

Wireless LANs

Unit-II

Session Objectives

Wireless LANs

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Introduction

Characteristics

Access Control

IEEE 802.11

MAC Sublayer

- Introducing the general issues behind wireless LANs
- Discussing a wireless LAN defined by the IEEE 802.11
- Discussing the Bluetooth technology

Agenda

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- The demand for connecting devices without the use of cables is increasing everywhere.
- The medium is air, the signal is generally broadcast.
- A host is not physically connected to the network
- A wireless isolated LAN, called an ad hoc network in wireless LAN terminology, is a set of hosts that communicate freely with each other
- Wireless LAN may be connected to a wired infrastructure network, to a wireless infrastructure network, or to another wireless LAN

Connection to Other Networks

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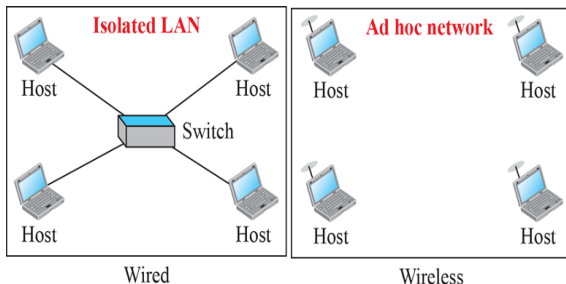


Figure: wired versus wireless

Connection to Other Networks

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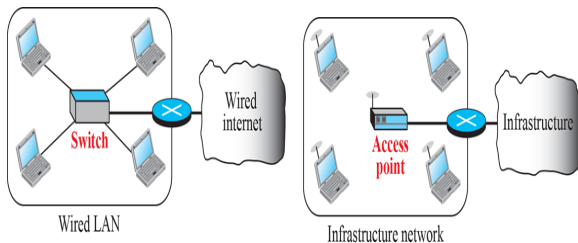


Figure: Connection of a wired LAN and a wireless LAN to other networks

Access point

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- The connection to the wired infrastructure, such as the Internet, is done via a device called an **access point (AP)**
- An access point is gluing two different environments together: one wired and one wireless.
- Communication between the AP and the wireless host occurs in a wireless environment;
- Communication between the AP and the infrastructure occurs in a wired environment

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- **Attenuation:** The strength of electromagnetic signals decreases rapidly because the signal disperses in all directions; only a small portion of it reaches the receiver.
- **Interference:** a receiver may receive signals not only from the intended sender, but also from other senders if they are using the same frequency band.
- **Multipath Propagation:** A receiver may receive more than one signal from the same sender because electromagnetic waves can be reflected back from obstacles such as walls, the ground, or objects. The result is that the receiver receives some signals at different phases - the signal less recognizable.

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- CSMA/CD algorithm does not work in wireless LANs
- To detect a collision, a host needs to send and receive at the same time
- Wireless hosts do not have enough power to do so
- A station may not be aware of another station's transmission due to some obstacles or range problems, collision may occur but not be detected.
- The distance between stations can be great

Hidden station problem

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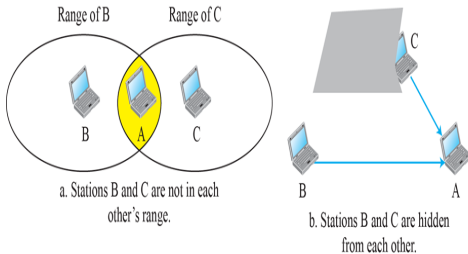


Figure: Hidden station problem

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IEEE 802.11 /Wireless Ethernet

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Architecture:

Two kinds of services: the basic service set (BSS) and the extended service set (ESS).

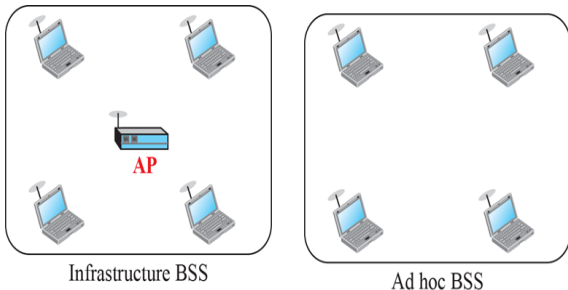


Figure: Basic service sets (BSSs)

Basic service set (BSS)

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- Are the building blocks of a wireless LAN.
- Made of stationary or mobile wireless stations and an optional central base station, known as the access point (AP).
- The BSS without an AP is a stand-alone network and cannot send data to other BSSs - called an **ad hoc architecture**.
- In ad hoc architecture, stations can form a network without the need of an AP;
- They can locate one another and agree to be part of a BSS.
- A BSS with an AP is sometimes referred to as an infrastructure BSS.

Extended Service Set(ESS)

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- ESS is made up of two or more BSSs with APs
- The BSSs are connected through a distribution system, which is a wired or a wireless network.
- The distribution system connects the APs in the BSSs.
- ESS uses two types of stations: mobile and stationary.
- The mobile stations are normal stations inside a BSS.
- The stationary stations are AP stations that are part of a wired LAN

ESS

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- When BSSs are connected, the stations within reach of one another can communicate without the use of an AP.
- Communication between a station in a BSS and the outside BSS occurs via the AP

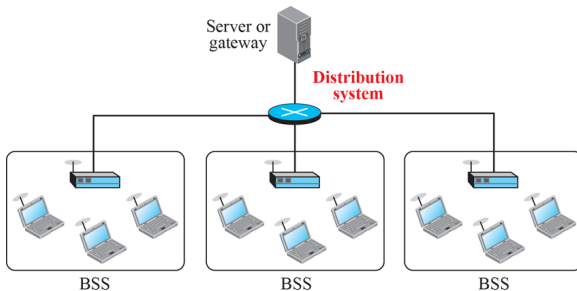


Figure: Extended service set (ESS)

Station Types

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- IEEE 802.11 defines three types of stations based on their mobility in a wireless LAN: **no-transition**, **BSS-transition**, and **ESS-transition mobility**.
- A station with no-transition mobility is either stationary (not moving) or moving only inside a BSS.
- A station with BSS-transition mobility can move from one BSS to another, but the movement is confined inside one ESS.
- A station with ESS-transition mobility can move from one ESS to another.

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- IEEE 802.11 defines two MAC sublayers: the distributed coordination function (DCF) and point coordination function (PCF).

Summary

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- Studied the characteristics of WLANs
- Learnt about CSMA-CD Access Control
- Architecture of IEEE802.11

Test Your understanding

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- WLANs use high power levels and generally require a license for spectrum use.
 - a) True
 - b) **False**
- Which of the following specifies a set of media access control (MAC) and physical layer specifications for implementing WLANs?
 - a) IEEE 802.16
 - b) IEEE 802.3
 - c) **IEEE 802.11**
 - d) IEEE 802.15