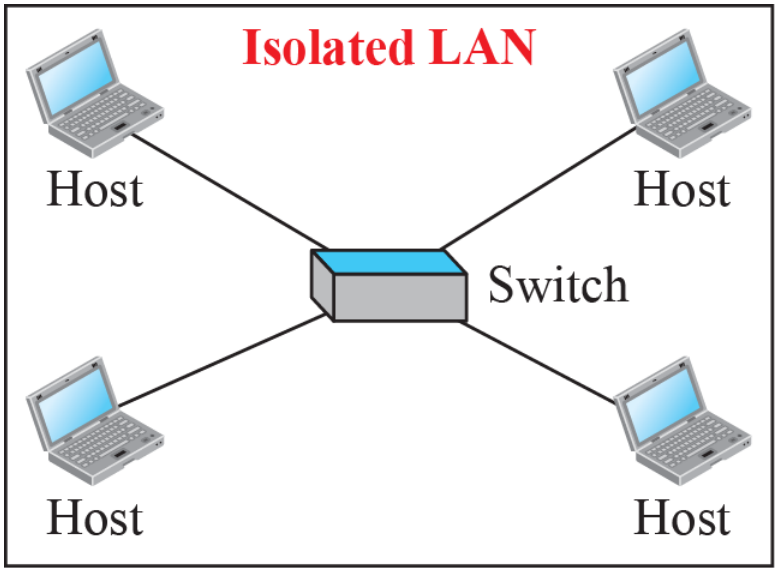
Chapter 15

Wireless LANs

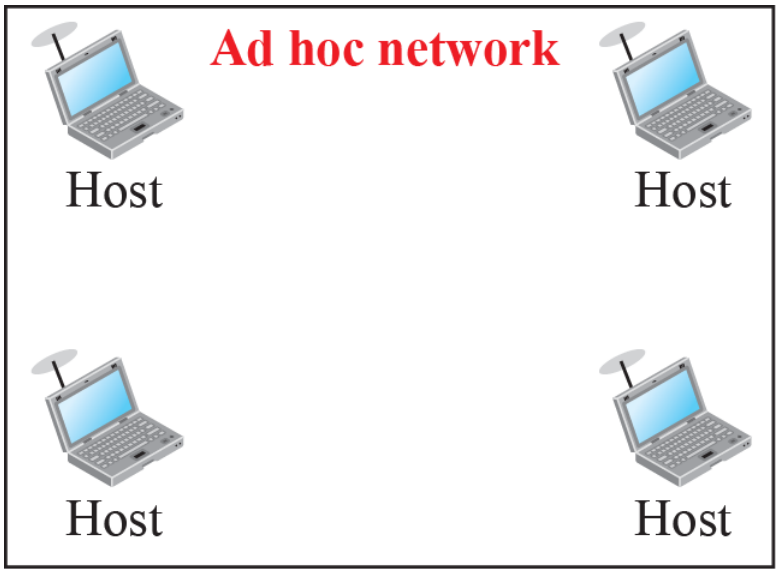
Architectural Comparison

Let us first compare the architecture of wired and wireless LANs to give some idea of what we need to look for when we study wireless LANs.

Isolated LANs: wired versus wireless

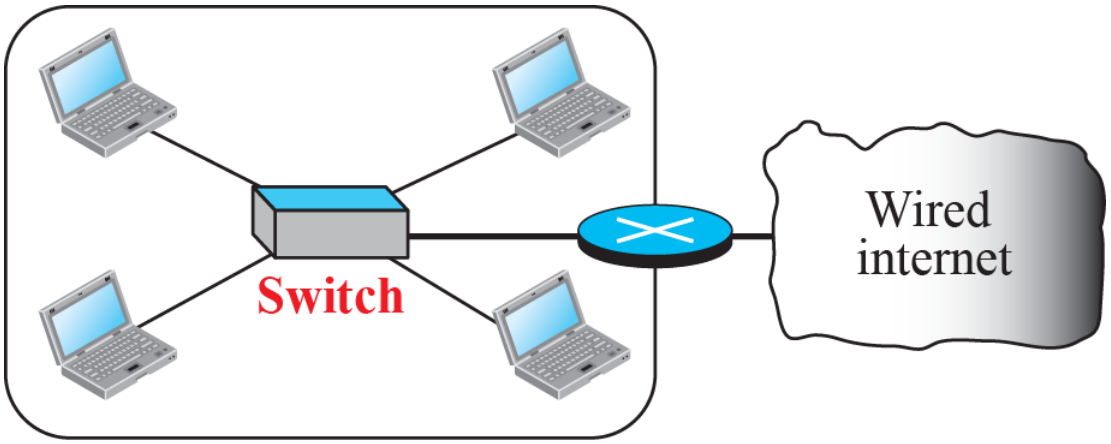


Wired

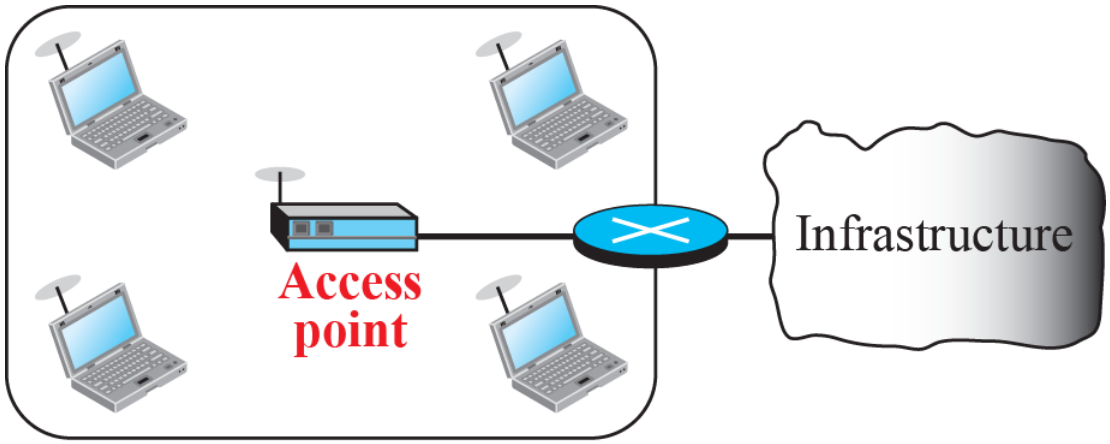


Wireless

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



Wired LAN



Infrastructure network

Access Control

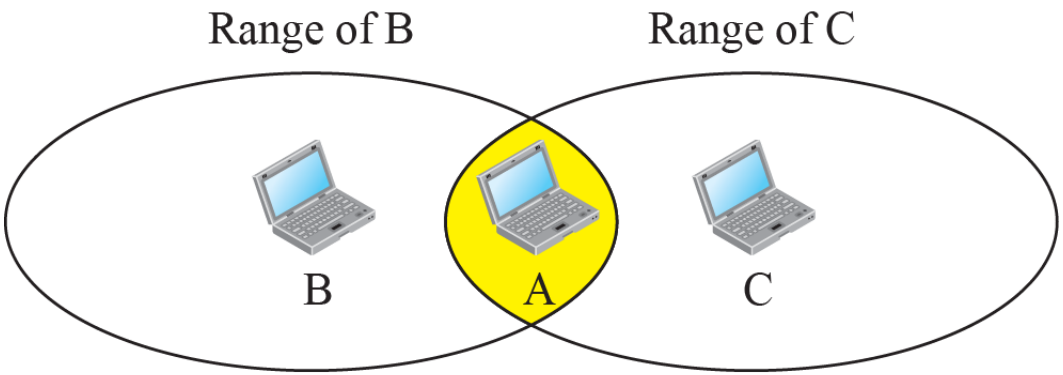
- **How a wireless host can get access to the shared medium (air)**

- **The CSMA/CD algorithm does not work in wireless LANs for such reasons:**

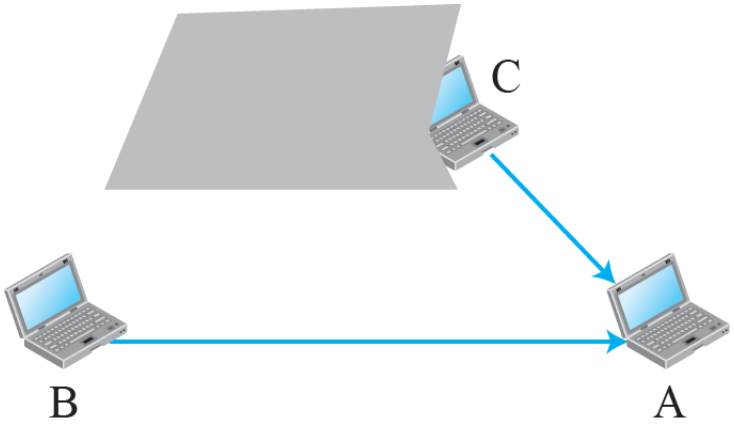
  - **Send and receiving signal power**

  - **The hidden station problem prevents collision detection**

Hidden station problem



a. Stations B and C are not in each other's range.



b. Stations B and C are hidden from each other.

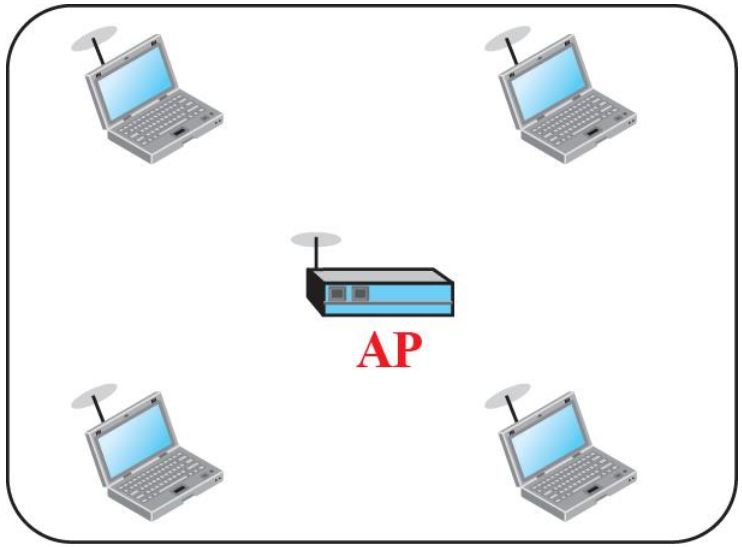
IEEE 802.11 PROJECT

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

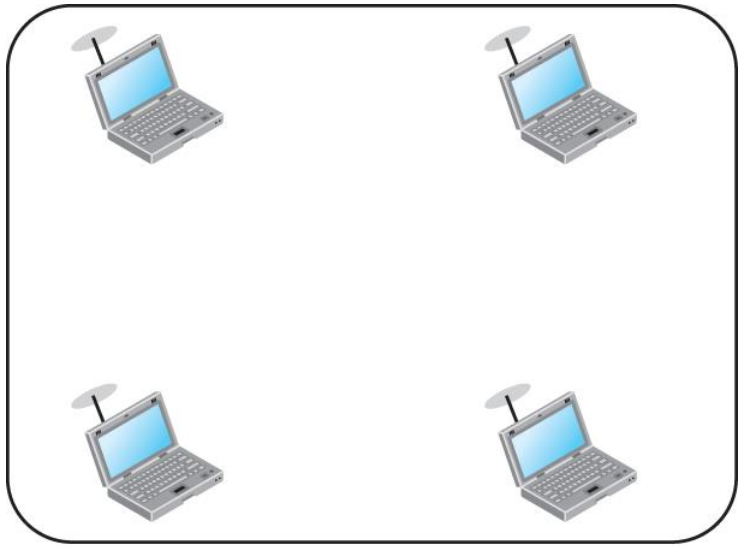
Architecture

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

Basic service sets (BSSs)

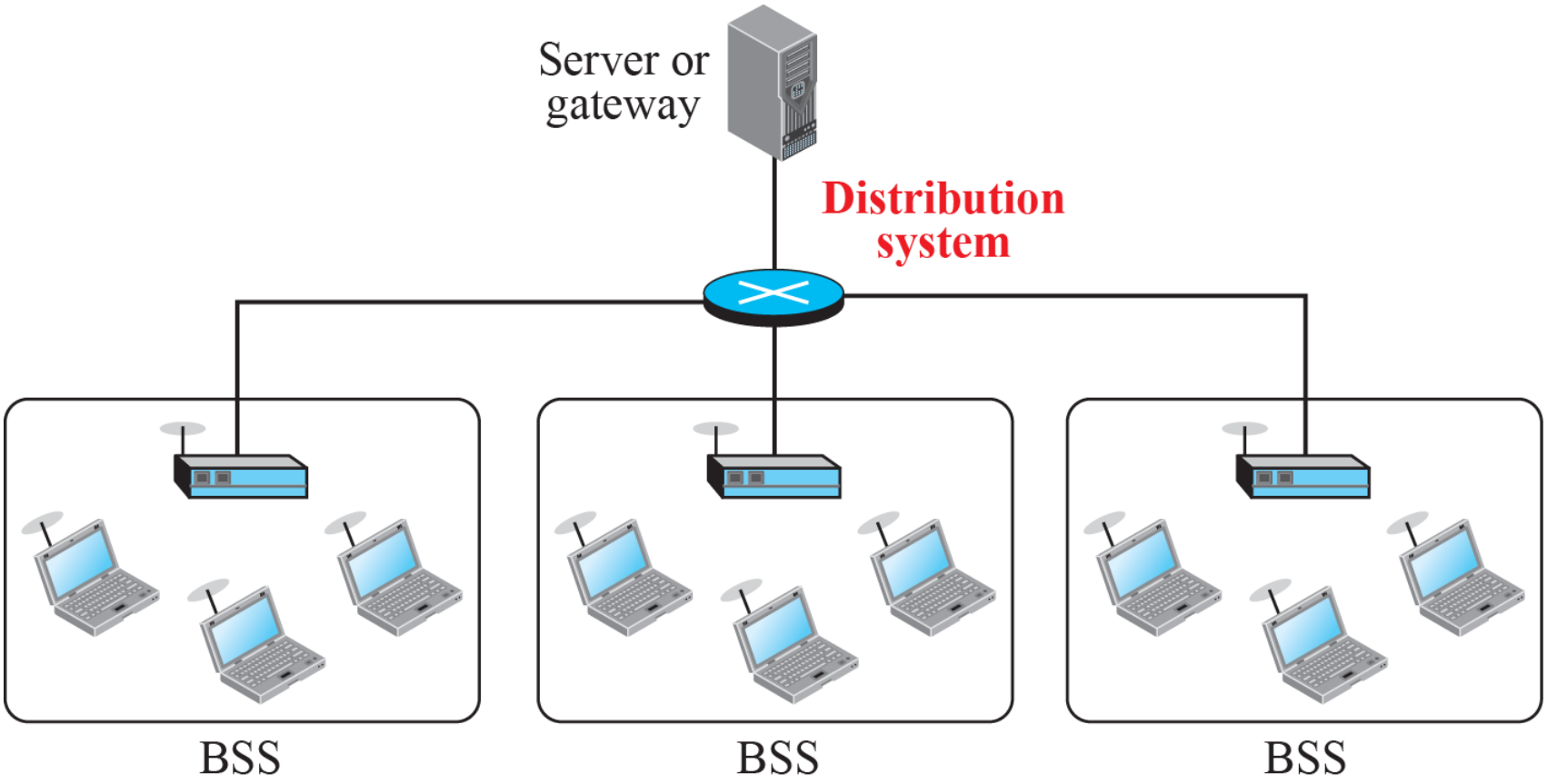


Infrastructure BSS



Ad hoc BSS

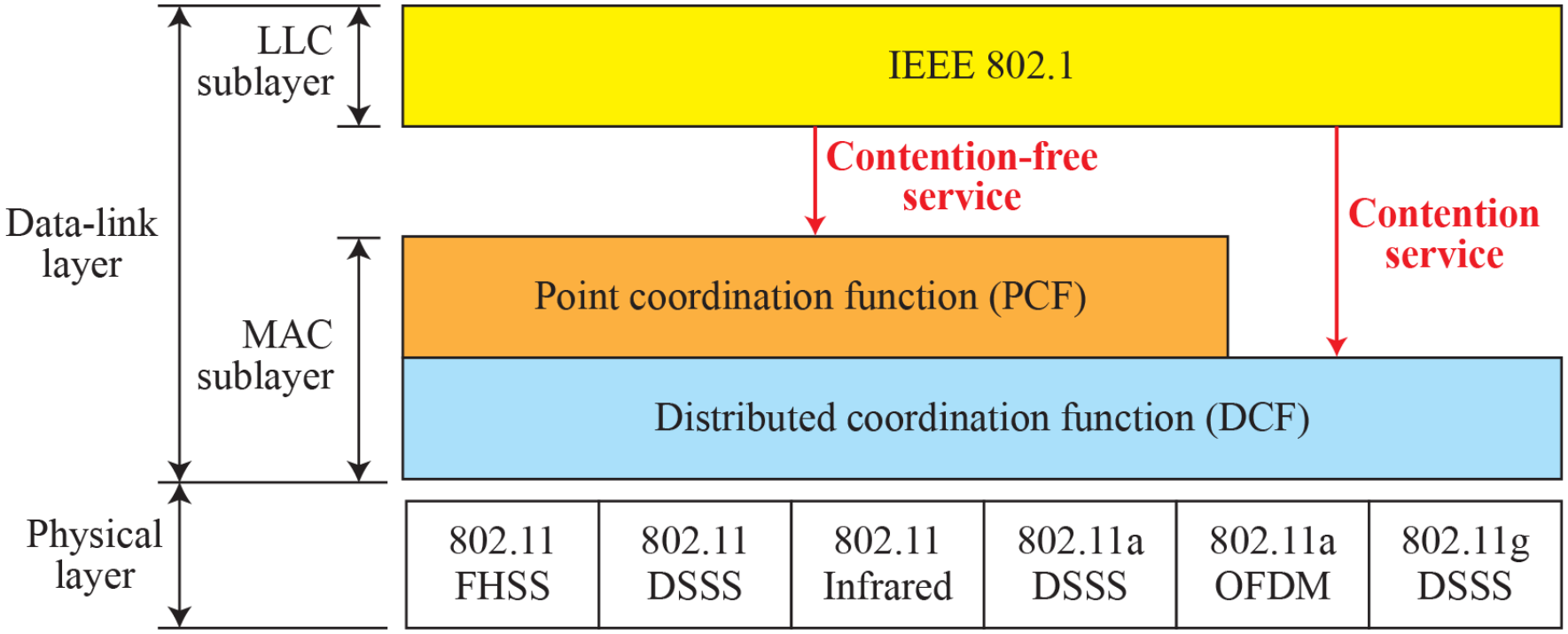
Extended service set (ESS)



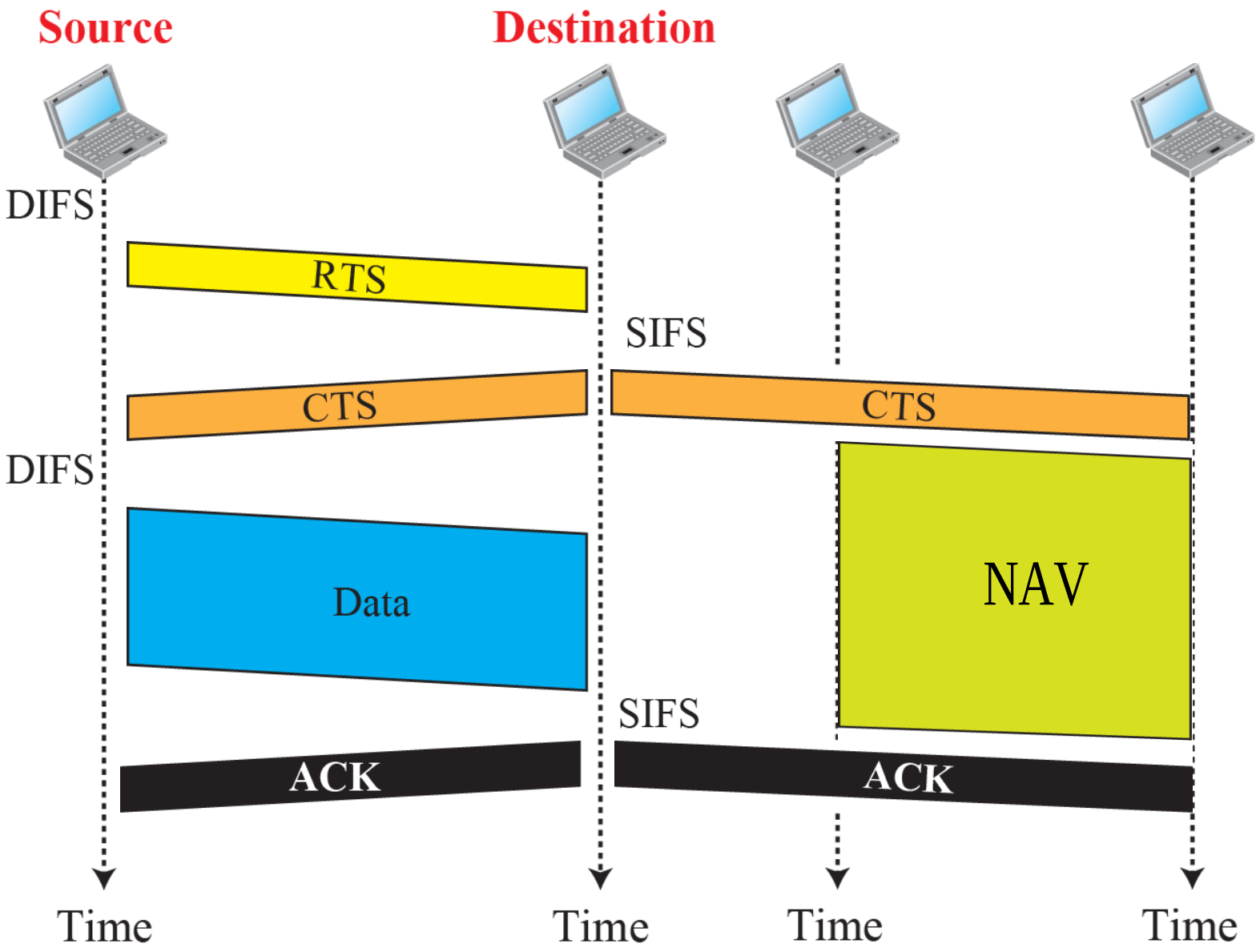
MAC Sublayer

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

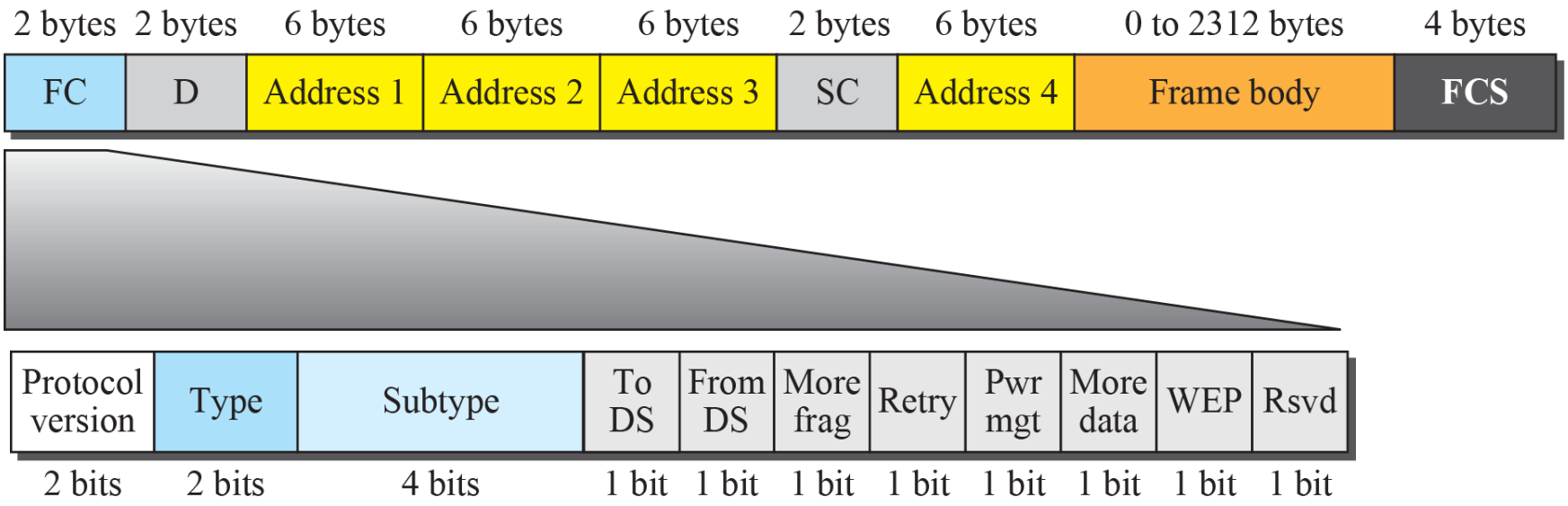
MAC layers in IEEE 802.11 standard



CSMA/CA and NAV



Frame format



Addressing Mechanism

- **The IEEE 802.11 addressing mechanism specifies four cases, defined by the value of the two flags in the FC field, To DS and From DS.**

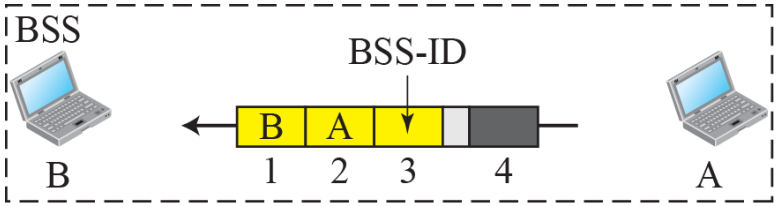
- **Each flag can be either 0 or 1, resulting in four different situations.**

- **The interpretation of the four addresses (address 1 to address 4) in the MAC frame depends on the value of these flags**

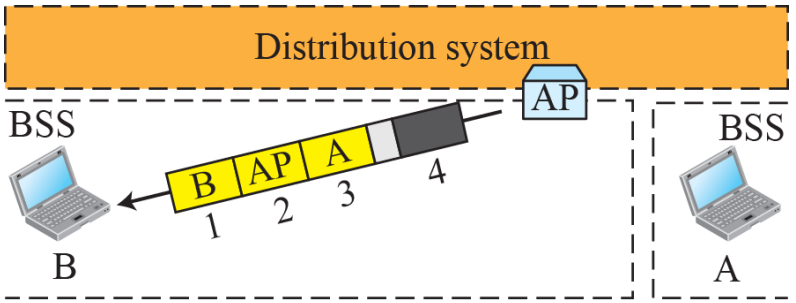
Addresses

To DS	*From DS*	*Address 1*	*Address 2*	*Address 3*	*Address 4*
0	0	Destination	Source	BSS ID	N/A
0	1	Destination	Sending AP	Source	N/A
1	0	Receiving AP	Source	Destination	N/A
1	1	Receiving AP	Sending AP	Destination	Source

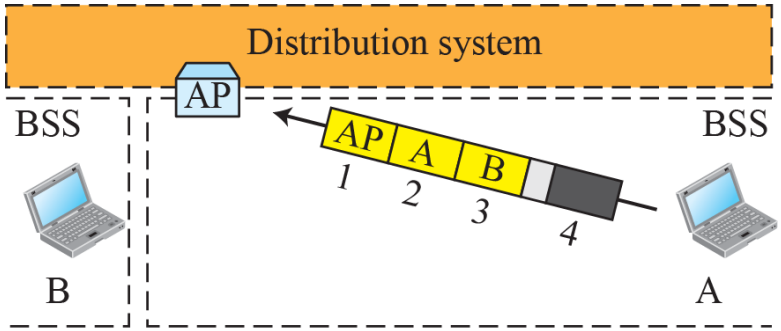
Addressing mechanisms



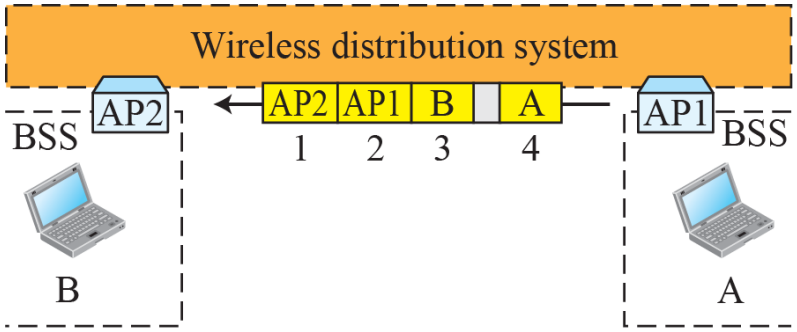
a. Case 1



b. Case 2



c. Case 3



d. Case 4

Exposed station problem