INTRODUCTION

1.1 WIRELESS LAN

A wireless LAN (or WLAN, for wireless local area network, sometimes referred to as LAWN, for local area wireless network) is one in which a mobile user can connect to a local area network (LAN) through a wireless (radio) connection. The IEEE802.11 group of standards specify the technologies for wireless LANs. 802.11 standards use the Ethernet protocol and CSMA/CA protocol.

There are three main ways by which WLANs transmit information: microwave, spread spectrum and infrared. WLANs have data transfer speeds ranging from 1 to 54Mbps, with some manufacturers offering proprietary 108Mbps solutions. The 802.11n standard can reach 300 to 600Mbps.

1.1.1 Types of Wireless LAN

There are two types of wireless LAN : "ad-hoc" and "infrastructred" networks.

1.1.1. aAd-hoc Networks

This network can be set up by a number of mobile users meeting in a small room. It doesnot need any support from a wired/wireless backbone. There are two ways to implementthis network.

- **Broadcasting/Flooding**
  Suppose that a mobile user A wants to send data to another user B in the same area. When the packets containing the data are ready, user A broadcasts the packets. On receiving the packets, the receiver checks the identification on the packet. If that receiver was not the correct destination, then it rebroadcasts the packets. Thisprocess is repeated until user B gets the data.
- **Temporary Infrastructure**
  In this method, the mobile users set up a temporary infrastructure. But this methodis complicated and it introduces overheads. It is useful only when there is a small number of mobile users.

  Ad-hoc wireless networks, however, do not need any infrastructure to work. Each node can communicate directly with other nodes, so no access point controlling medium access is necessary. Nodes within an ad-hoc network can only

communicate if they can reach each other physically, i.e., if they are within each other‘s radio range or if other nodes can forward the message.
In ad-hoc networks, the complexity of each node is higher because every node has toimplement medium access mechanisms, mechanisms to handle hidden or exposed terminal problems, and perhaps priority mechanisms, to provide a certain quality of service. This type of wireless network exhibits the greatest possible flexibility as itis, for example, needed for unexpected meetings, quick replacements of infrastructure or communication scenarios far away from any infrastructure.

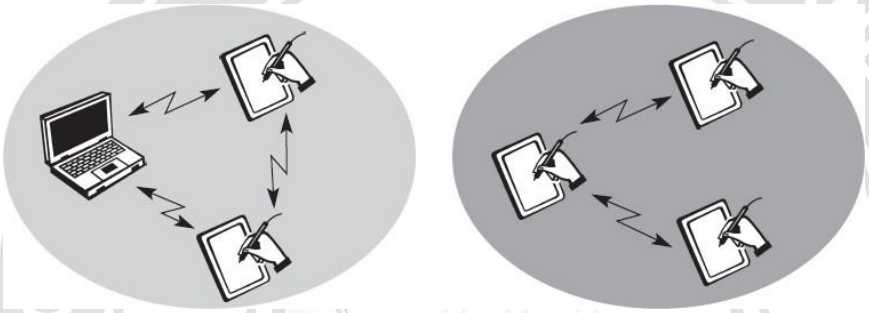

Fig. 1.1 Two adhoc wireless networks

[Source: Text book- Mobile Communications, Second Edition, Pearson Education by Jochen Schiller]

1.1.1.bInfrastructure Networks

The design of infrastructure-based wireless networks is simpler because most of the network functionality lies within the access point, where as the wireless clients can remain quite simple. This structure is reminiscent of switched Ethernet or other star- based networks, where a central element (e.g., aswitch) controls network flow. This type of network can use different access schemes with or without collision.

Collisions may occur if medium access of the wireless nodes and the access point is not coordinated. However, if only the access point controls medium access, no collisions are possible. This setting may be useful for quality of service guarantees such as minimum bandwidth for certain nodes. The access point may poll the single wireless nodes to ensure the data rate.

This type of network allows users to move in a building while they are connected to computer resources. The IEEE Project 802.11 specified the components in a wirelessLAN architecture. In an infrastructure network, a cell is also known as a Basic Service Area (BSA). It contains a number of wireless stations. The size of a BSA depends on the power of the transmitter and receiver units; it also depends on the environment. A number of BSAs are connected to each other and to a distribution system by Access Points (APs). A group of stations belonging to an AP is called a Basic Service Set (BSS).

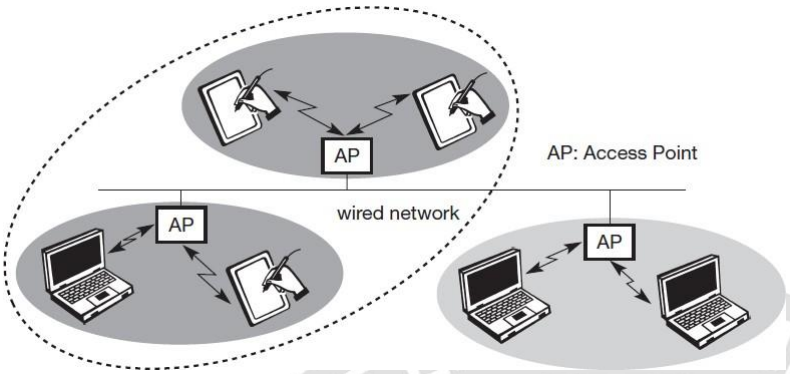

Fig. 1.2 Three infrastructure based wireless networks

[Source: Text book- Mobile Communications, Second Edition, Pearson Education by Jochen Schiller]

1.2 WLAN TECHNOLOGIES

1.2.1 INFRARED (IR)

Infrared is an invisible band of radiation that exists at the lower end of the visible electromagnetic spectrum. This type of transmission is most effective when a clear line-of- sight exists between the transmitter and the receiver.

Two types of infrared WLAN solutions are available: diffused-beam and direct-beam (or line-of-sight). Currently, direct-beam WLANs offer a faster data rate than diffused-beam networks, but is more directional since diffused-beam technology uses reflected rays to transmit/receive a data signal, it achieves lower data rates in the 1-2 Mbps range.

Infrared optical signals are often used in remote control device applications. The users connect to the local wired network via an infrared device for retrieving information or using fax and print functions on a server. A group of users may also set up a peer-to peer infrared network while on location to share printer, fax, or other server facilities within their own LAN environment. When used indoors, it can be limited by solid objects such asdoors, walls, merchandise, or racking. In addition, the lighting environment can affect signal quality.

For example, loss of communications may occur because of the large amount of sunlightor background light in an environment. Fluorescent lights also may contain large amounts of infrared. This problem maybe solved by using high signal power and an optical bandwidth filter, which reduces the infrared signals coming from outside sources

Advantages

- No government regulations controlling use
- Immunity to electromagnetic and RF interference

Dis – Advantages

- A short range technology (30 to 50 ft. radius)
- Signals cannot penetrate solid objects
- Signal affected by light, fog, snow, etc.
- Dirt can interfere with infrared

1.2.2 UHF (Narrowband)

UHF wireless data communication systems normally transmit in the 430 to 470 MHz frequency range, with rare systems using segments of the 800 MHz range. The lower portion of this band 430-450 MHz is often referenced as unprotected(unlicensed) and 450-470 MHz is referred to as the protected (licensed) band.

In the unprotected band, RF licenses are not granted for specific frequencies and anyone isallowed to use any frequency in the band. In the protected band, RF licenses are granted for specific frequencies, giving customers some assurance that they will have complete use of that frequency.

Other terms for UHF include narrowband and 400 MHz RF. Because independent narrowband RF systems cannot coexist on the same frequency, government agencies allocate specific radio frequencies to users through RF site licenses. A limited amount of unlicensed spectrum is also available in some countries. In order to have many frequenciesthat can be allocated to users, the bandwidth given to a specific user is very small.

The term –narrowband is used to describe this technology because the RF signal is sent in a very narrow bandwidth, typically 12.5 kHz or 25 kHz. Power levels range from 1 to 2 watts for narrowband RF data systems. This narrow bandwidth combined with high powerresults in large transmission distances than are available from 900 MHz or 2.4 GHz spread spectrum systems, which have lower power levels and wider bandwidths.