Chapter 14

Wireless LANs

14-1 IEEE 802.11

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

Topics discussed in this section:

Architecture
MAC Sublayer
Physical Layer

Note

A BSS without an AP is called an ad hoc network; a BSS with an AP is called an infrastructure network.

Figure 14.1 *Basic service sets (BSSs)*

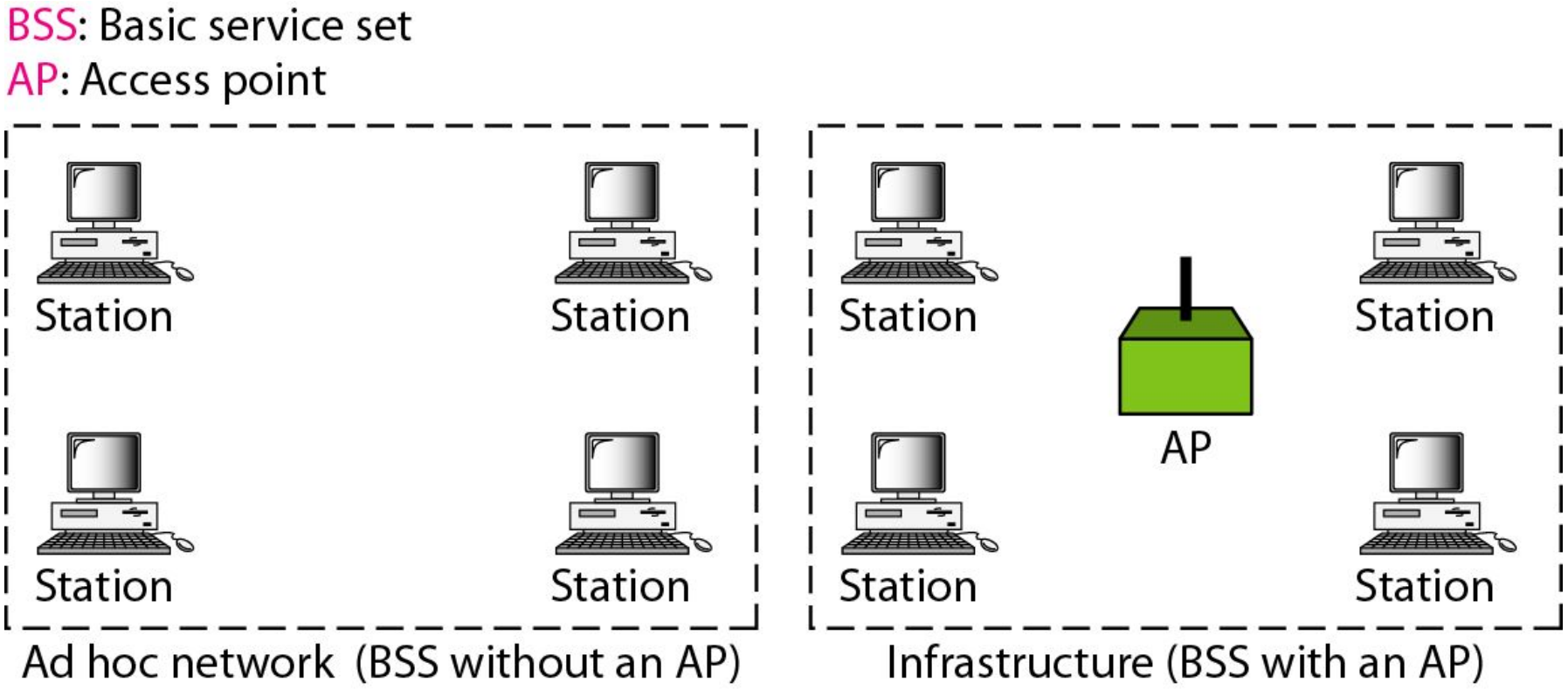


Figure 14.2 *Extended service sets (ESSs)*

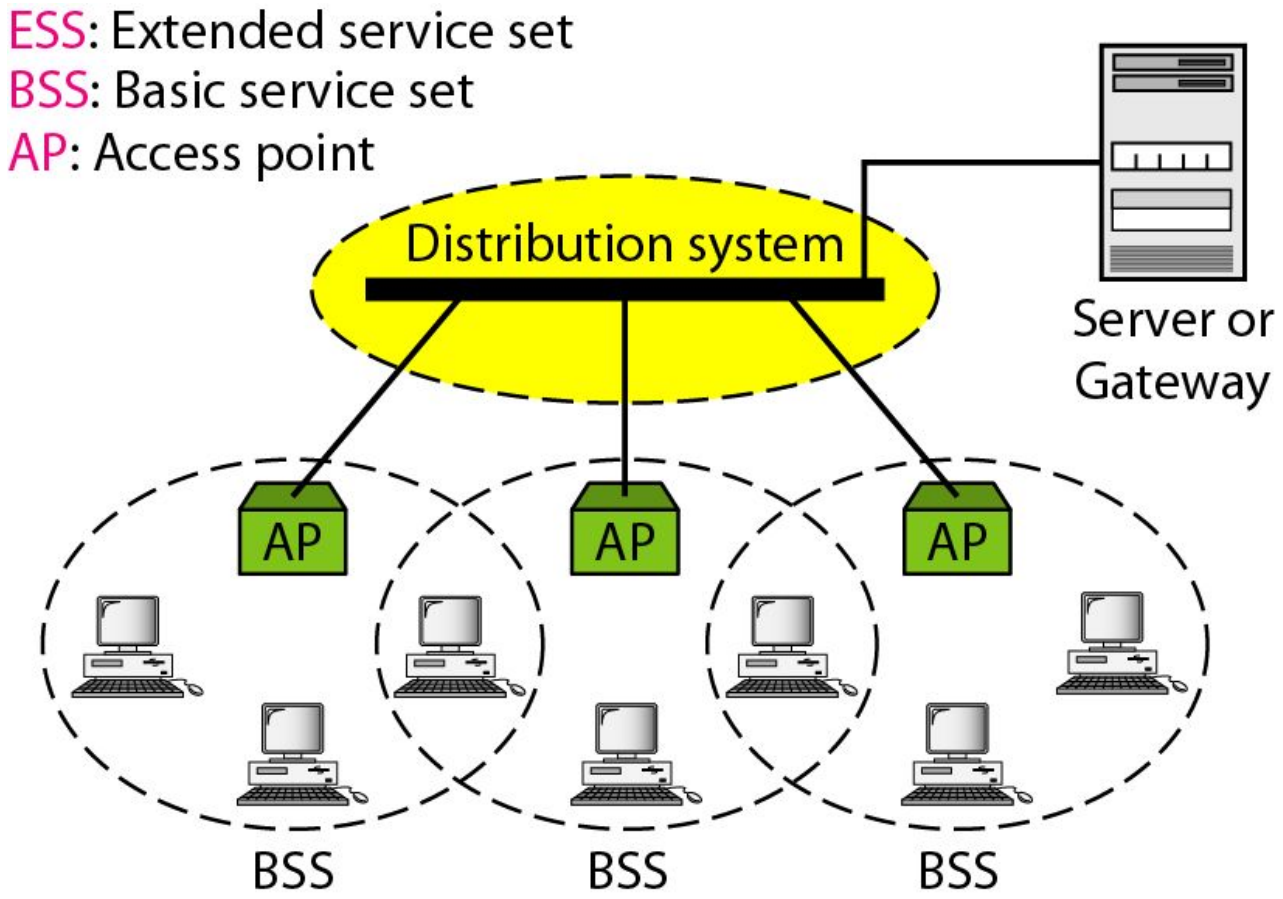
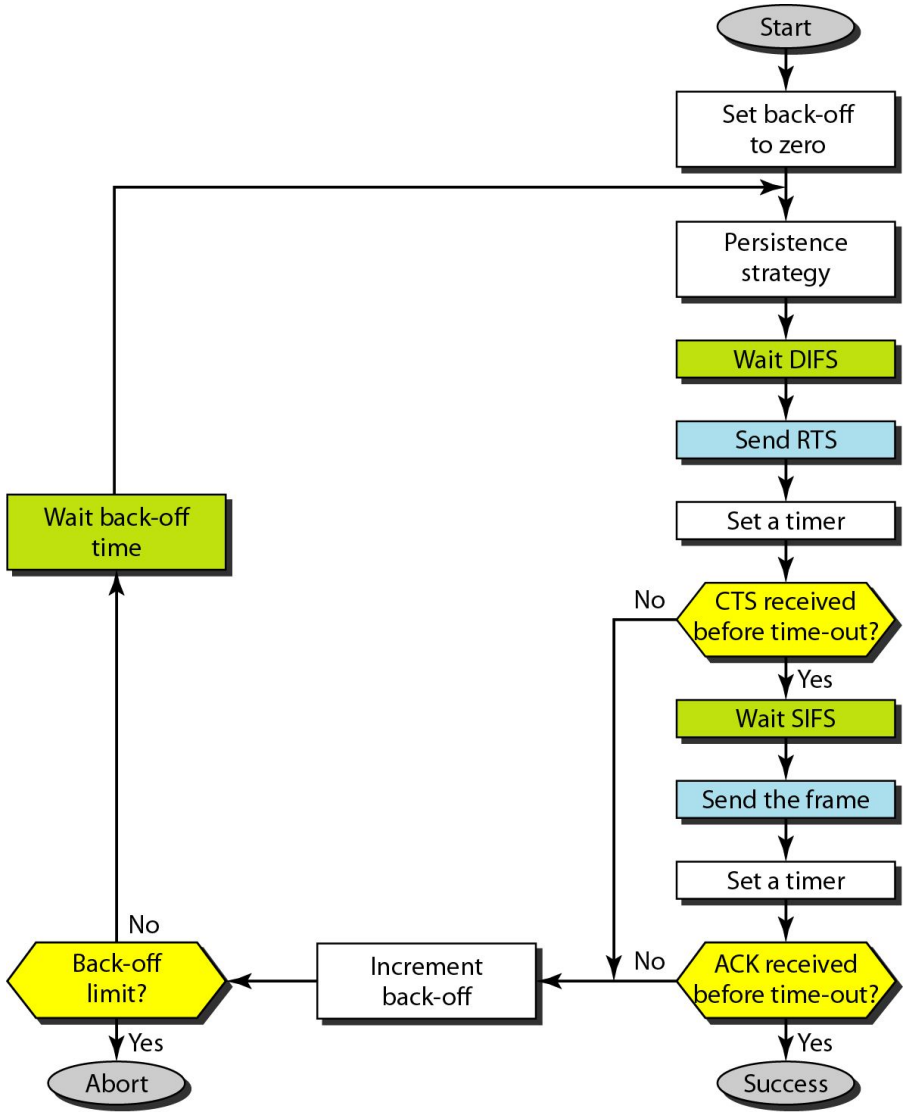


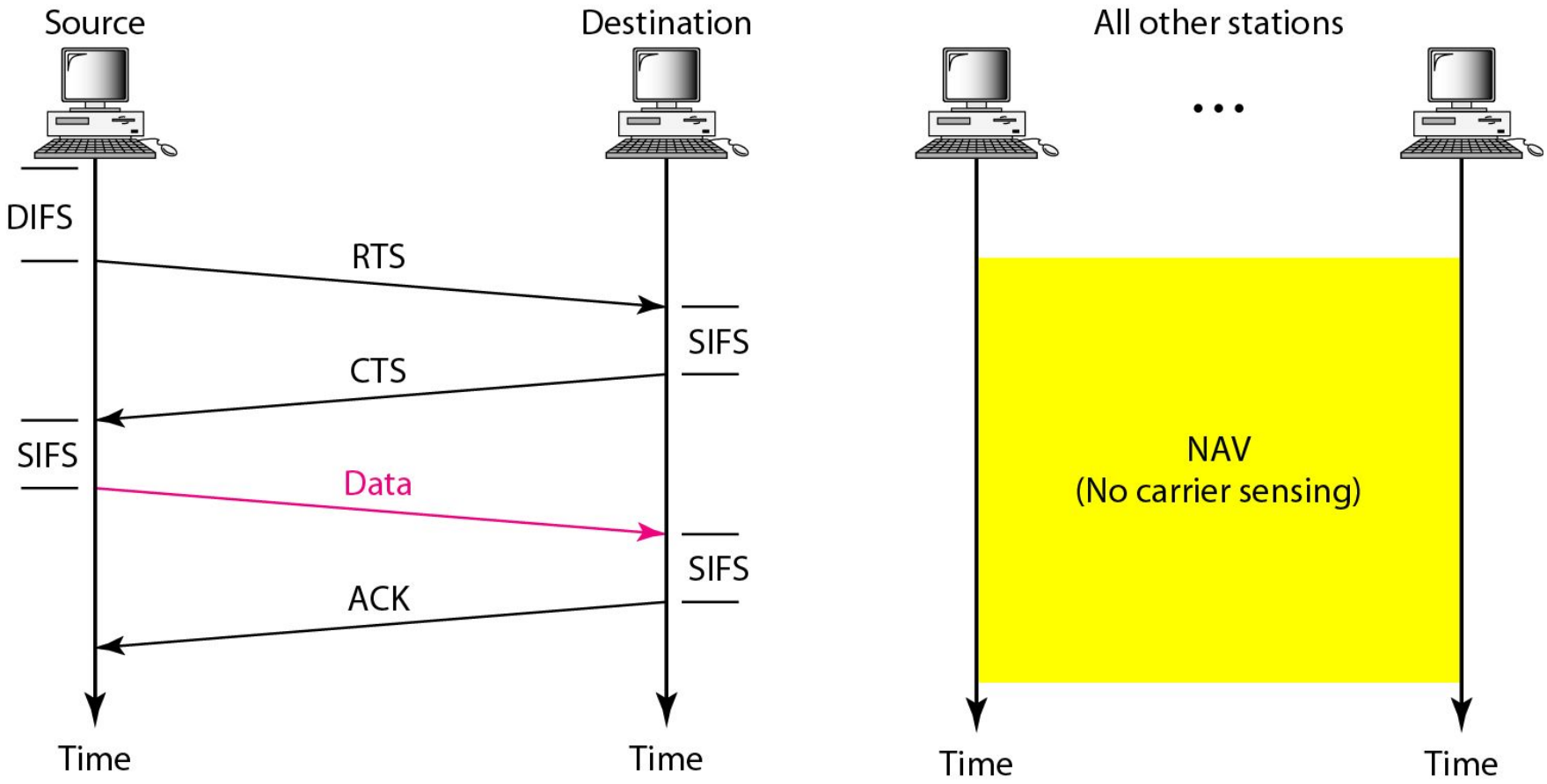
Figure 14.4 *CSMA/CA flowchart*



DIFS: distributed interframe space

SIFS: short interframe space

Figure 14.5 *CSMA/CA and NAV (Network Allocation Vector)*



When a station sends its RTS, it includes a time of how long it needs the medium. Other stations then set their NAV timer to this time so they don't transmit. DIFS: Distributed interframe space; SIFS: short interframe space

Frame Types

Three types of frames:

1. Management - used for initial communication between stations and access points

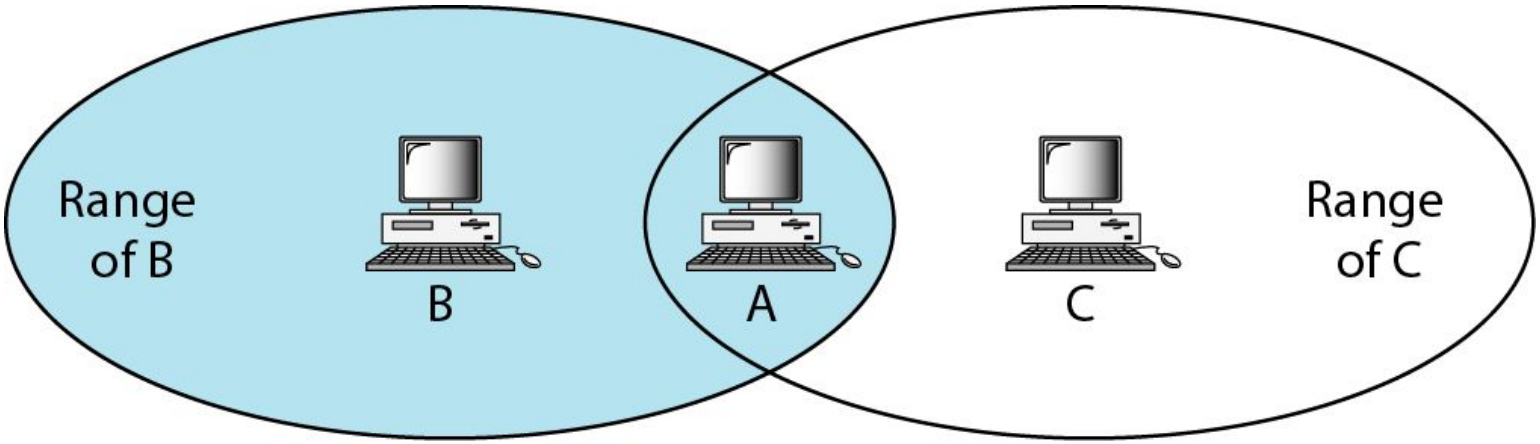
2. Control - used for accessing the channel (RTS) and acknowledging frames (CTS or ACK) (See Figure 15-10).

3. Data - used for carrying data and control information

Table 14.2 ***Values of subfields in control frames***

Subtype	*Meaning*
1011	Request to send (RTS)
1100	Clear to send (CTS)
1101	Acknowledgment (ACK)

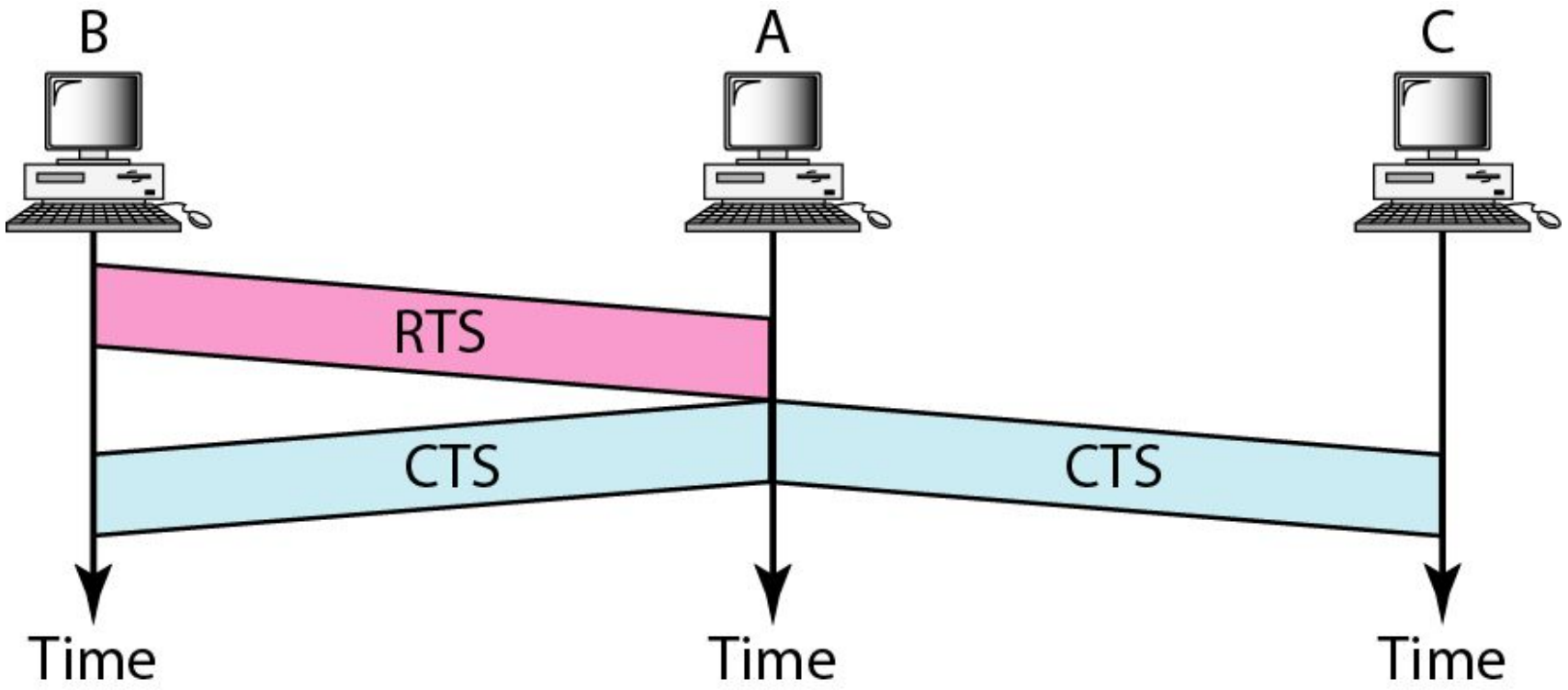
Figure 14.10 *Hidden station problem*



Note

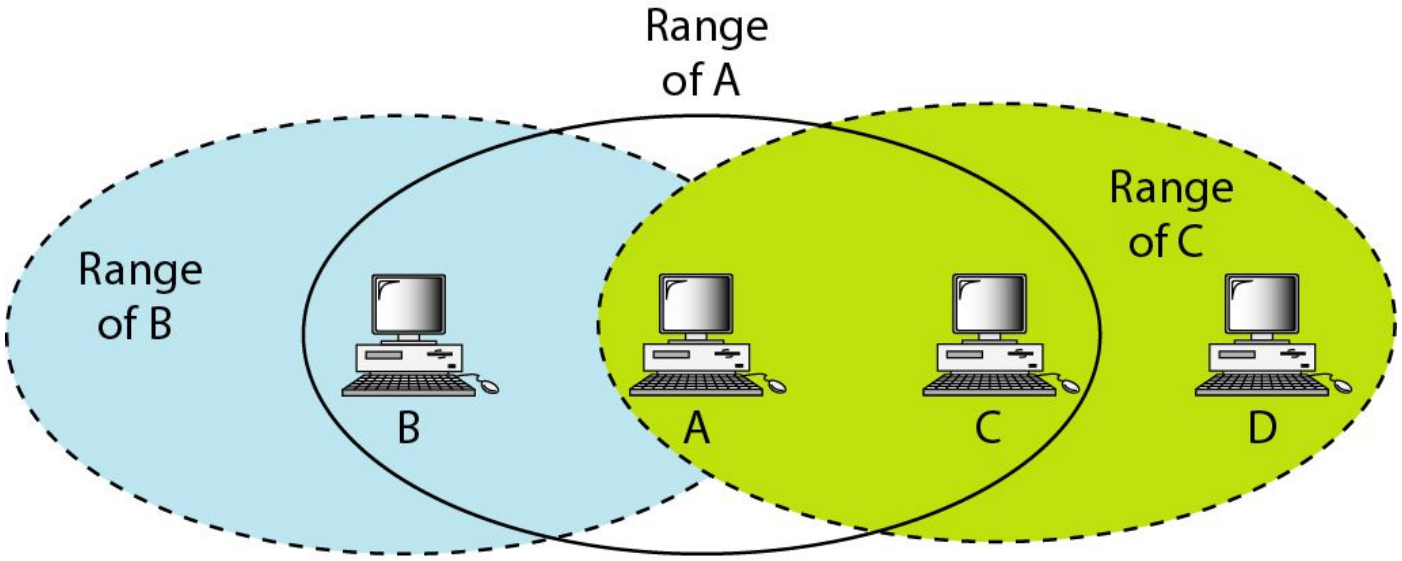
The CTS frame in CSMA/CA handshake can prevent collision from a hidden station.

Figure 14.11 *Use of handshaking to prevent hidden station problem*



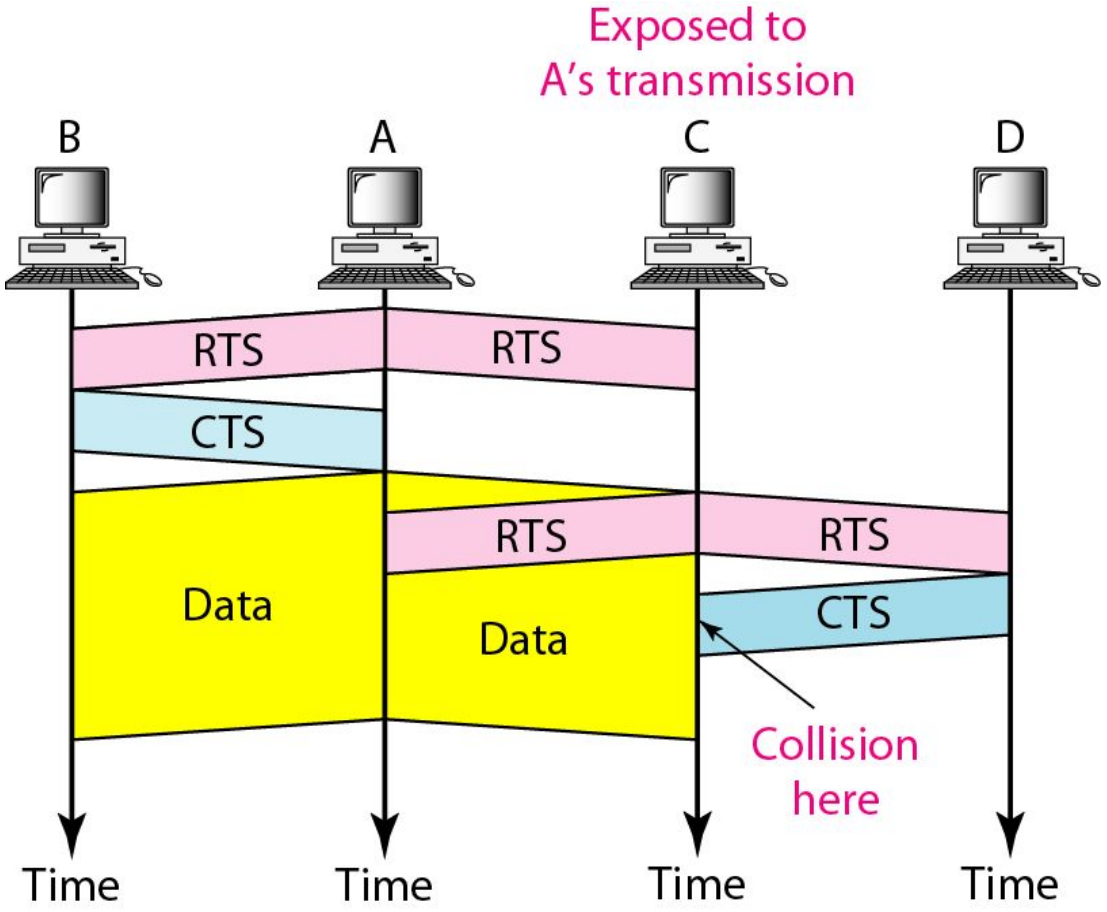
Station C doesn't hear RTS from B, but it does hear CTS from A, so it knows something is up.

Figure 14.12 *Exposed station problem*



C wants to send to D, but hears A talking to B, so assumes the medium is (incorrectly) busy.

Figure 14.13 *Use of handshaking in exposed station problem*



Looking for a CTS handshake does not work in this case.

14-2 BLUETOOTH

***Bluetooth** is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers, cameras, printers, coffee makers, and so on. A Bluetooth LAN is an ad hoc network, which means that the network is formed spontaneously.*

Topics discussed in this section:

Architecture
Bluetooth Layers
Baseband Layer
L2CAP

Figure 14.19 *Piconet*

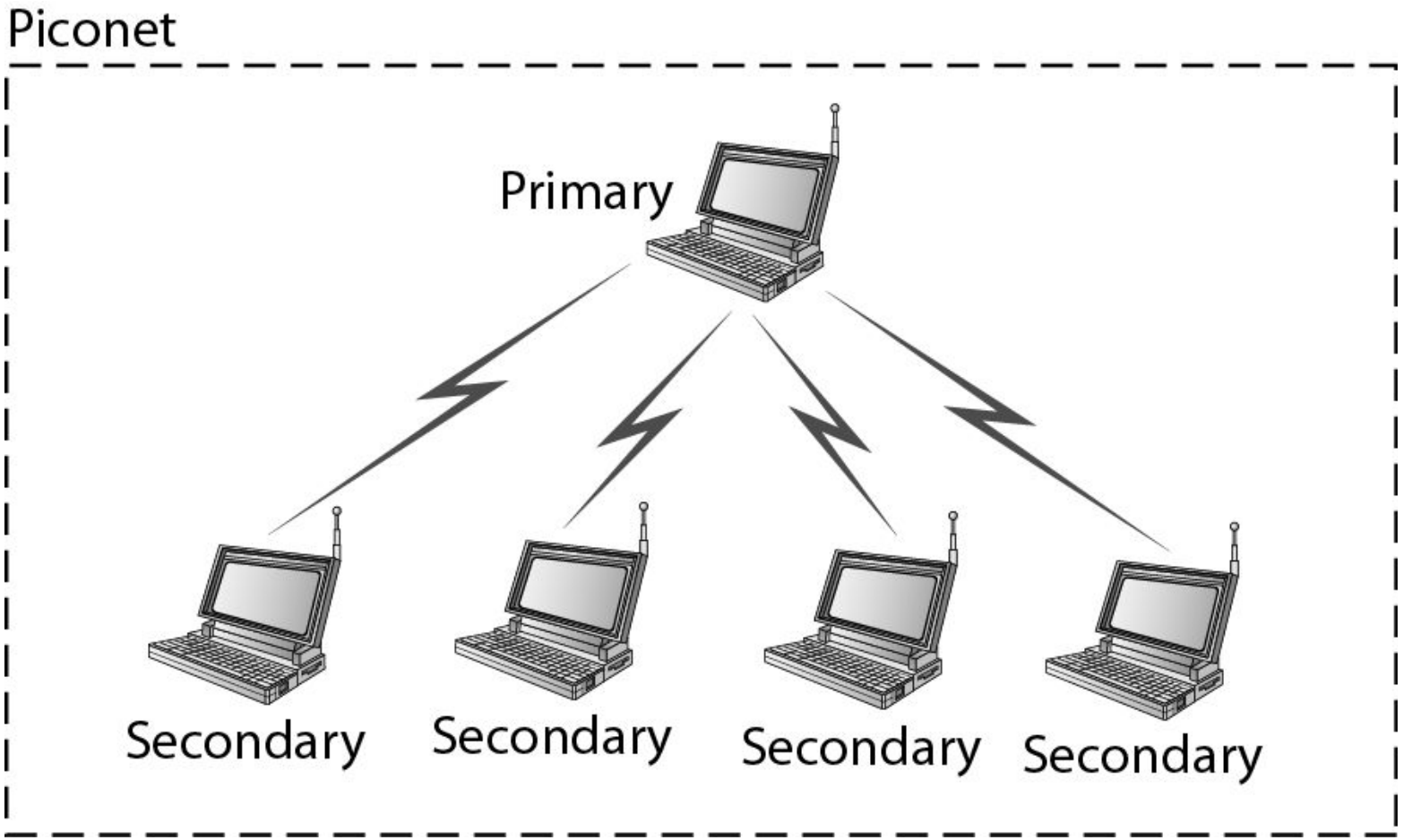


Figure 14.20 *Scatternet*

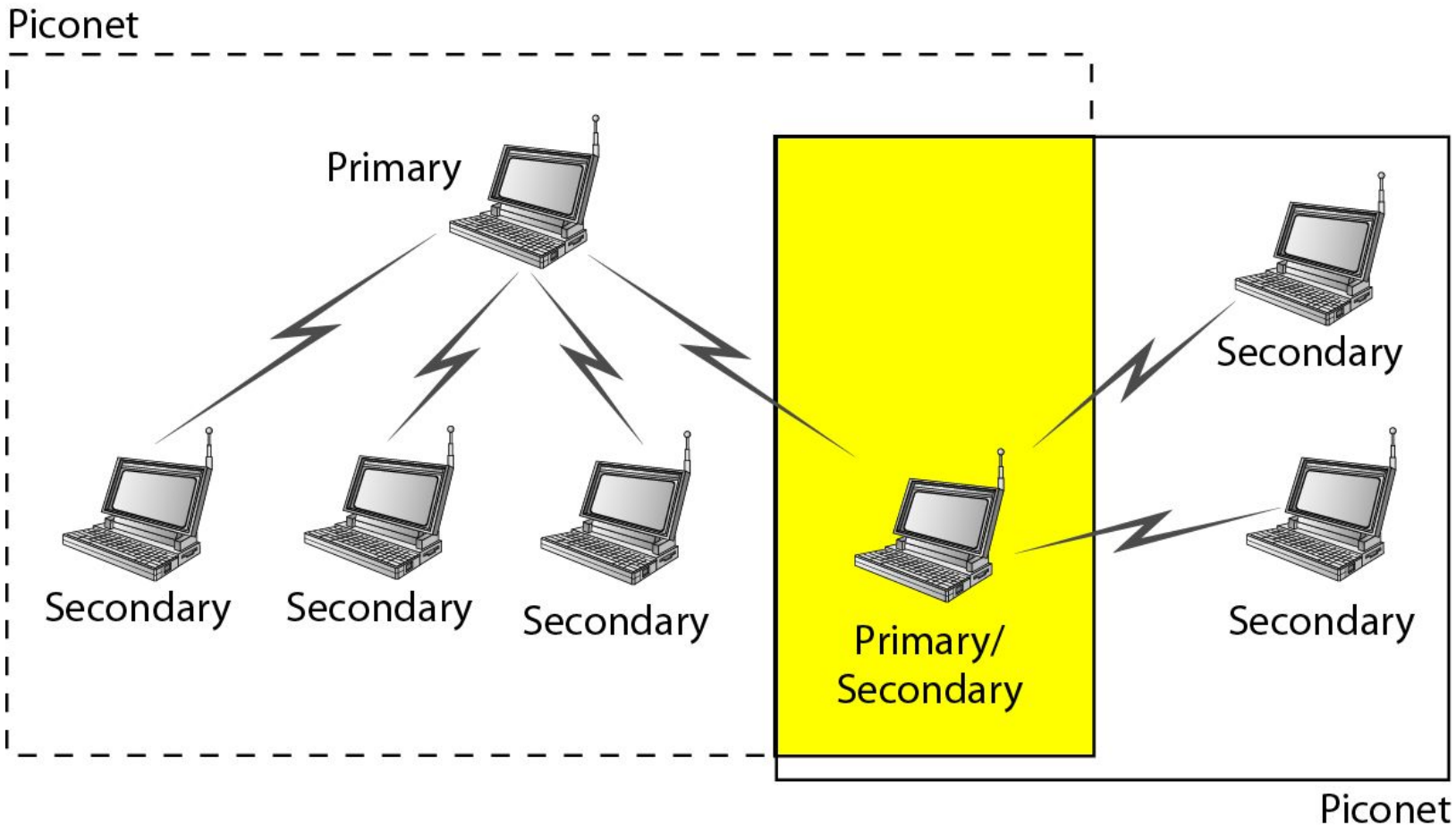
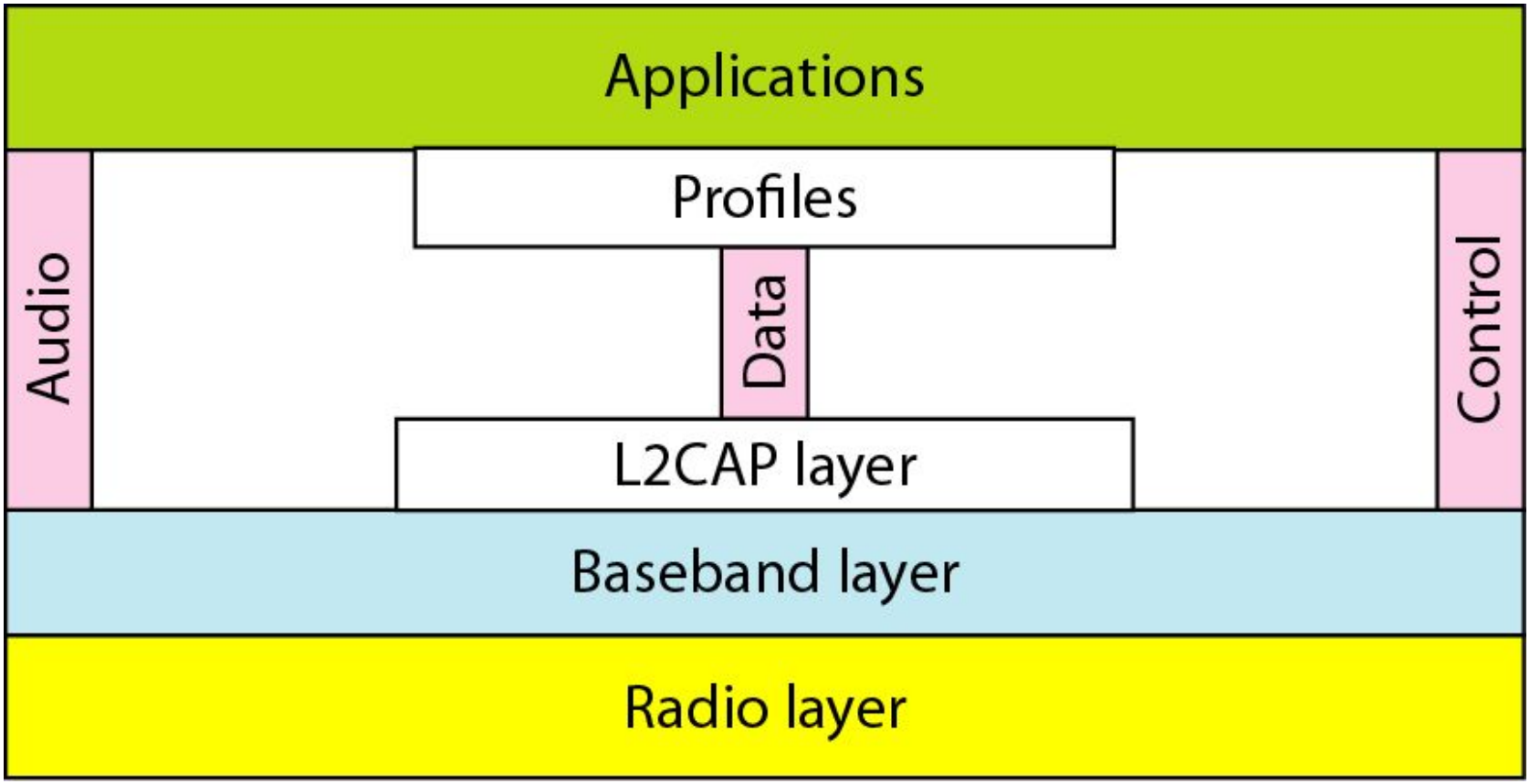


Figure 14.21 *Bluetooth layers*



See next slide for description of some of these layers

Figure 15.17 Bluetooth layers

Radio layer - roughly equivalent to physical layer.
Uses 2.4 GHz ISM divided into 79 channels of 1 MHz each.

Uses FHSS: 1600 hops/sec, so each frequency lasts for only 625 microseconds (1/1600). This is the dwell time.

Baseband layer - roughly equivalent to MAC sublayer and uses TDD-TDMA (time-division duplexing TDMA).
Similar to walkie-talkies using different carrier frequencies.