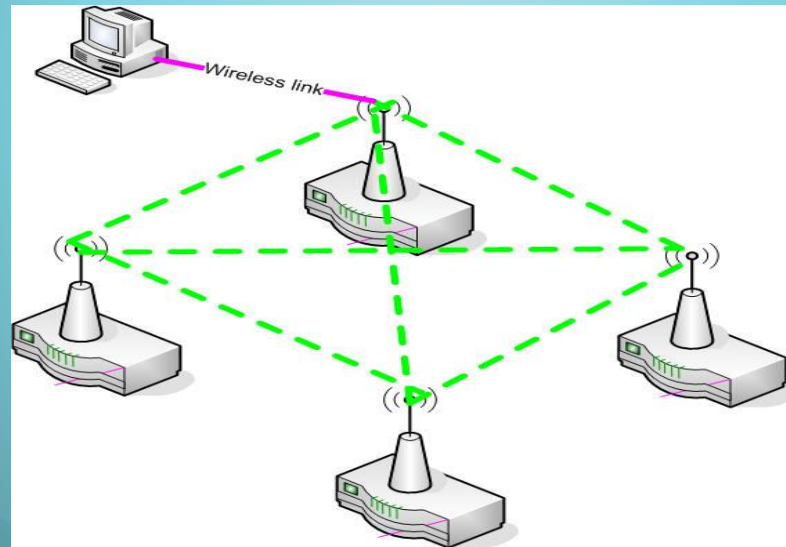# AD-HOC NETWORKS

- Introduction
- History
- Mobile Ad-hoc Networks
  - Infrastructure based Networks and Infrastructure-less Networks.
  - Mobile Ad-hoc Network Routing Protocols
  - Setting up a simple Mobile Ad-hoc Network
  - Pros and Cons.
- Difference between Cellular and Ad-hoc Networks
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What is an ad-hoc network

- An ad-hoc network is a local area network (LAN) that is built spontaneously as devices connect. Instead of relying on a base station to coordinate the flow of messages to each node in the network, the individual network nodes forward packets to and from each other

- In Latin, ad hoc literally means "for this purpose".

- Ad hoc networks therefore refer to networks created for a particular purpose. They are often created for one-time or temporary use.

- Ad hoc networks are comprised of a group of workstations or other wireless devices which communicate directly with each other to exchange information
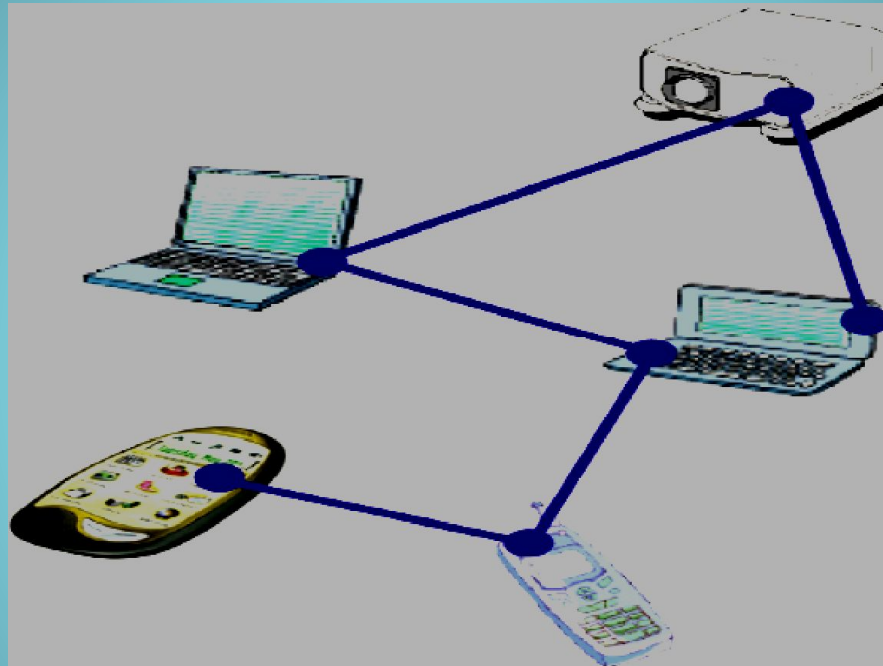
Why Ad-Hoc Networks???

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Generally the networks normally developed are of the type having some fixed infrastructure. If the network is required to be made for some short period of time then we go for AD-HOC NETWORKS

Infrastructure networks pass information through a central information hub which can be a hardware device or software on a computer.

Office networks, for example, generally use a server to which company workstations connect to receive their information

A Simple example for Ad Hoc Network

Nodes or devices can join together to make up a simple ad-hoc network. Every device owes an equal status or designation in the network.

If an organization, for example arranges a conference, then attendees use their laptops or notebook computers to connect to the nearby computers and the Internet through the wireless router.

Internet   Modem   Wireless router   Wireless computer   Wireless computer
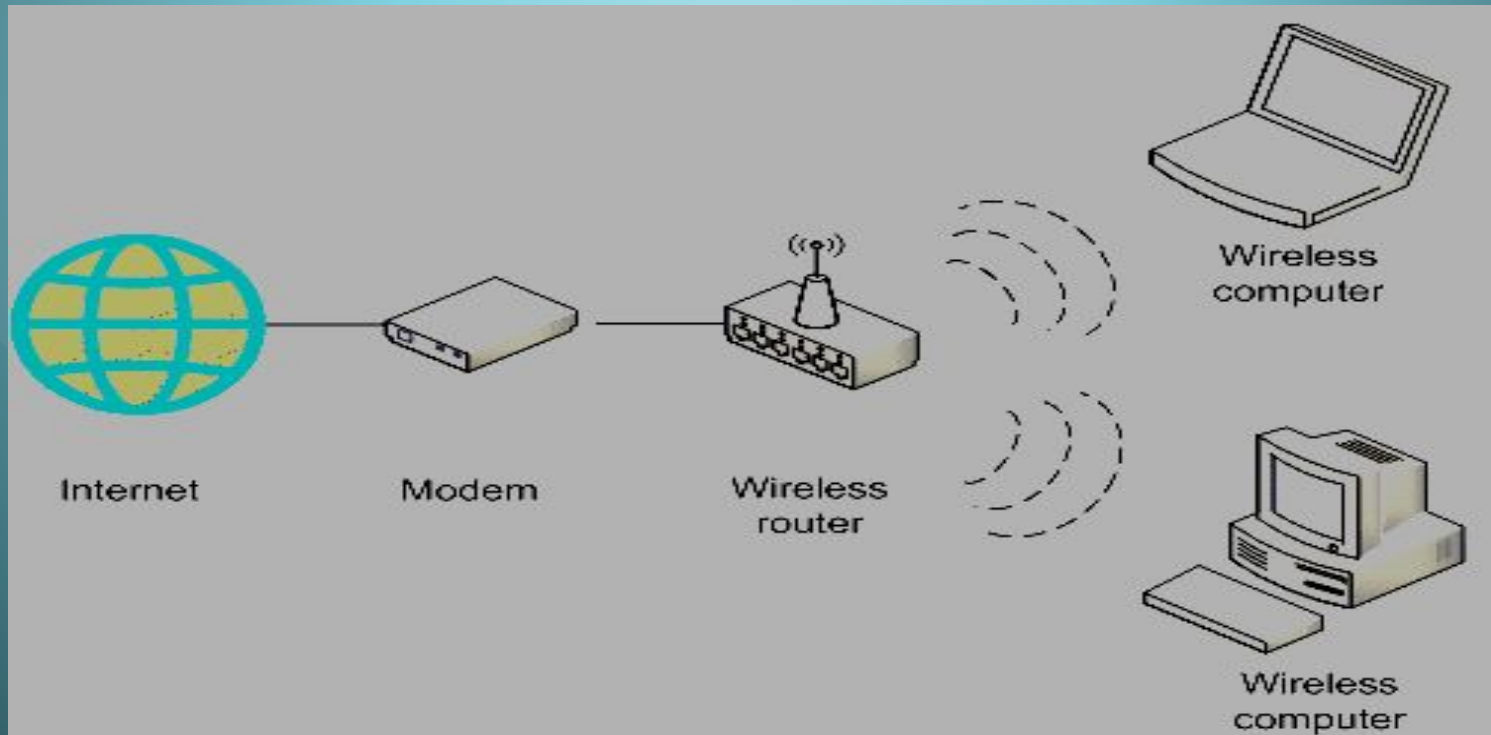
A better solution to this kind of network will be an ad-hoc network in which the wireless router is replaced by a wireless computer that can well act as a wireless router.

The computers communicate directly with each other.
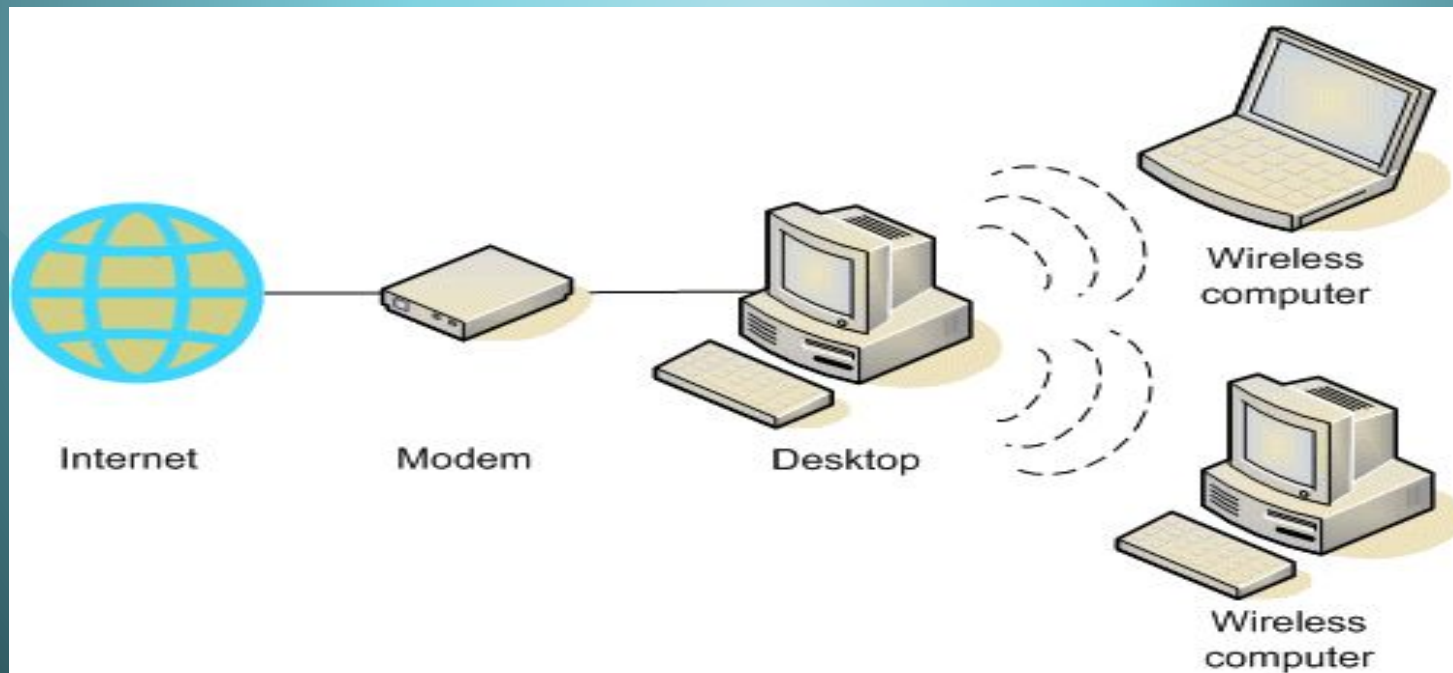
Ad hoc networks do not go through any central information hub.

 Ad hoc networks are generally closed networks, i.e. they do not connect to the Internet and are typically created between participants.

 If one of the participants has a connection to a public or private network, this connection can be shared among other members of the ad hoc network. This will allow other users on the spontaneous ad hoc network to connect to the Internet as well.

On the basis of infrastructure we can classify the Ad-hoc networks into two main categories.
They are :

 Infrastructure-based Networks

 Infrastructure-less Networks

1. **Infrastructure-based networks:**

   - A network with pre-constructed infrastructure that is made of fixed network nodes and gateways, with typically network services delivered via these preconfigured infrastructures.

   - For example, cellular networks are infrastructure-based networks built from PSTN backbone switches, MSCs, base stations, and mobile hosts.

   - Each node has its strict specific responsibility in the network. WLANs typically also fall into this category.

2 . Infrastructure-less Networks

☐ In this case a network is formed dynamically through the cooperation of an arbitrary set of independent nodes.

☐ For example, two PCs equipped with wireless adapter cards can set up an independent network whenever they are within range of one another.

☐ In mobile ad hoc networks, nodes are expected to behave as routers and take part in discovery and maintenance of routes to other nodes.

☐ Network is decentralized where the topology discovering and the message delivering must be executed by the nodes themselves.

Mobile Ad-hoc Networks Routing Protocols

 Ad-hoc Networks require efficient routing protocols because determining successful routing paths and delivering messages in a centralized environment where network topology fluctuates is not a well defined problem.

 An optimal route at a certain time may not work seconds later

Table Driven Routing Protocol

 Send periodic updates of the routes.

 Each node uses routing information to store the location information of other nodes in the network and this information is then used to move data among different nodes in the network.

 Have lower latency since routes are maintained at all times

On Demand Routing Protocols

 Establish routes only when required to route data packets.

 Route discovery process

 Have longer transmission delays.

Hybrid Routing Protocols

 Combine Table Based Routing Protocols with On Demand Routing Protocols.

 They use distance-vectors to establish the optimum routes, and report routing information only when there is a change in the topology of the network.

 Each node in the network has its own routing zone, the size of which is defined by a zone radius, defined by a metric such as the number of nodes.

 Each node keeps a record of routing information for its own zone

Key Benefits of Mobile Ad-hoc Networks

- No expensive infrastructure must be installed

- Use of unlicensed frequency spectrum

- Quick distribution of information around sender

- Use of ad-hoc networks can increase mobility and flexibility, as ad-hoc networks can be brought up and torn down in a very short time.

- Ad-hoc networks can be more economical in some cases, as they eliminate fixed infrastructure costs and reduce power consumption at mobile nodes.

Because of multi-hop support in ad-hoc networks, communication beyond the Line of Sight (LOS) is possible at high frequencies.

 Multi-hop ad-hoc networks can reduce the power consumption of wireless devices. More transmission power is required for sending a signal over any distance in one long hop than in multiple shorter hops. It can easily be proved that the gain in transmission power consumption is proportional to the number of hops made.

Because of short communication links, radio emission levels can be kept low. This reduces interference levels, increases spectrum reuse efficiency, and makes it possible to use unlicensed unregulated frequency bands

DIS-ADVANTAGES

 They are infrastructure less

 Dynamically changing network topologies

 Limited link bandwidth and quality

 Energy constrained operation

 Physical layer limitation

 Quality of service

CONCLUSIONS

Ad hoc networking will play an important role in this evolution. Its intrinsic flexibility, ease of maintenance, lack of needed infrastructure, auto configuration, self-administration capabilities, and significant cost advantages make it a prime candidate for becoming the stalwart technology for personal pervasive communication

THANKS FOR CONCENTRATING

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