

(*) MIMO (Multiple Input, Multiple Output).

- Multiple antennas are used both at the source & destination.
- Uses Multipath. Multipath means when the radio waves / information bounces off buildings or other objects before reaching the receiver.
- Earlier, multipath was used to create interference, ~~but now~~, with Multipath, MIMO uses multiple smart transmitters & receivers, improving the performance & range.
- It increases the receiver signal-capturing power by enabling antennas to combine the data streams arriving from different paths.
- It has provided scalability.
- Used for simultaneously transmitting and receiving multiple data streams.

(*) ~~Handover~~ Handover: Used when there are mobile devices in a wireless NW. 2 Types:

- ① Horizontal Handover: When a device moves b/w one type of network technology under one operator.
Eg. Switching cellular towers on moving out of range.
- ② Vertical Handover: When a device must switch technologies or operators. Eg. a device switching from wifi to 4G cellular coverage illustrates a switch b/w technologies.

(*) Cell Breathing:

- Allows overloaded cells to offload subscriber traffic to neighbouring cells by changing their geographical size (area).
- Heavily loaded cells decrease in size while neighbouring cells increase in size to compensate.
- This way, some traffic is handed off from the overloaded cell to the neighbouring cells, resulting in load balancing.

(*) Dwell time:

- Time over which a call is maintained within a cell w/o handoff.
- Stationary user has a finite dwell time.
- Varies on the speed of user.
- Depends on factors like propagation, interference, distance b/w subscriber & base station, etc.

(*) Cell dragging:

- Occurs when even when the user has travelled beyond the designed range of cell & ~~the~~ still handoff is ~~not~~ not done.
- This problem can be solved by adjusting the handoff threshold.

(*) ~~Beam~~ Beamforming:

- Technique used to improve signal to noise ratio of received signals.
- Eliminate interference & focus transmitted signals to specific location.
- MIMO beamforming can be used to increase capacity of datastreams.
- Widely used in RADAR, SONAR, Medical Imaging, etc.
- Used to focus transmitted signals in a particular direction.
- Rather than sending a signal from a broadcast antenna to be spread in all directions, beamforming ~~uses~~ directs the same signal towards a single receiving device.

(*) Circuit switched

- Relies on physical connection b/w two nodes.
- Link set up before the nodes communicate.
- The circuit remains dedicated to the communication for session duration.
- High cost

Packet switched

- Manages data transfer in the form of small & optimized packets.

→ low cost

→ Inefficient use of Bandwidth	→ efficient use
→ Limited scalability	→ scalable
→ Low latency	→ High Latency
→ Real time communication	→ No real time communication
→ Each data unit knows entire path address	→ Each data unit knows just the final destination address
→ More reliable	→ less reliable
→ wastage of resources	→ less wastage
→ Cannot handle bilateral traffic	→ Can handle bilateral traffic
→ Physical path b/w source & destination	→ No physical path b/w source & dest
→ Each packet follows same route	→ Packets can follow any route
→ Simple protocols	→ Complex protocols

(*) Risks to Wireless N/ws:

- ① If you fail to secure, anyone can use your n/w connection.
- ② Broadcast range of ~~all~~ wireless Access points can make internet connections available outside your home.
- ③ Evil twin attack: Hackers impersonate the n/w & you login to it.
- ④ Wireless sniffing: Not securing & encrypting your wireless AP.
- ⑤ Unauthorized computer Access.
- ⑥ Someone could look password as you type
- ⑦ Theft of mobile devices.

(*) Minimization of Risks: ① Change your default passwords, Restrict access, Encrypt data on your n/w, Install a firewall, Maintain antivirus software, Share files with caution, Connect using a VPN, Keep your access point upto date, etc.