



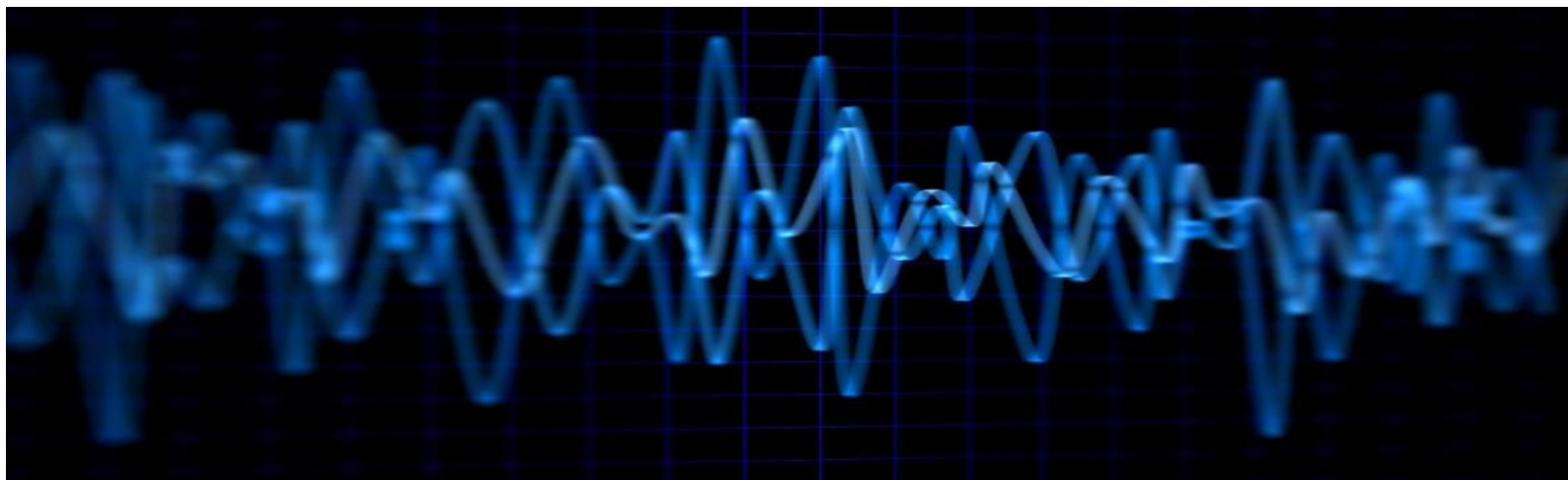
OVERVIEW OF RADIO TECHNOLOGY

PREPARED BY MD. REFAYET ULLAH



What is radio technology ?

Radio is the technology of signaling and communicating using radio waves. Radio waves are electromagnetic waves of frequency. They are generated by an electronic device called a transmitter connected to an antenna which radiates the waves, and received by another antenna connected to a radio receiver.





Types of frequency band

Licensed

License is required to be purchased for spectrum use and it is not free

The medium can be accessed or used only by the owner of the license

Frequency: 2.3 GHz, 3.5 GHz, 900 MHz, 1800 MHz

ISM

License is free

Anyone can use the unlicensed spectrum and its medium

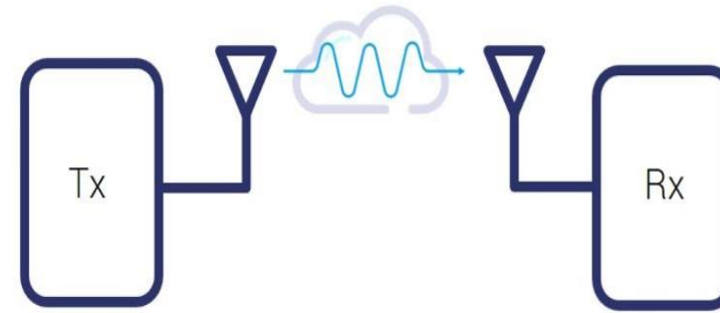
Anyone can access the medium via listening if channel is empty

Frequency: 2.4 GHz and 5.8 GHz

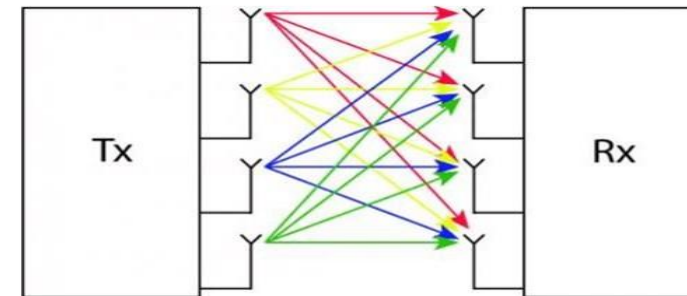
Radio old and Existing technology of BRACNet



SISO refers to a wireless communications system in which one antenna is used at the source (transmitter) and one antenna is used at the destination(receiver).



MIMO is a wireless technology that uses multiple transmitters and receivers to transfer more data at the same time.



Existing Radio Brands/Model of BRACNet

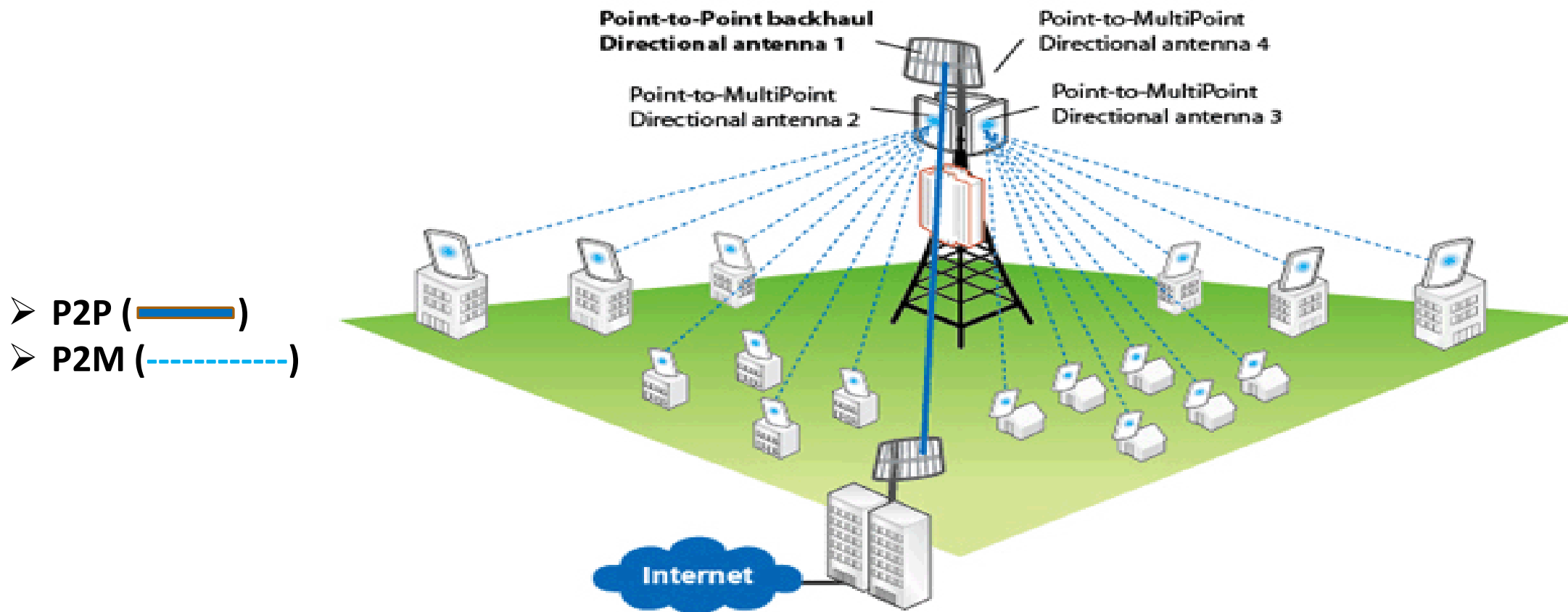


Two radio brands currently BRACNet is using (Ubiquiti & Cambium)

Cambium	Ubiquiti
ePMP 180	Power Beam M5 400
ePMP 190	Lite Beam M5
ePMP 200/ePMP 200L	Nano Station M5
ePMP 300-25/ePMP 300-25L	Rocket M5
ePMP 300-16	
ePMP 1000	
ePMP 2000	



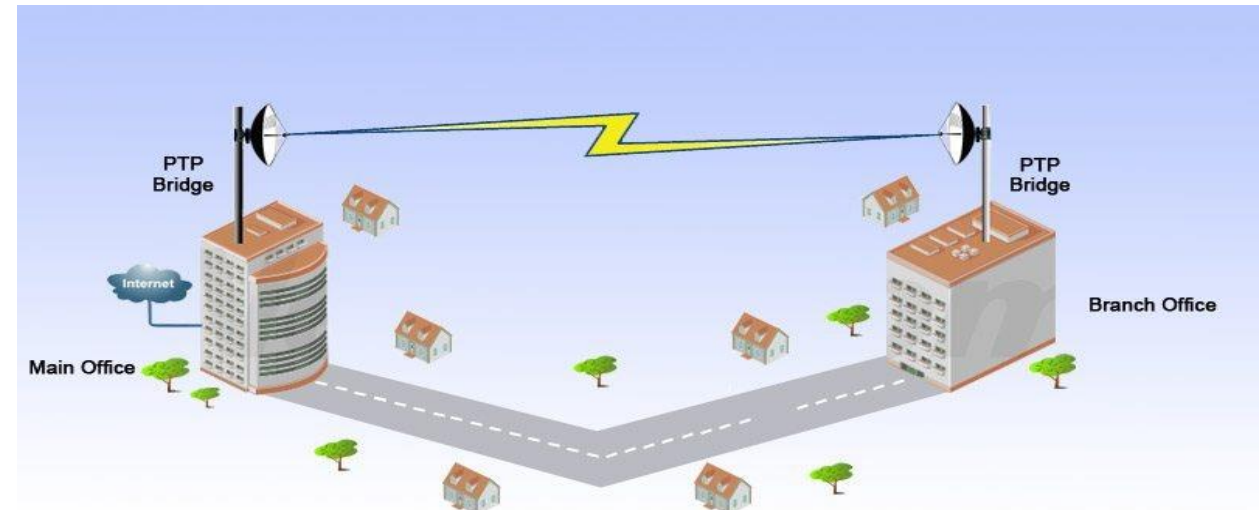
Type of Radio links



P2P Radio Links



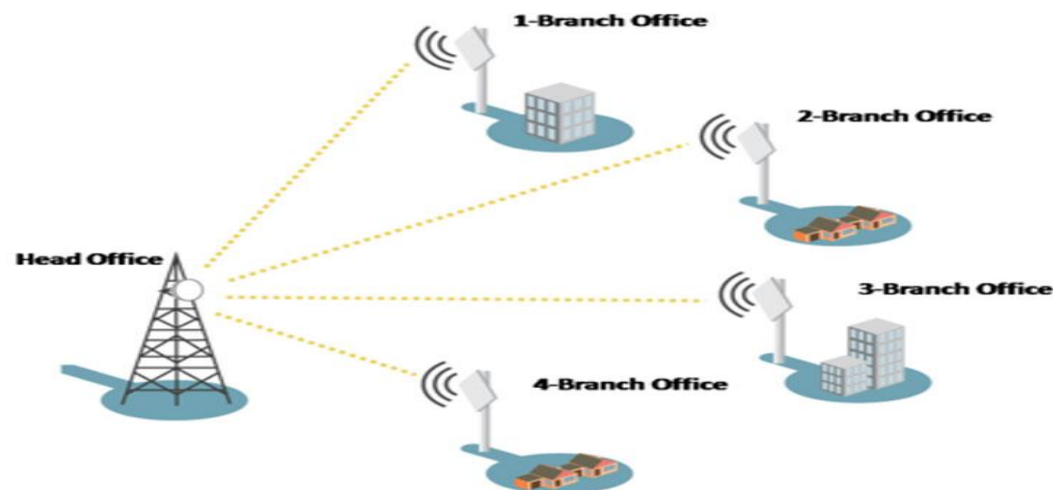
Point to Point wireless is a data connection between two points. The connection is delivered wirelessly through radio waves. For fixed links, this can involve use of high gain directional antennas which enables long distance and high capacity links.





P2M Radio Links

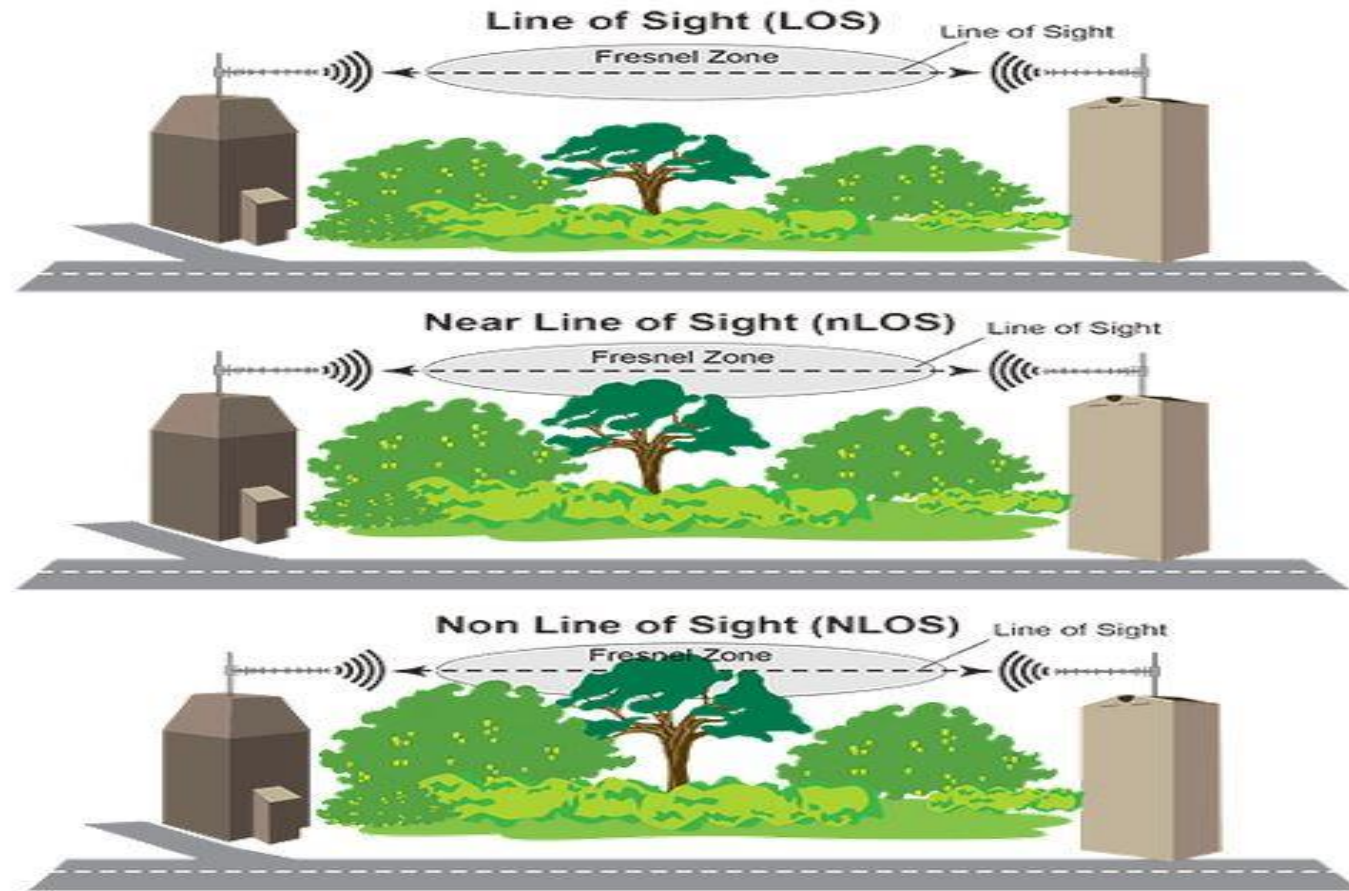
For P2MP, a central antenna or antenna array broadcasts to several receiving antennas and the system uses either Frequency Division Multiplexing or time-division multiplexing to allow for bidirectional traffic flow.



Line of sight (LoS)



Line of sight (LoS) is a type of propagation that can transmit and receive data only where transmit and receive stations are in view of each other without any sort of an obstacle between them.

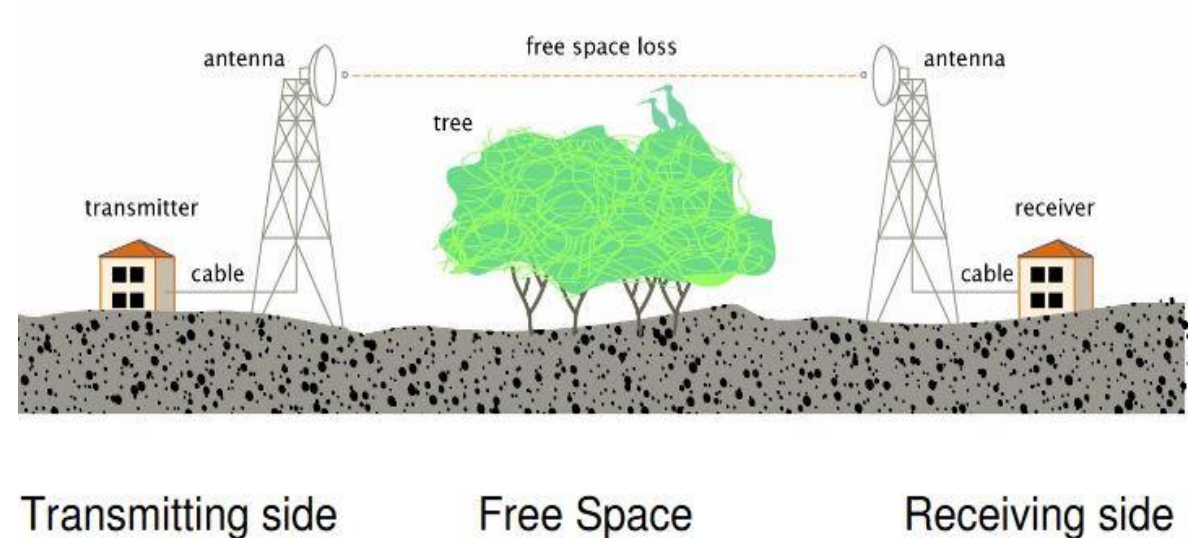


Link Budget



- ❖ The accounting of all of the gains and losses from transmitter to receiver.
- ❖ Estimation of losses/gains in radio link
- ❖ Suitable design Adequate choice of equipment
- ❖ Transmitting side
 - Transmitting power, cable loss, antenna gain
- ❖ Propagating side.
 - Fresnel zone
- ❖ Receiving side.
 - Antenna gain, cable loss, receiver sensibility

Elements of a Radio Link



Example Max. Range of BRACNet Radio Links



Cambium Networks ePMP 1000 | Bn-Bhola-Uplink-Kun... | Access Point

1 2

Administrator

Home

Quick Start

Configuration

Monitor

Performance

System

Wireless

Throughput Chart

Network

System Log

Tools

Monitor > Wireless

Wireless Status

Operating Frequency	5635 MHz
Operating Channel Bandwidth	20 MHz
Transmitter Output Power	30 dBm
Registered Subscriber Modules	1
Ethernet Status	100 Mbps / Full
Wireless Status	Up
Country	Other

Registered Subscriber Modules [Show Details](#)

	MAC Address	IPv4 / IPv6 Addresses	Device Name	SM Distance (km)	Session Time (hh:mm:ss)	RSSI (dBm) Uplink	SNR (dB) Uplink	MCS Downlink Uplink
Deregister	58:C1:7A:40:B7:DF	172.21.189.83	Bn-KunjerhatUplink-Bhola	31.478	07:26:33	-76	21	3/11

Example of Max. Throughput of BRACNet Radio Links



Cambium Networks Force 300 | Bn-Konabari-Gp-POP | Access Point

EN 1 3 Administrator

Tools > Wireless Link Test

Test Setup

SM MAC Address: 00:04:56:29:C9:1F

Packet Size: ☐ Small (128 bytes) ☐ Medium (800 bytes) ☒ Large (1500 bytes)

Duration: ☐ 4 seconds ☐ 10 seconds ☒ 20 seconds

Start Test

Downlink: 261.354 Mbps

Uplink: 243.54 Mbps

Registered Subscriber Modules

Show Details

MAC Address	IPv4 / IPv6 Addresses	Device Name	SM Distance (km)	Session Time (hh:mm:ss)	RSSI (dBm) Downlink / Uplink	SNR (dB) Downlink / Uplink	MCS Downlink / Uplink	Downlink Quality	Downlink Capacity	Model Name
00:04:56:29:C9:1F	172.21.116.179	Bn-Blue-Ocean-POP	4.836	37 days 15:16:35	-59/-56	33/36	DS 8/DS 7	89 %	75 %	5 GHz Force 300-25 Rac

Average Wireless Throughput

Any Question ?





Thank You!