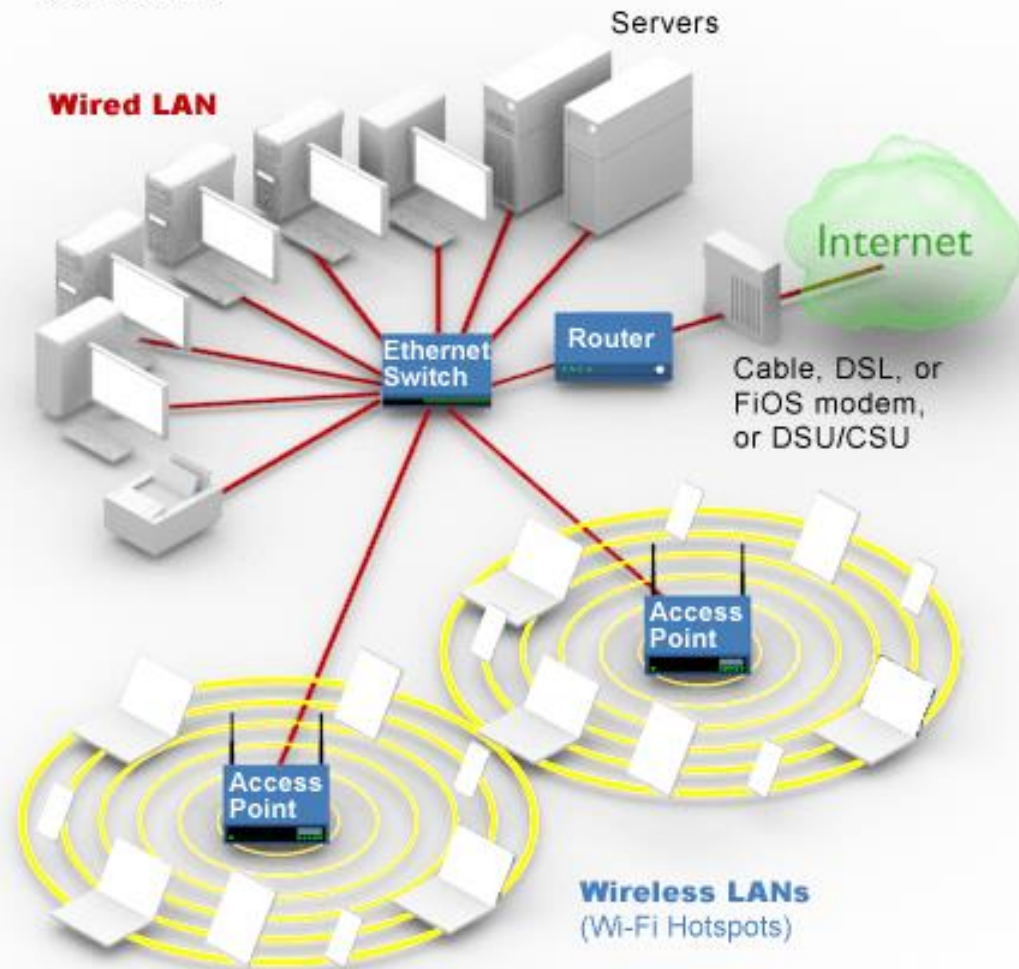# Chapter 15
Wireless LANs

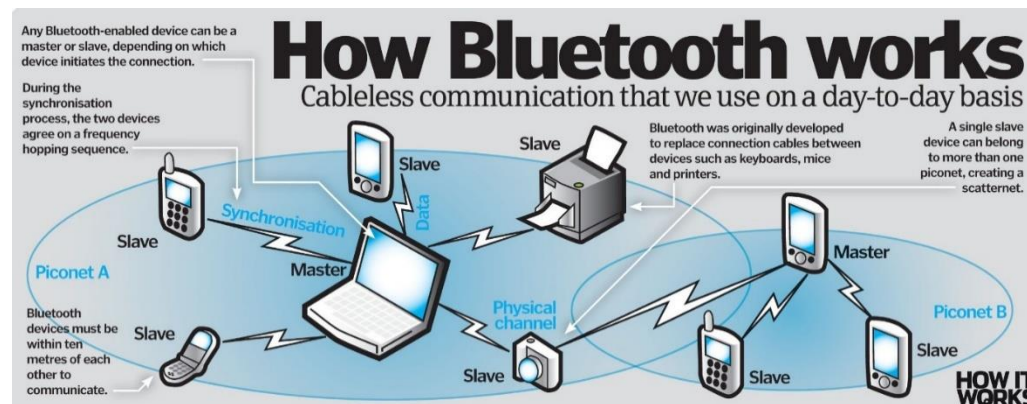**Business Network**
A company local area network (LAN) comprises at the very least a **switch**, **router, access point** and **modem**.

Servers

Wired LAN

Internet

Ethernet Switch

Router

Cable, DSL, or FiOS modem, or DSU/CSU

Access Point

Access Point

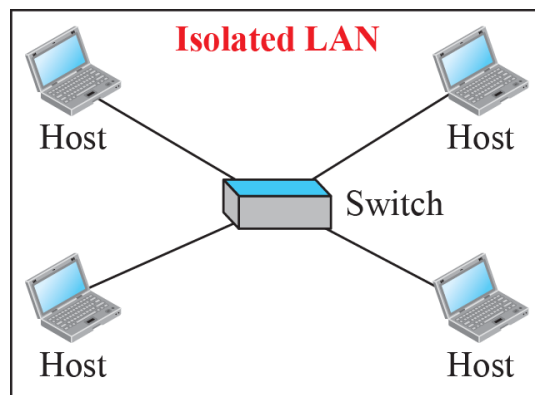**Wireless LANs**
(Wi-Fi Hotspots)

Objective

- Compares wired and wireless networks, and describes the characteristics of the wireless networks.

- IEEE 802.11 Project.

- Bluetooth technology as a personal area network (PAN).

How Bluetooth works
Cableless communication that we use on a day-to-day basis

Any Bluetooth-enabled device can be a master or slave, depending on which device initiates the connection.

During the synchronisation process, the two devices agree on a frequency hopping sequence.

Bluetooth devices must be within ten metres of each other to communicate.

Bluetooth was originally developed to replace connection cables between devices such as keyboards, mice and printers.

A single slave device can belong to more than one piconet, creating a scatternet.

Piconet A

Piconet B

Synchronisation

Data

Physical channel

Master

Slave

Master

Slave

HOW IT WORKS

Introduction

- Wireless communication is one of the fastest-growing technologies. The demand for connecting devices without the use of cables is increasing everywhere. Wireless LANs can be found on college campuses, in office buildings, and in many public areas.
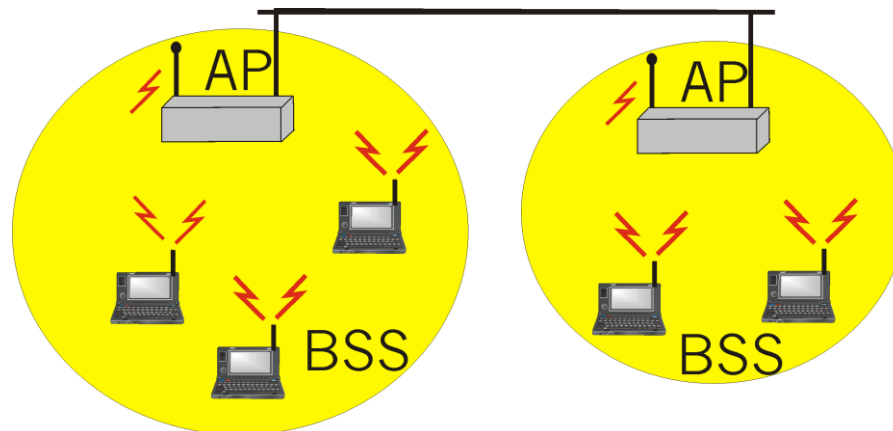

Isolated LAN

Host   Host

Switch

Host   Host

Wired

Ad hoc network

Host   Host

Host   Host
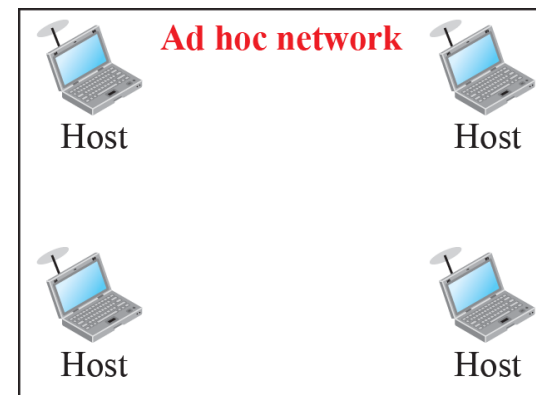
Wireless

*Isolated LANs: wired versus wireless*

Characteristics

- There are several characteristics of wireless LANs that either do not apply to wired LANs.

- We discuss some of these characteristics here to pave the way for discussing wireless LAN protocols.

Access Control

- Maybe the most important issue in a wireless LAN is access control - how a wireless host can get access to the shared medium (air). The CSMA/CD algorithm does not work in wireless LANs for three reasons:

  1. *Wireless hosts do not have enough power to send and receive at the same time.*
  2. *The hidden station problem prevents collision detection*
  3. *The distance between stations can be great.*
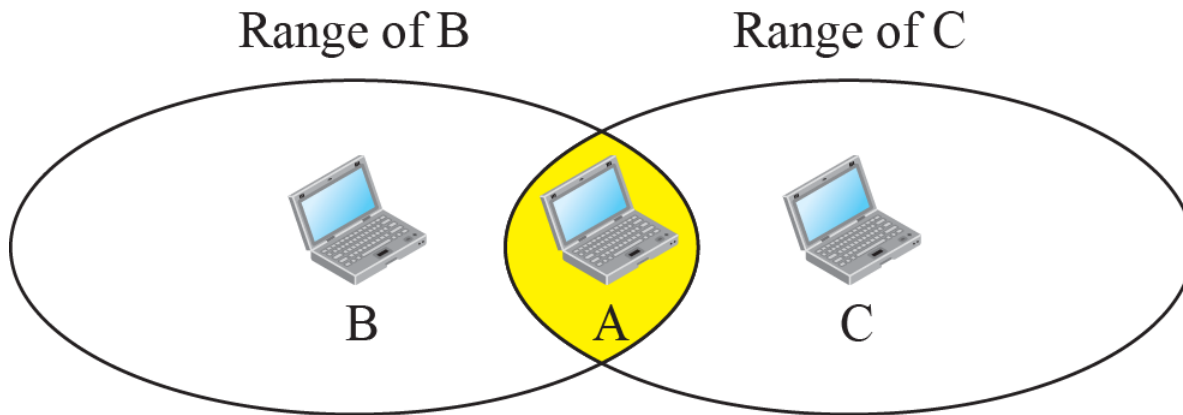
a. Stations B and C are not in each other's range.
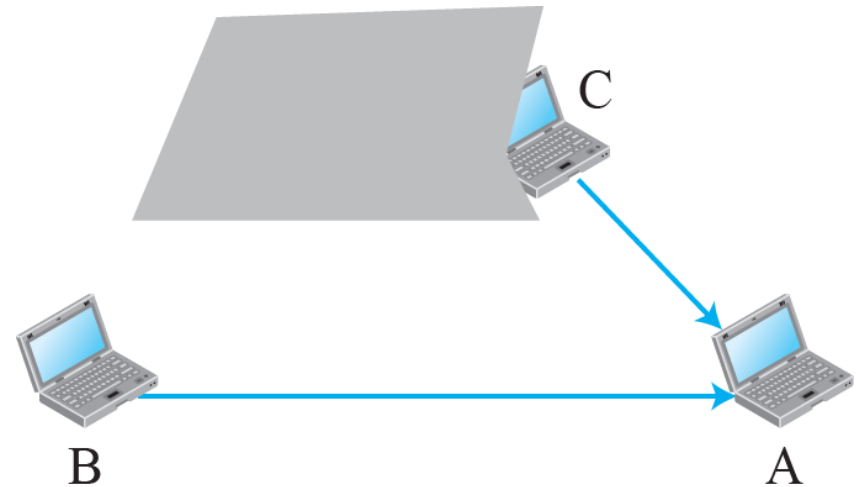
b. Stations B and C are hidden from each other.

Hidden station problem

IEEE 802.11 Project

- IEEE has defined the specifications for a wireless LAN, called IEEE 802.11, which covers the physical and data-link layers. It is sometimes called wireless Ethernet.

- In some countries, including the United States, the public uses the term WiFi (short for wireless fidelity) as a synonym for wireless LAN.

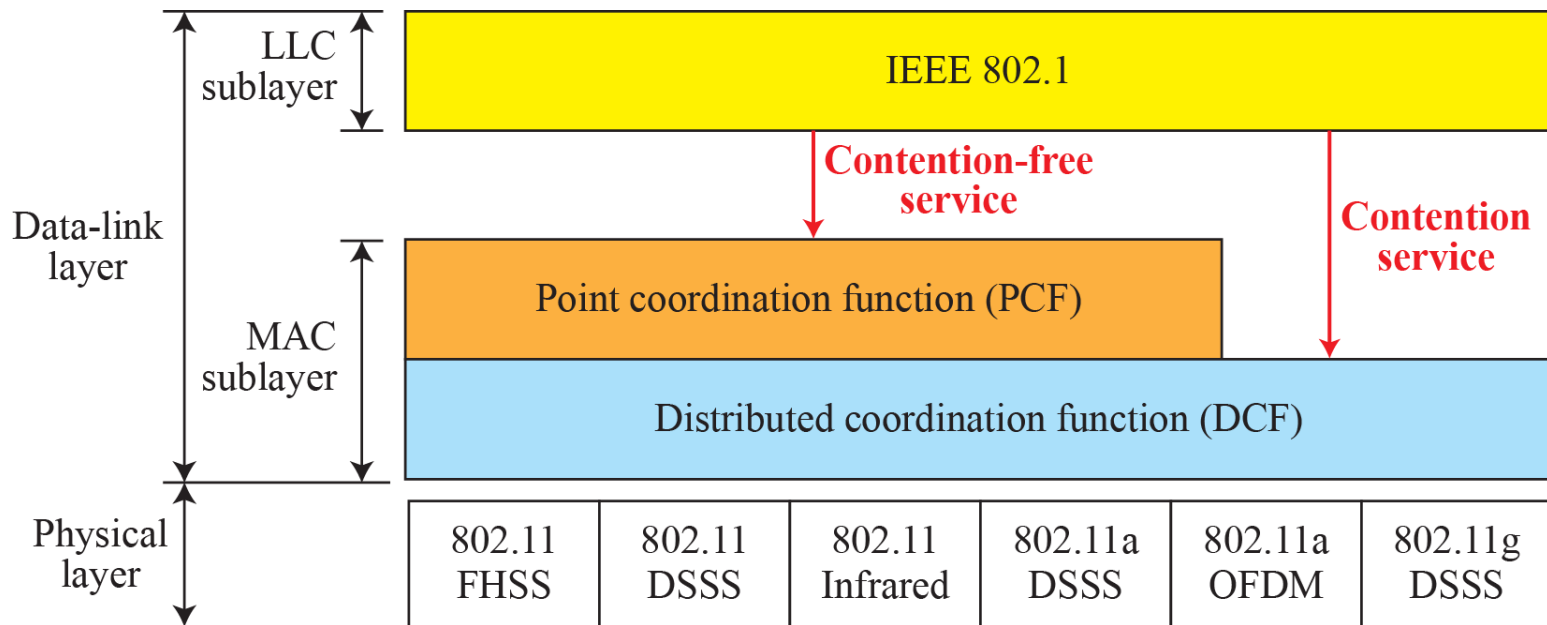- WiFi, however, is a wireless LAN that is certified by the WiFi Alliance.

Architecture

- The standard defines two kinds of services: the basic service set (BSS) and the extended service set (ESS).

Server or gateway

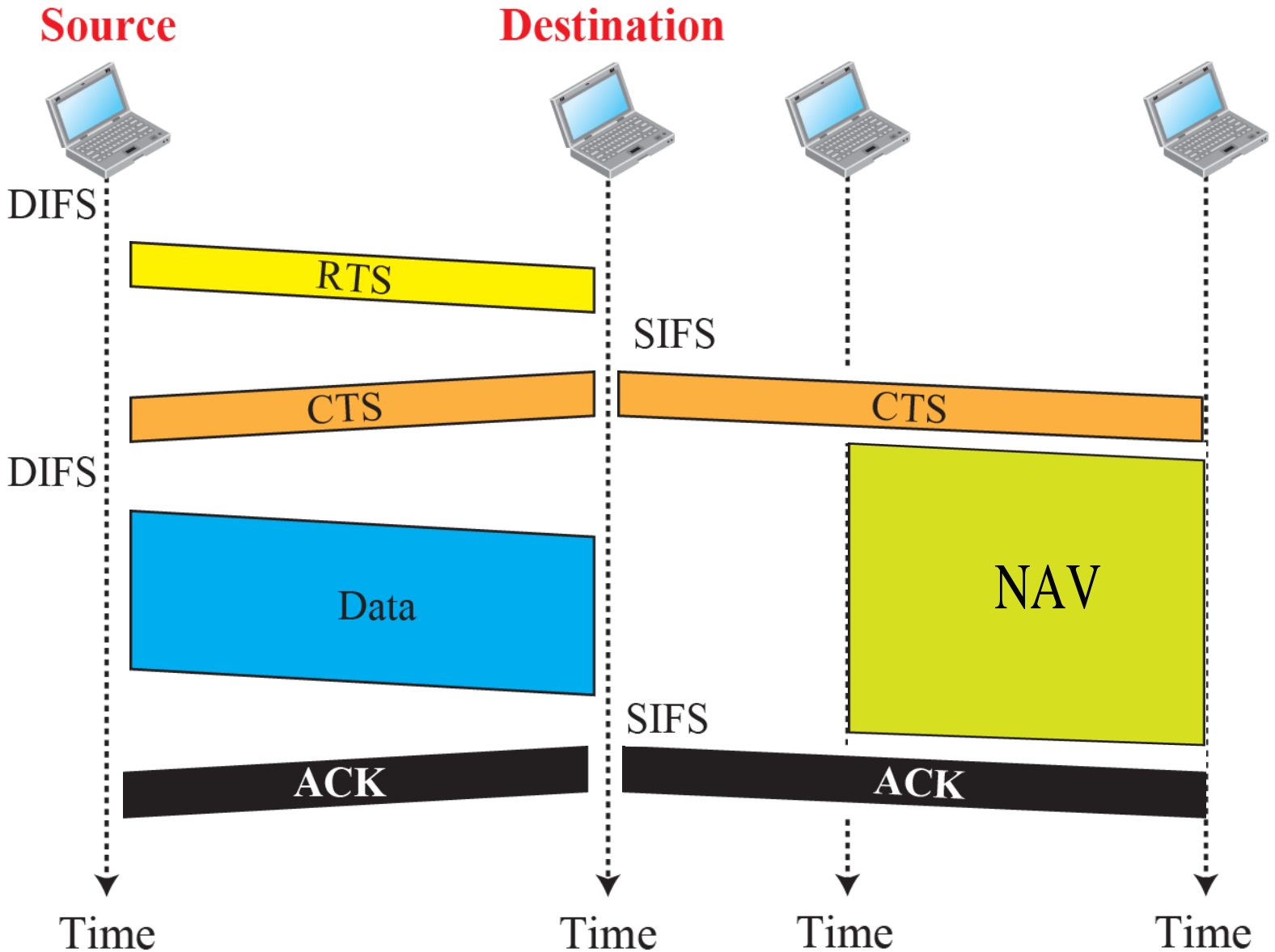**Distribution system**
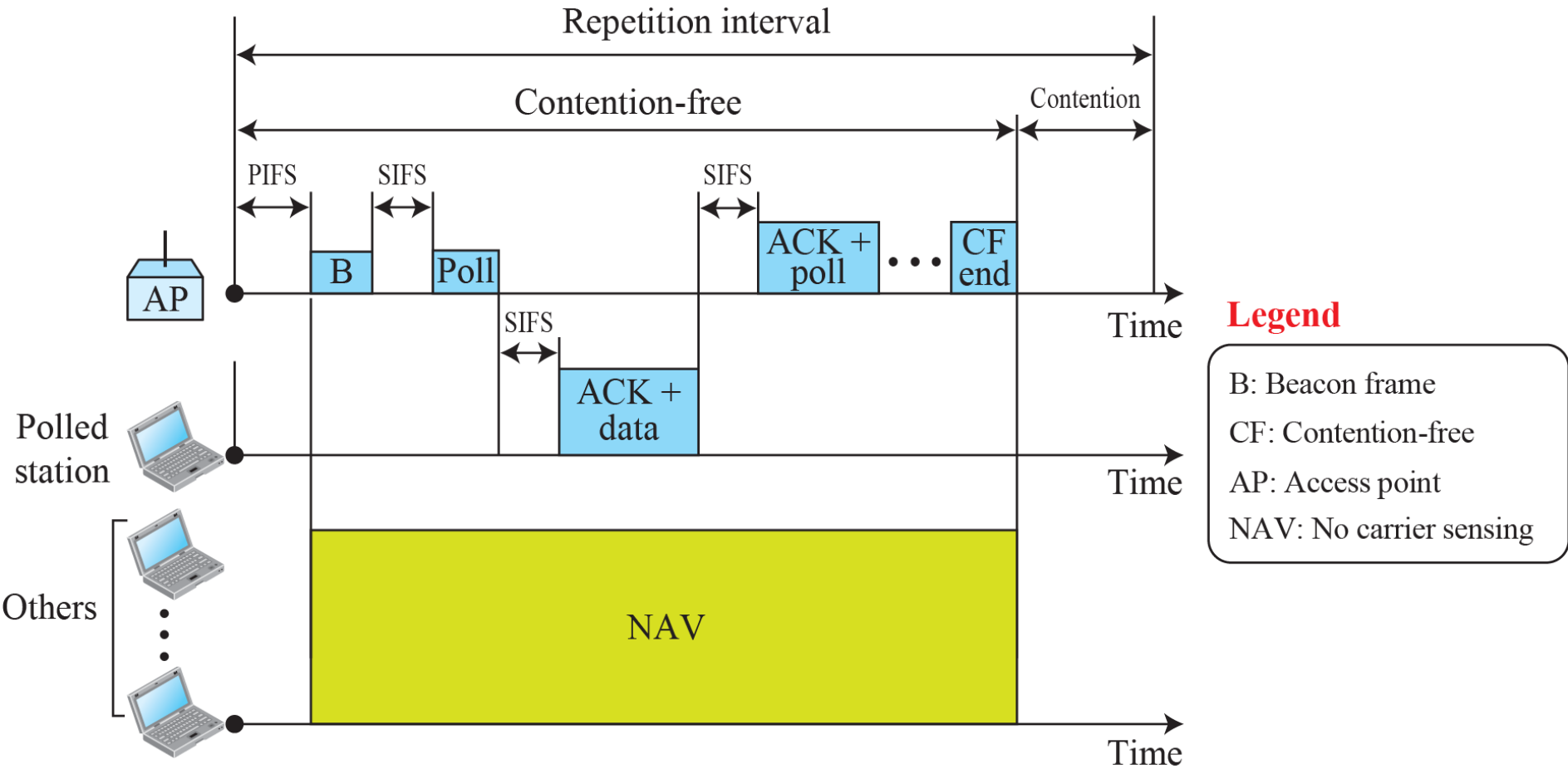
BSS   BSS   BSS
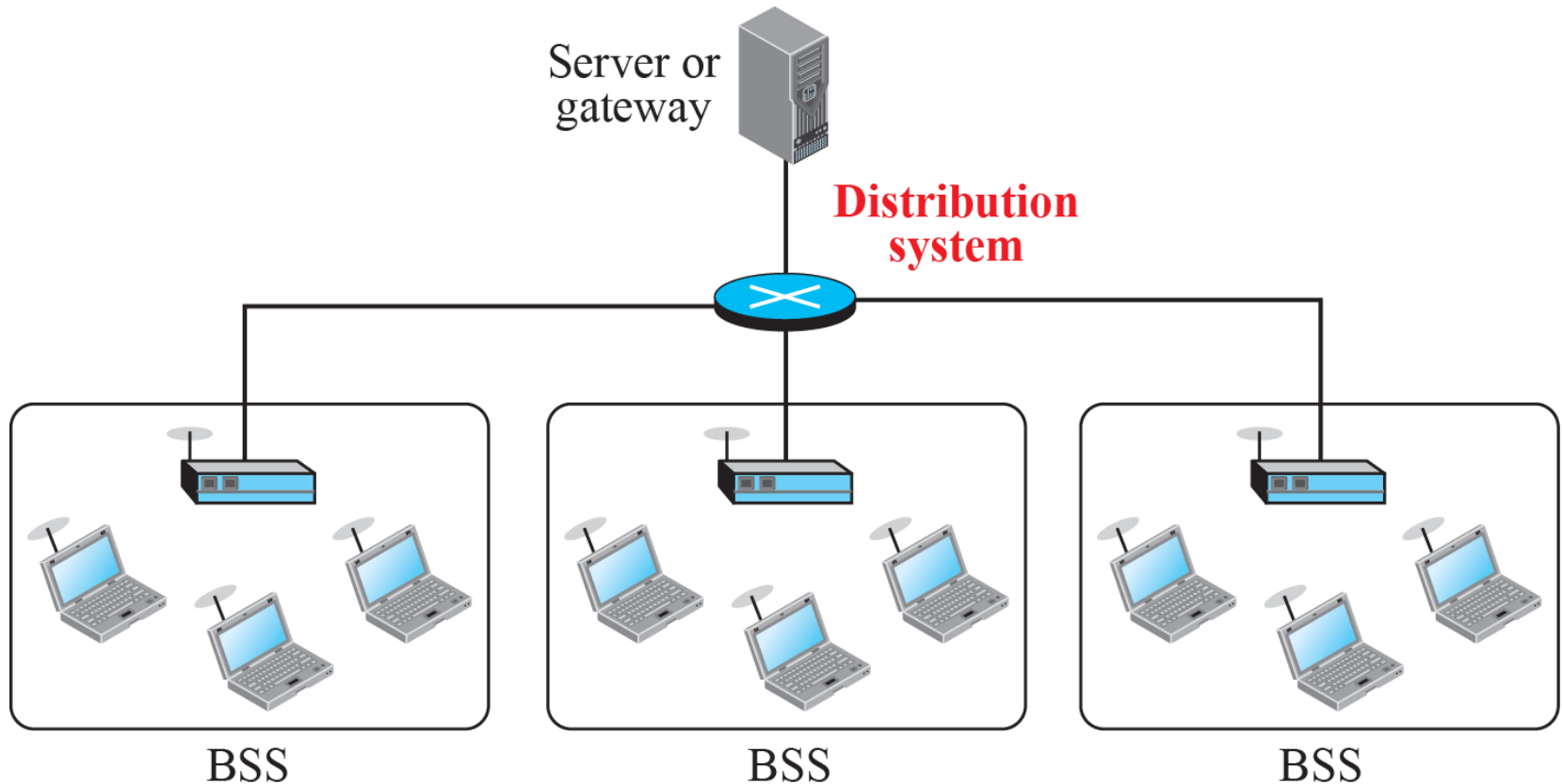
MAC Sublayer

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



MAC layers in IEEE 802.11 standard

Source **Destination**

DIFS

RTS

SIFS

CTS CTS

DIFS

Data NAV

SIFS

ACK ACK

Time Time Time Time

CSMA/CA and NAV
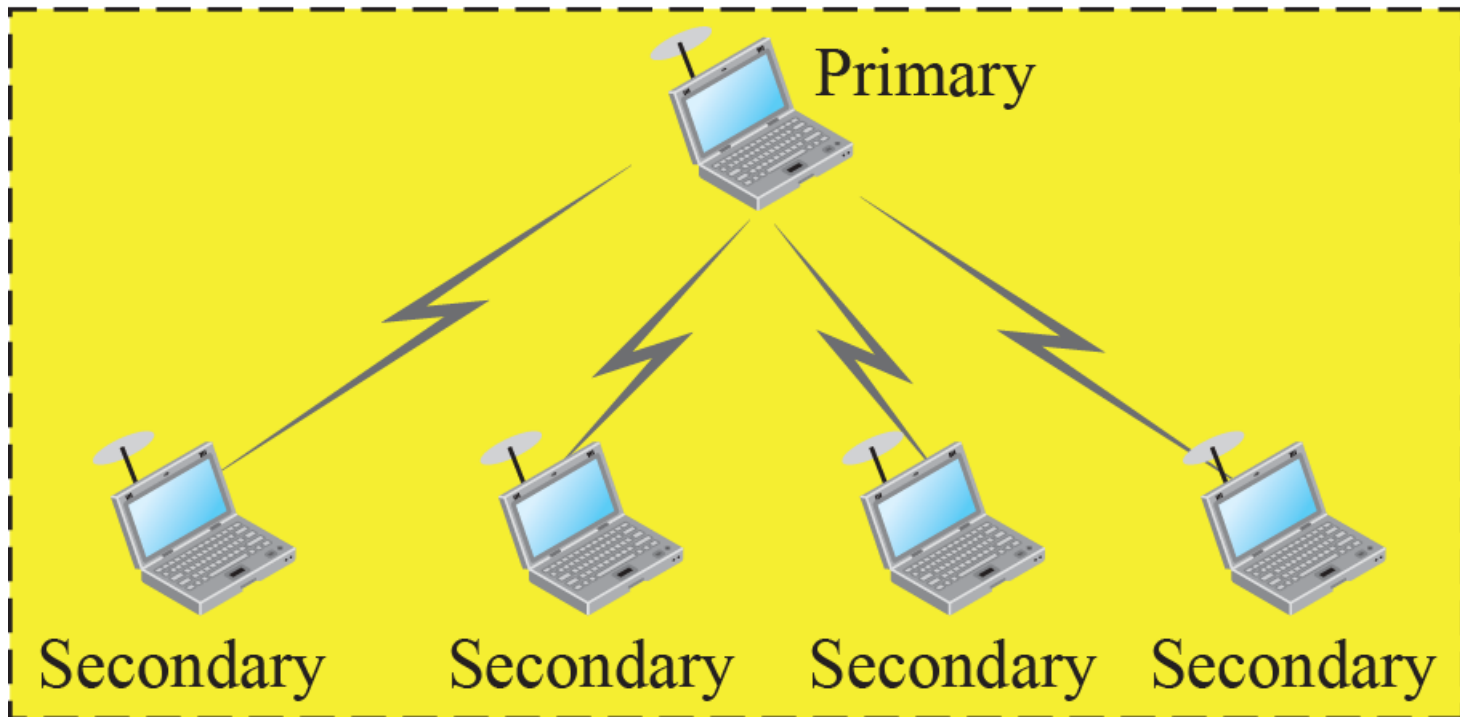
Example of repetition interval

15.11

Bluetooth

- Bluetooth is a wireless LAN technology designed to connect devices of different functions when they are at a short distance from each other.

- A Bluetooth LAN is an ad hoc network. The devices, sometimes called gadgets, find each other and make a network called a piconet.
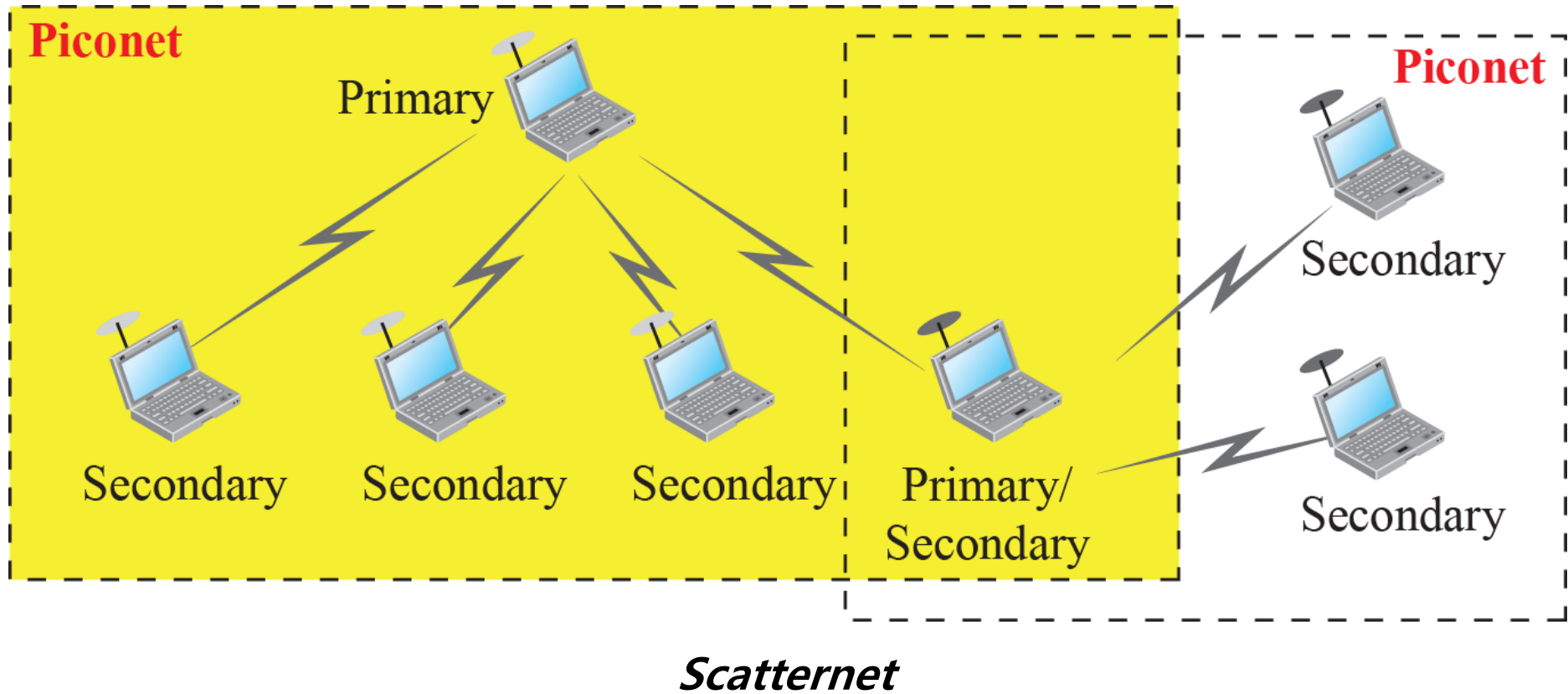
$$H \; (\ast) \; + \; B \; (\beta) \; = \; \text{\textcircled{\ast}}$$
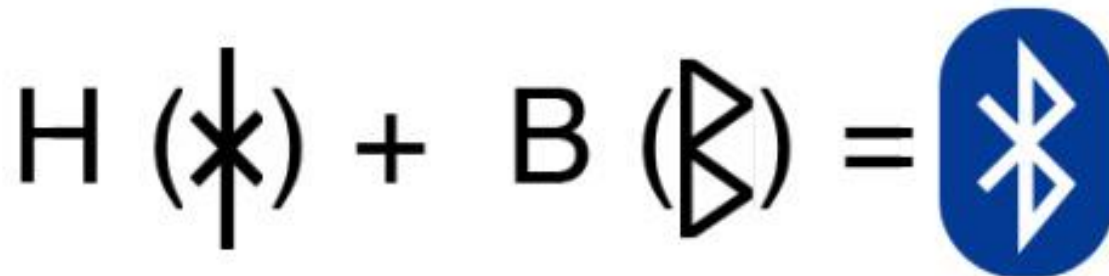
Architecture

- Bluetooth defines two types of networks: piconet and scatternet.

Piconet

Piconet

Primary

Secondary   Secondary   Secondary   Primary/
                                        Secondary
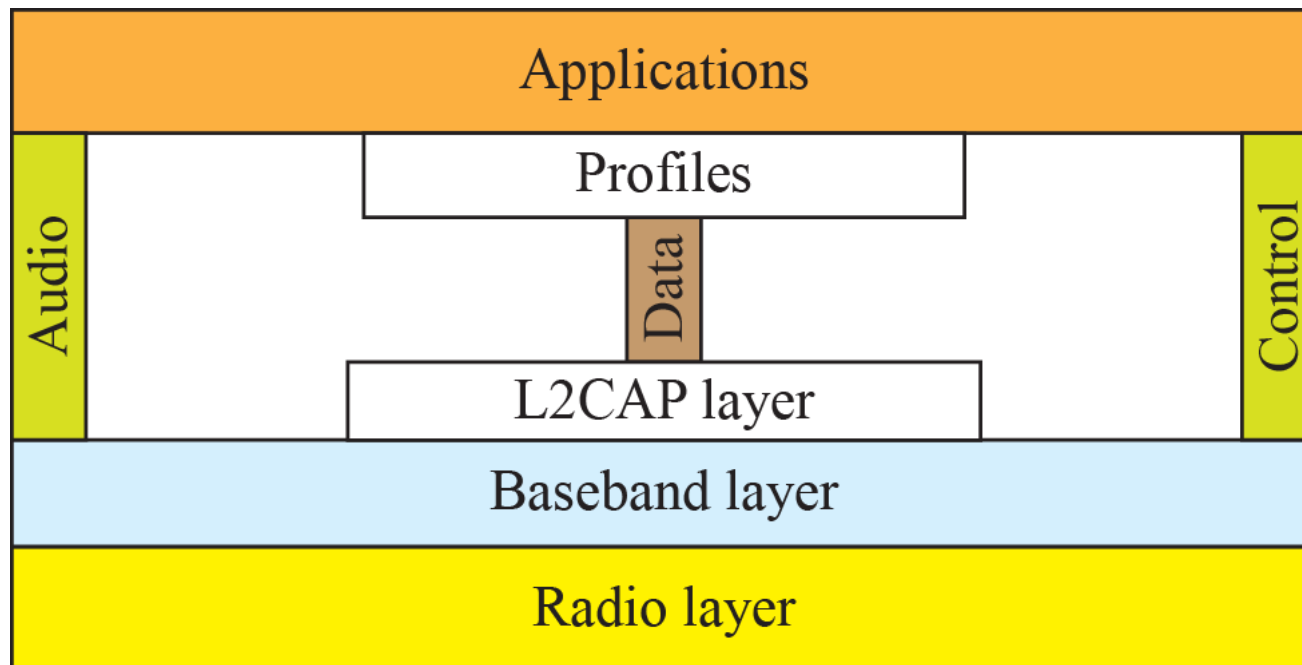
Piconet

Secondary

Secondary

Scatternet

15.14

Bluetooth Layers

- Bluetooth uses several layers that do not exactly match those of the Internet model.

Bluetooth layers