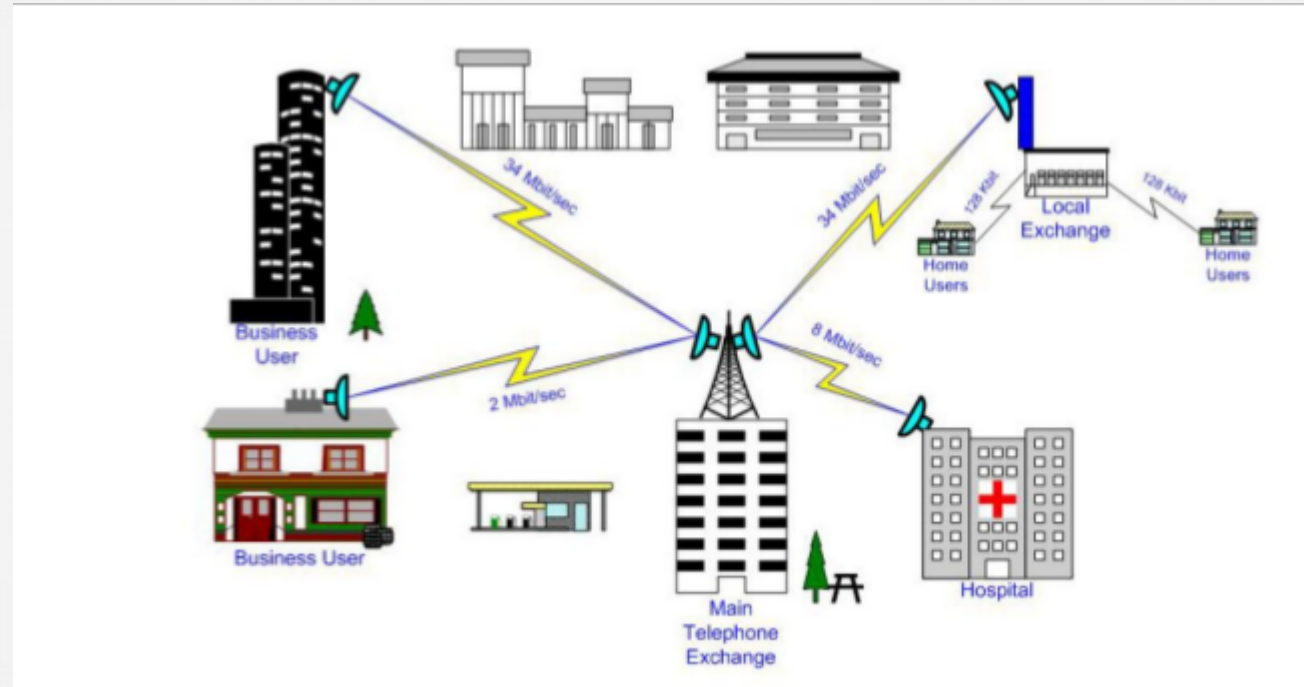


# Microwave Link Design

Communication Systems  
Lecture 3

Eng. (Mrs) PN Karunanayake

# Microwave Link Design



# Benefits of using Microwave Links for Communication operators

- Economical compared to fibre or leased lines.
  - Ownership
  - Flexibility
  - Reliability
- Uses air interface
- Speed of Installation
- Ability for re-deployment
- Availability
- Gives a competitive edge

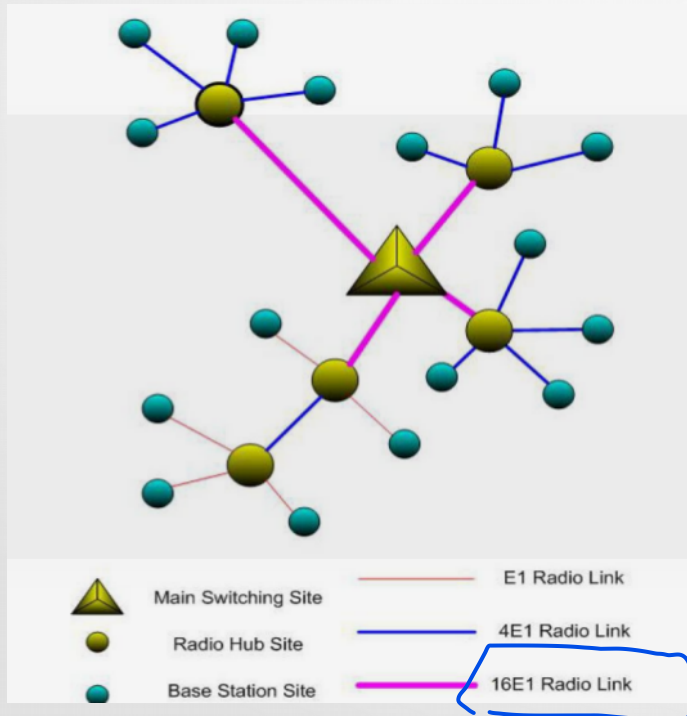


# Network Design Process

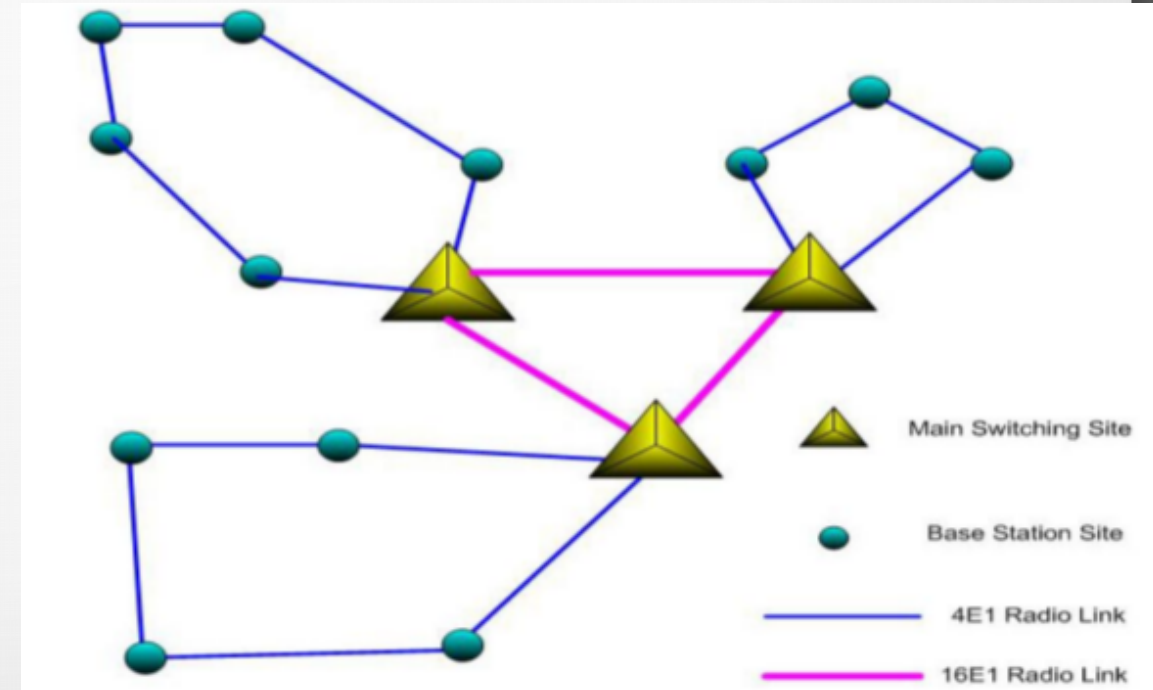
- Availability target for network. This involves setting a target for how often the network should be operational without interruptions.
- Availability target for radio path. define the desired availability for each individual microwave link.
- Required capacity (current and future).
- Maintainability, i.e. protected or non-protected
- Design of the network
- Determine local frequency availability and regulatory restrictions. this includes deciding how many microwave links will be required, where they will be located, and how they will connect various network nodes.
- Select and survey sites
- Establish existence of line-of-sight
- Detailed network design - frequency planning

# Network Topologies

## ■ Star




## ■ Ring



# Frequency ranges with the distance

Frequency (GHz)	Distance (km)
23	< 2.5
18	6
15	10
13	15
8	22
4&2	More than 22



# Regulatory Consideration

- Prevents misuse and interference between the many and varied applications.
- Operator must determine available frequency bands and channel plans specific to that country.
- Approval
- Limitations imposed by authorities



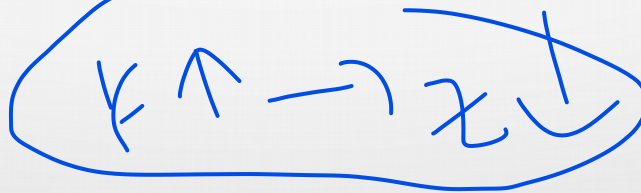
# Site Selection and Survey

- **The location** of good microwave site, particularly in relation to hub sites.
- **Future growth** requirements in all areas, especially if the site is likely to develop into a future hub.
- Local authority planning.
- **Equipment installation** requirements must be confirmed with power, accommodation, and environmental conditions
- **Required loading** needs to be calculated if new tower installations are proposed



# Confirmation of Line of sight

- A clear transmission path must exist between the two link nodes of any microwave radio link.
- Additional clearance, known as the Fresnel zone is required to maintain. Fresnel zone differs for the frequency band of the radio path, where higher frequency translates into a smaller clearance requirement.

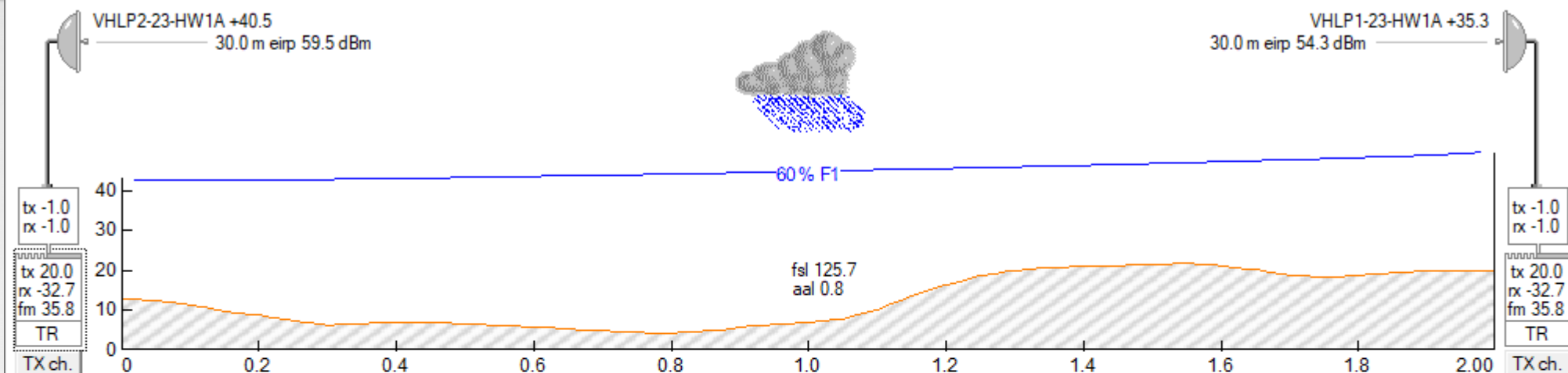


# Frequency planning

- Frequency planning is the coordination of link frequencies to minimize any interference between links within the network and those operated by other users.

# Pathloss 5 Link - Transmission Analysis - KDU-KDUH.pl5

Files Design Configure Operations Design link Report Help



EIRP (dBm)	59.50	54.30
Free space loss (dB)	125.71	
Atmospheric absorption loss (dB)	0.81	
Net path loss (dB)	52.72	52.72
Receive signal (dBm)	-32.72	-32.72
Thermal fade margin (dB)	35.78	35.78
Effective fade margin (dB)	35.69	35.69
Worst month multipath availability (%)	100.00000	100.00000
Worst month multipath unavailability (sec)	0.00	0.00
Annual multipath availability (%)	100.00000	100.00000
Annual multipath unavailability (sec)	0.01	0.01

KDU

23000.0 MHz - V

TR-TR

Microwave

Rec. ITU-R P.530-13/16

km - m



KDUH



# Reference

- Sanjeeva Gupta, “Microwave Engineering”