

Microwave

- ❑ Transmission and reception are achieved by means of an antenna
- ❑ Configurations for wireless transmission
 - Directional
 - Omnidirectional
- ❑ Microwave data communication exists in two forms:
 1. **Terrestrial** (earth-based) **systems**, and
 2. **Satellite systems**.
- ❑ Functionally they are similar, but the abilities of each are somewhat different.

Terrestrial Microwave

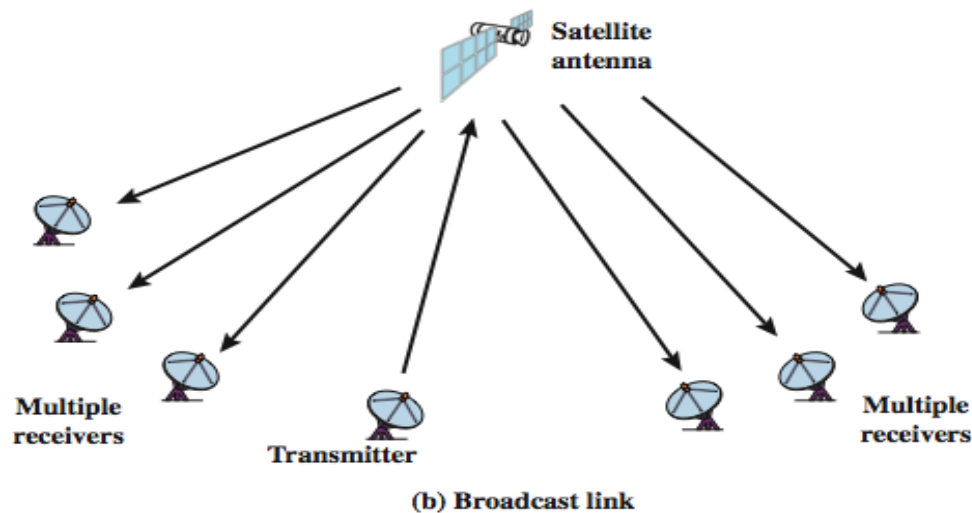
- ❑ The primary use is in long haul telecommunications service, as an alternative to coaxial cable or optical fiber.
- ❑ Commonly used for both voice and TV transmission.
- ❑ Used for short point-to-point links between buildings, for closed-circuit TV or as a data link between local area networks.
- ❑ Requires fewer amplifiers or repeaters than coaxial cable over the same distance, (typically every 10-100 km) but requires line-of-sight transmission.

Terrestrial Microwave

- ❑ Antenna is the parabolic "dish", fixed rigidly to focus a narrow beam on a receiving antenna.
- ❑ A typical size is about 3 m in diameter.
- ❑ Use a parabolic dish to focus a narrow beam onto a receiver antenna.
- ❑ Antennas are usually located at substantial heights above ground level to extend the range between antennas.
- ❑ 1-40GHz frequencies. Higher frequencies give higher data rates
- ❑ Main source of loss is attenuation. Distance, rainfall also create an interference

Satellite Microwave

- ❑ A satellite is a microwave relay station.
- ❑ Used to link two or more ground-based transmitter/receivers (earth stations).



- ❑ Receives transmissions on one frequency band (uplink), amplifies or repeats the signal, and transmits it on another frequency (downlink).
- ❑ Frequency range: 1 to 10 GHz.

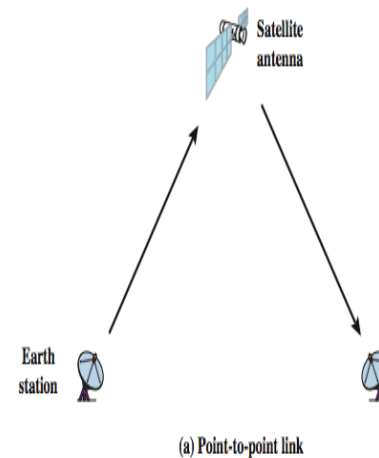
Satellite Microwave

- ❑ Earth Stations – antenna systems on or near earth
- ❑ Uplink – transmission from an earth station to a satellite
- ❑ Downlink – transmission from a satellite to an earth station
- ❑ Transponder - electronics in the satellite that convert uplink signals to downlink signals
- ❑ Most satellites providing point-to-point service today.
- ❑ Use a frequency bandwidth:

5.925 to 6.425 GHz for uplink

3.7 to 4.2 GHz for downlink

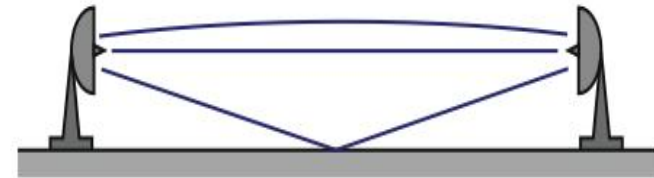
- ❑ Typical uses
 - television
 - long distance telephone
 - private business networks



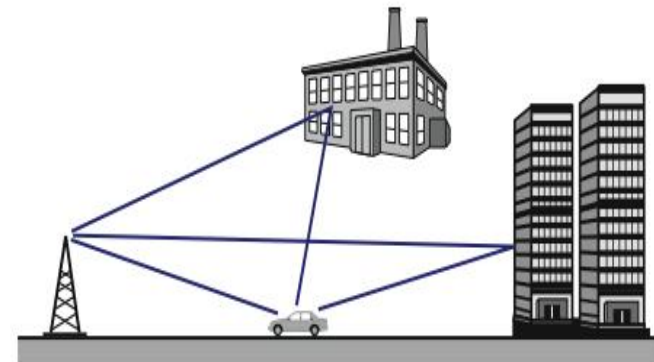
Broadcast Radio

Multipath Interference

- ❑ **Radio** frequency (3 kHz -300 GHz)
- ❑ FM radio, UHF and VHF TV.
- ❑ **Omni** directional.
- ❑ Still need line of sight.
- ❑ Less sensitive to attenuation from rainfall.
- ❑ Suffered by multipath interference (Reflection from land, water, and natural or human-made objects eg **ghosting** on TV pictures).



(a) Microwave line of sight



(b) Mobile radio

Infrared

- ❑ Uses infrared light.
- ❑ Transceivers must be within the line of sight of each other.
- ❑ Infrared do not penetrate through the walls.
- ❑ Furthermore, there is no frequency allocation issue with infrared, because no licensing is required.
- ❑ typical uses
 - TV remote control
 - IRD port

UNBOUNDED MEDIA COMPARISON

Types	Area of Coverage	EMI Sensitivity
Terrestrial Microwave	Directional beam	Moderate
Satellite Microwave	Beam to small or large area	Moderate
Infrared	Omnidirectional in relatively small area	Low
Radio	Omnidirectional in small or large area	High