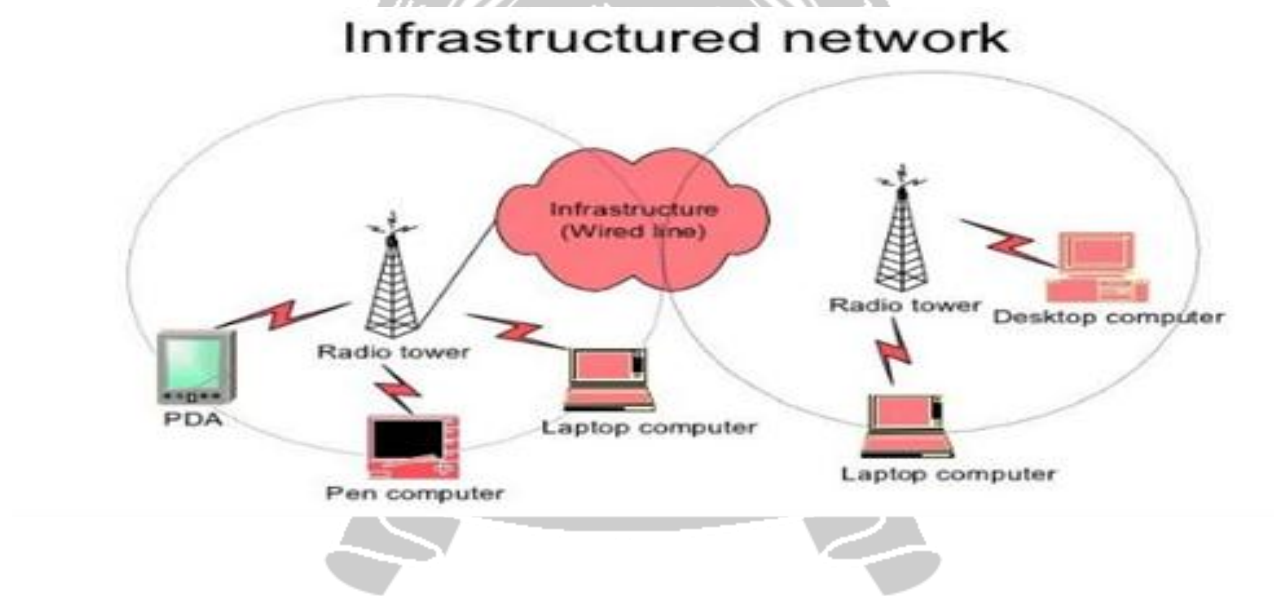# CS8601 –MOBILE COMPUTING

UNIT 3

MOBILE NETWORK LAYER

3.3. MOBILE AD-HOC NETWORK (MANET)

Types of wireless network:
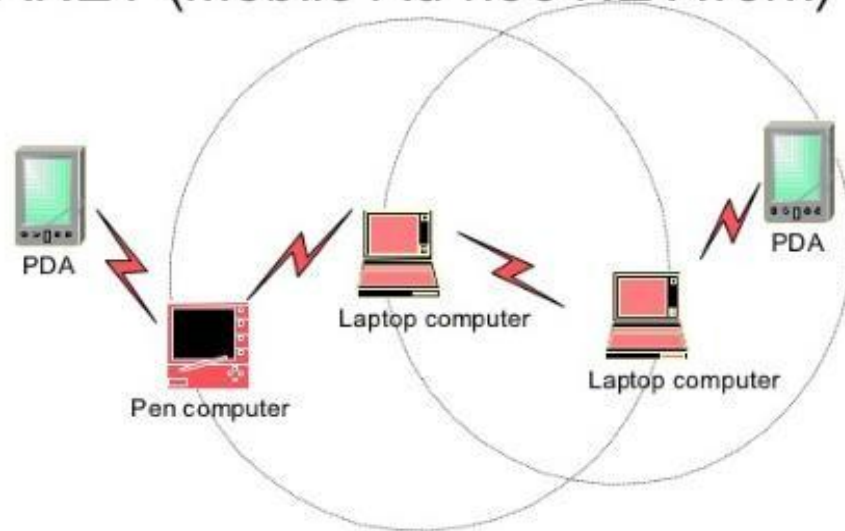
Infrastructured:

• The MN can move while communicating

• The BSs are fixed

• As the node goes out of the range of a BS, it gets into the range of another BS.

Infrastructured network

Infrastructureless or Mobile ad-hoc (MANET):

- ❖ The MN can move while communicating
- ❖ There are no fixed BSs.
- ❖ All the nodes in the network need to act as routers.
- ❖ Used to simplify the installation and maintenance of networked computers.
- ❖ MANET are formed dynamically by an autonomous system of mobile nodes that are connected via wireless links.
- ❖ No existing fixed infrastructure or centralized administration
- ❖ Mobile nodes are free to move randomly i.e., network topology changes frequently.
- ❖ Each node work as a router.

Infrastructurless (ad-hoc) network or MANET (Mobile Ad-hoc NETwork)

FEATURES OF MANET:

- ❖ MANET can be formed without any pre-existing infrastructure.
- ❖ It follows dynamic topology where nodes may join and leave the network at any time and the multi-hop routing may keep changing as nodes join and depart from the network.
- ❖ It does have very limited physical security, and thus increasing security is a major concern.
- ❖ Every node in the MANET can assist in routing of packets in the network.
- ❖ Limited Bandwidth & Limited Power

CHARACTERISTICS OF MANET

1. Lack of fixed infrastructure

− bring new n/w designing challenges.

− Pair of nodes can either communicate directly when they are in within the range or can communicate via multi-hop communication.

2. Dynamic topologies :

− n/w topology can change unpredictably because of the mobility of devices in MANET

− Rate of topology change depends on the speed of mobile movement

3. Bandwidth constrained, variable capacity link:

– Wireless link have lower capacity compare to wired link

– Factors affecting Bandwidth: Noise, Interference…….

4. Energy constrained operation:

– Nodes depends on battery power

– Small battery – limited amount of energy

– Need more energy during Routing

– "Energy Conservation" – important objective of MANET routing protocol

5. Increased vulnerability:

– New type of security threats

– Increased the possibility of eavesdropping, spoofing, DOS attacks.

– Difficult to identify the attacker because:

– Devices keeps on moving

– Do not have global Identifier

CHALLENGES / CONSTRAINTS / DESIGN ISSUES OF MANET

1) Limited bandwidth:

Limited bandwidth because of the effect of multiple access, fading, noise, and interference conditions, etc.,

2) Dynamic topology:

Dynamic topology membership may disturb the trust relationship among node.

3) Routing Overhead:

Unnecessary routing overhead since nodes often change their location within network.

4) Hidden terminal problem:

The hidden terminal problem refers to the collision of packets at a receiving node due to the simultaneous transmission of those nodes that are not within the direct transmission range of the sender, but are within the transmission range of the receiver.

5) Packet losses due to transmission errors:

Much higher packet loss due to factors such as increased collisions due to the presence of hidden terminals, presence of interference, uni- directional links, frequent path breaks due to mobility of nodes.

6) Mobility-induced route changes:

The network topology in an ad hoc wireless network is highly dynamic due to the movement of nodes; hence an on-going session suffers frequent path breaks. This situation often leads to frequent route changes.

7) Battery constraints:

Devices used in these networks have restrictions on the power source in order to maintain portability, size and weight of the device.

8) Security threats:

Brings new security challenges to the network design. As the wireless medium is vulnerable to eavesdropping.

APPLICATIONS OF MANET

Application	Possible scenarios/services
Tactical networks	• Military communication and operations • Automated battlefields
Emergency services	• Search and rescue operations • Disaster recovery • Replacement of fixed infrastructure in case of environmental disasters • Policing and fire fighting • Supporting doctors and nurses in hospitals
Commercial and civilian environments	• E-commerce: electronic payments anytime and anywhere • Business: dynamic database access, mobile offices • Vehicular services: road or accident guidance, transmission of road and weather conditions, taxi cab network, inter-vehicle networks • Sports stadiums, trade fairs, shopping malls • Networks of visitors at airports
Home and enterprise networking	• Home/office wireless networking • Conferences, meeting rooms • Personal area networks (PAN), Personal networks (PN) • Networks at construction sites
Education	• Universities and campus settings • Virtual classrooms • Ad hoc communications during meetings or lectures
Entertainment	• Multi-user games • Wireless P2P networking • Outdoor Internet access • Robotic pets • Theme parks
Sensor networks	• Home applications: smart sensors and actuators embedded in consumer electronics • Body area networks (BAN) • Data tracking of environmental conditions, animal movements, chemical/biological detection
Context aware services	• Follow-on services: call-forwarding, mobile workspace • Information services: location specific services, time dependent services • Infotainment: touristic information
Coverage extension	• Extending cellular network access • Linking up with the Internet, intranets, etc.