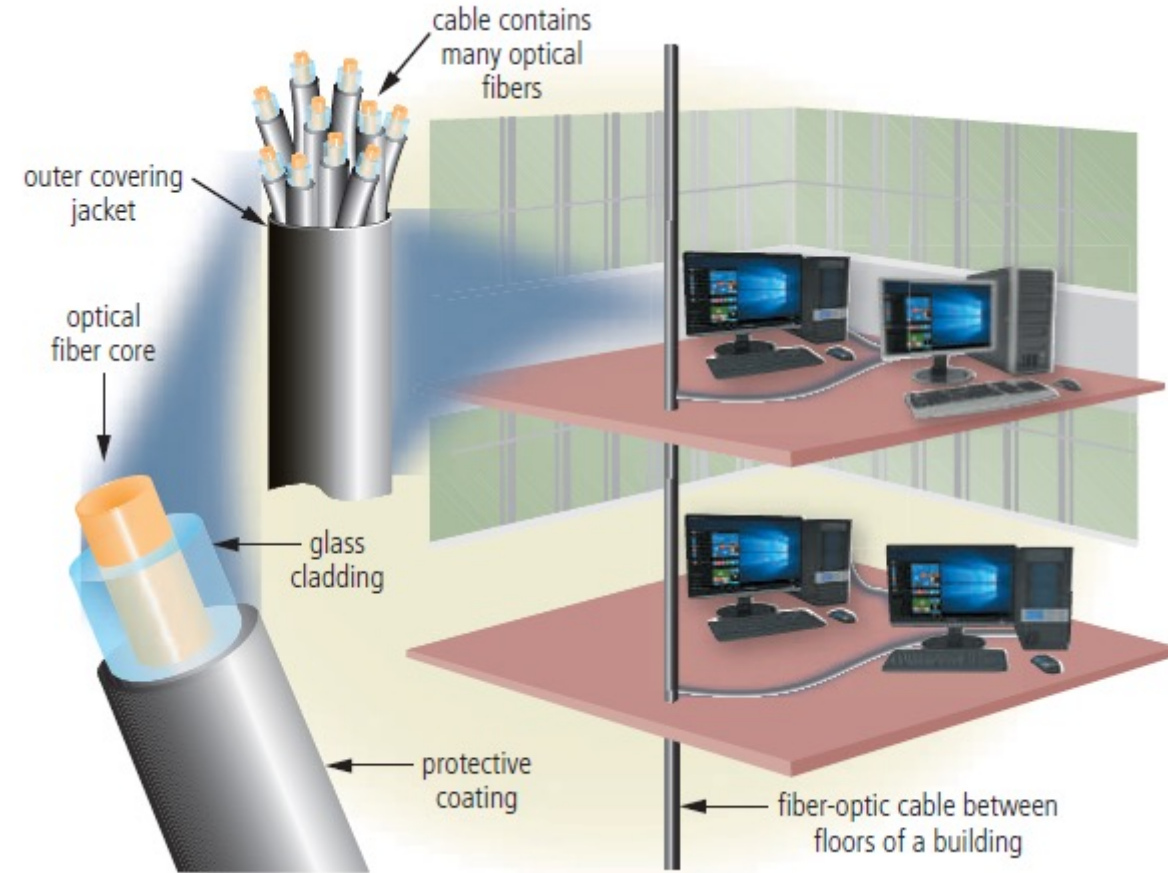
## Coaxial Cable



# 6. Physical transmission media

## Fiber-optic Cable

Consists of hair-thin strands of glass or plastic  
Carry data as pulses of light



# 6. Wireless transmission media

| Medium          |           | Maximum Transfer Transmission Rate     |
|-----------------|-----------|--|
| Infrared        |           | 115 Kbps to 4 Mbps                     |
| Broadcast radio | Bluetooth | 1 Mbps to 24 Mbps                      |
|                 | 802.11b   | 11 Mbps                                |
|                 | 802.11a   | 54 Mbps                                |
|                 | 802.11g   | 54 Mbps                                |
|                 | 802.11n   | 300 mbps                               |
|                 | 802.11ac  | 500 Mbps to 1 Gbps                     |
|                 | 802.11ad  | up to 7 Gbps                           |
|                 | UWB       | 110 Mbps to 480 Mbps                   |
| Cellular radio  | 2G        | 9.6 Kbps to 144 Kbps                   |
|                 | 3G        | 144 Kbps to 3.84 Mbps                  |
|                 | 4G        | Up to 100 Mbps                         |
| Microwave radio |           | Up to 10 Gbps                          |
| Communications  |           | Up to 2.56 Tbps (Tera bits per second) |

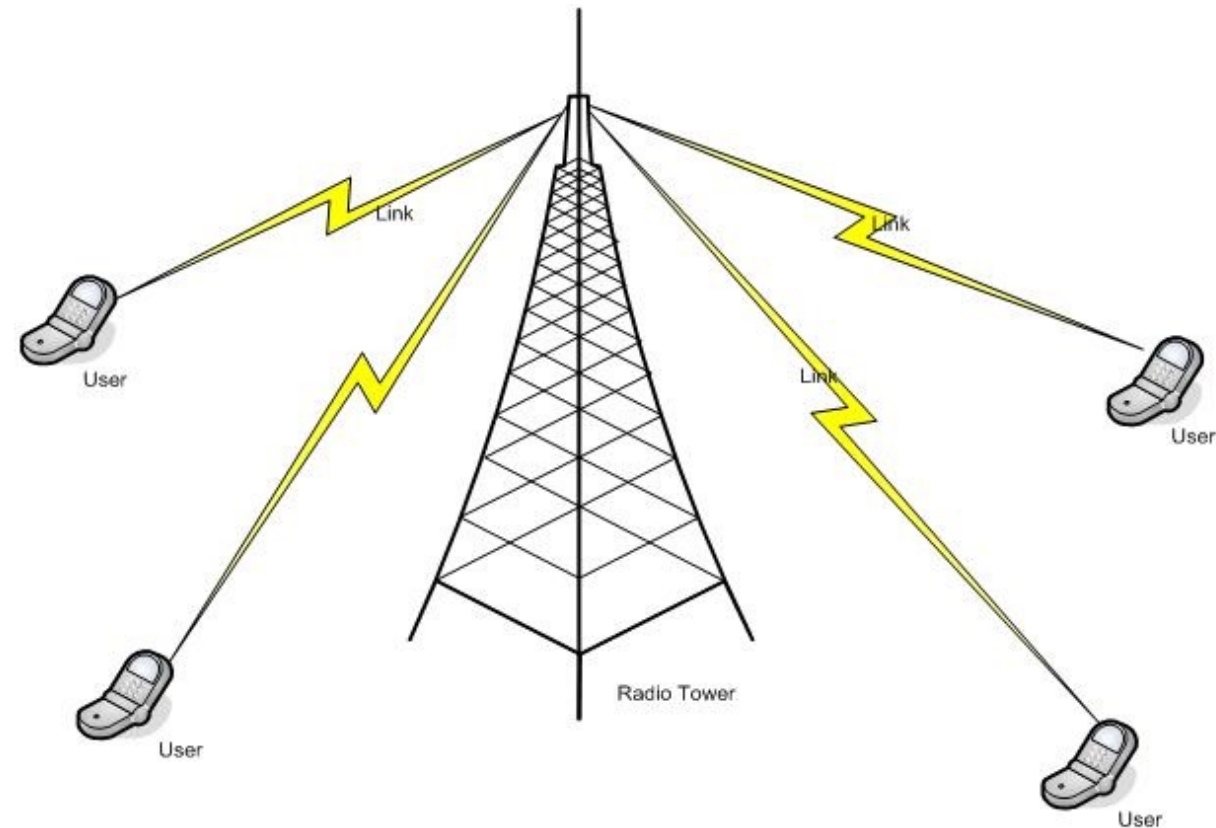
# 6. Wireless transmission media

## Broadcast Radio

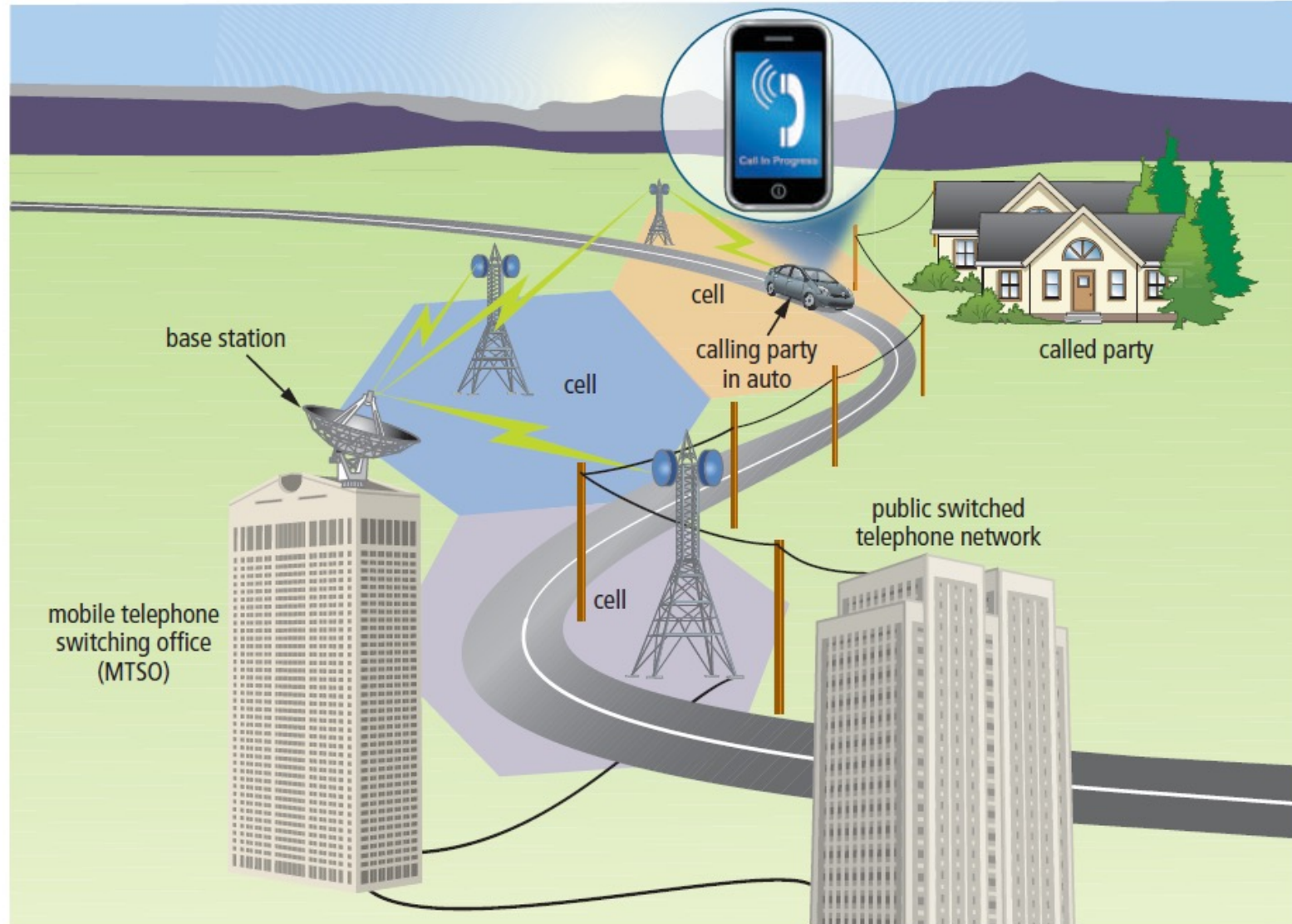
Distributes radio signals over long distance

## Cellular Radio

Broadcast radio in wide use for mobile communication



# 6. Wireless transmission media

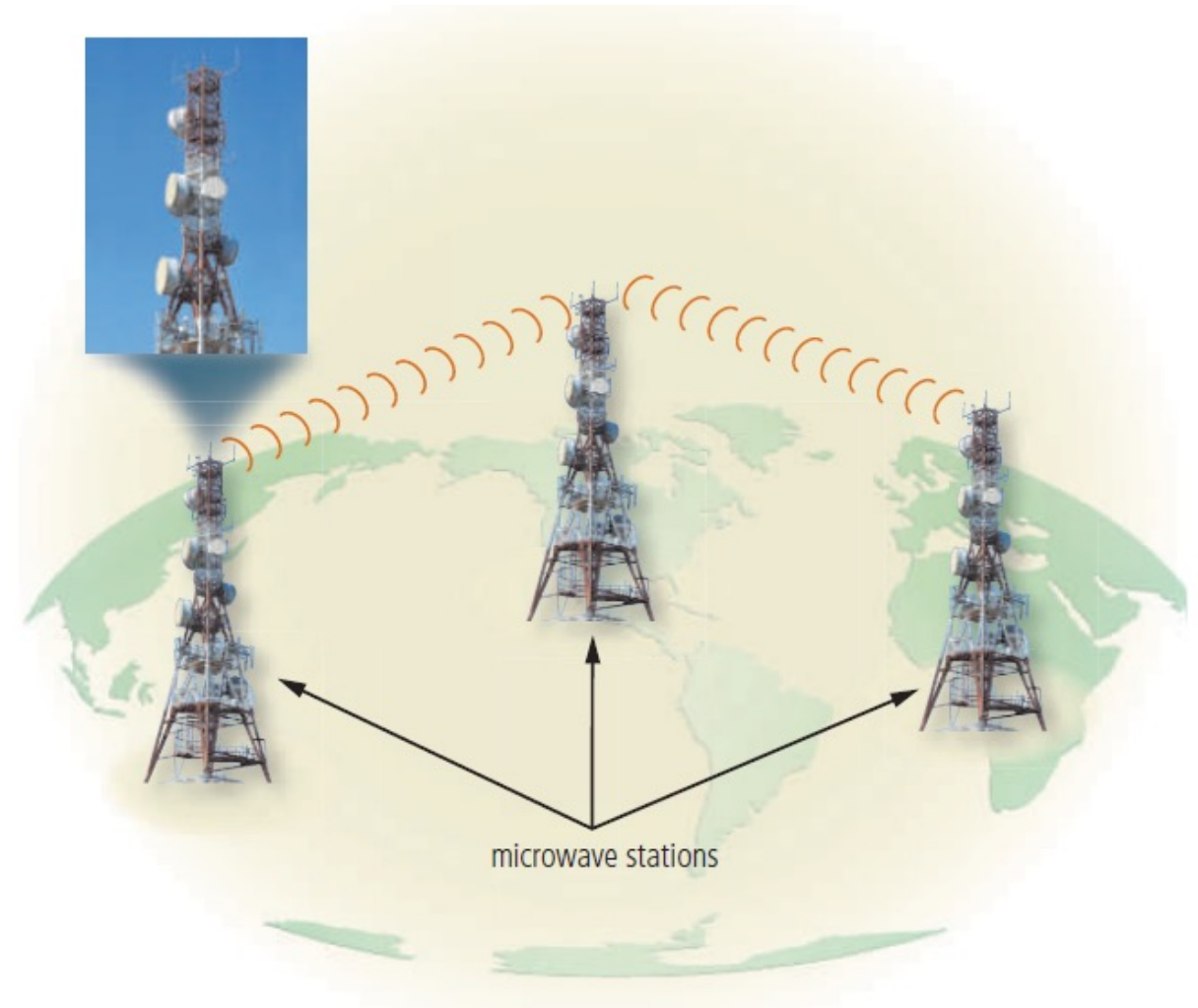




# 6. Physical transmission media

## Microwaves

Radio waves provide high-speed signal transmission



# 6. Physical transmission media

## Communication Satellite



# 6. Physical transmission media

**GPS**



# Summary

**1. Communications**

**2. Networks**

**3. Communication software**

**4. Network communication standards and protocols**

**5. Types of communication lines and devices**

**6. Physical/Wireless transmission media**

# QA

**1. Name 2 kinds of VoIP apps**

**2. Name a kind of physical transmission media**

# QA

## 1. Name 2 kinds of VoIP apps

**\*VoIP: Voice over Internet Protocol**



The infographic illustrates the benefits of VoIP, centered around a VoIP phone. The benefits listed are:

- Easy Install
- Virtual Phone Numbers
- Use existed Internet
- Link Phone Numbers
- Simple Integration
- Advance Voicemail
- High Audio Quality
- Power over Ethernet

Surrounding the central image are logos for popular VoIP apps: Zoom, LINE, Skype, WeChat, and WhatsApp.

## 2. Name a kind of physical transmission media

Twisted pair cable  
Coaxial cable  
Fiber-optic Cable