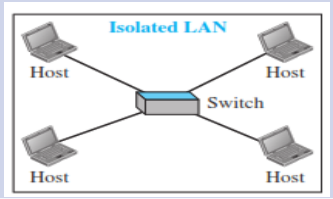
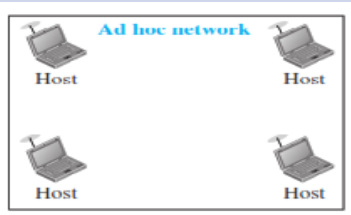
Lecture 3

Wireless LANs

Comparison

	Wired	Wireless
Medium	Use wires to connect hosts	Medium is air signal is broadcasts
Hosts	Hosts are connected with **a fixed** link layer address (NIC)	Move freely
Isolated LANs	Connected via link layer switch 	Called Ad hoc ,communicate freely 
Connection to other network	Connect to another network by routers	Connected to wired/wireless network by Access Point (AP)

Characteristics

- Attenuation
- Interference
- Multipath propagation
- Error .....(Signal to Noise Ratio)

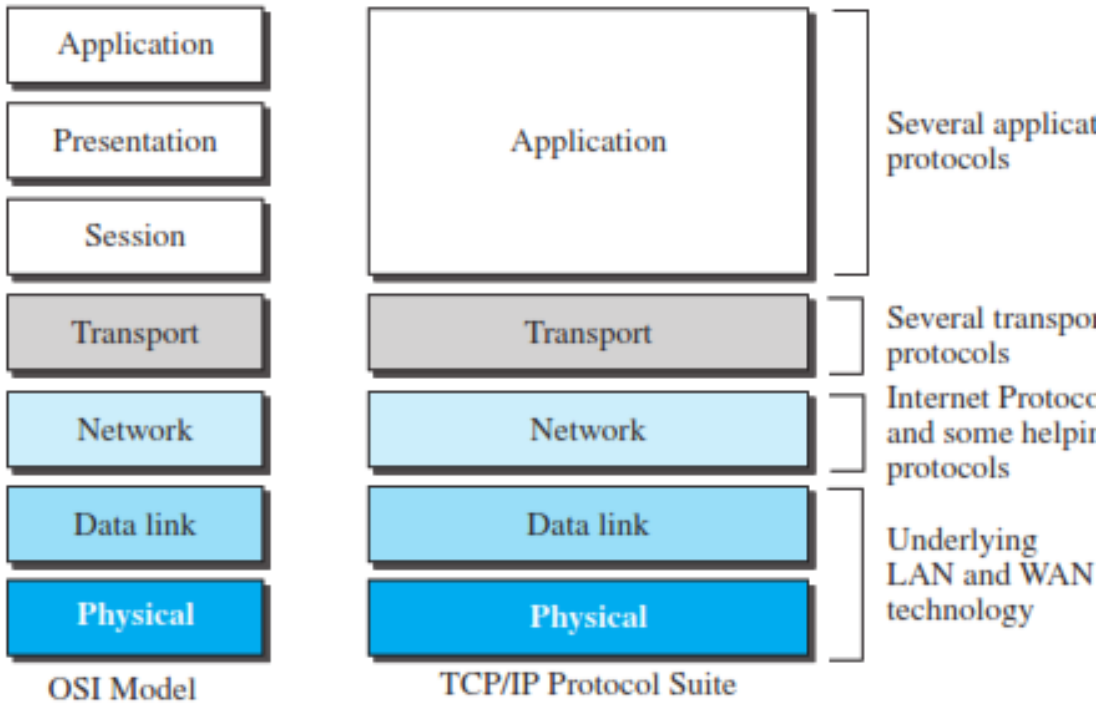
(If SNR high then signal is stronger than noise) (If SNR low then signal corrupted)

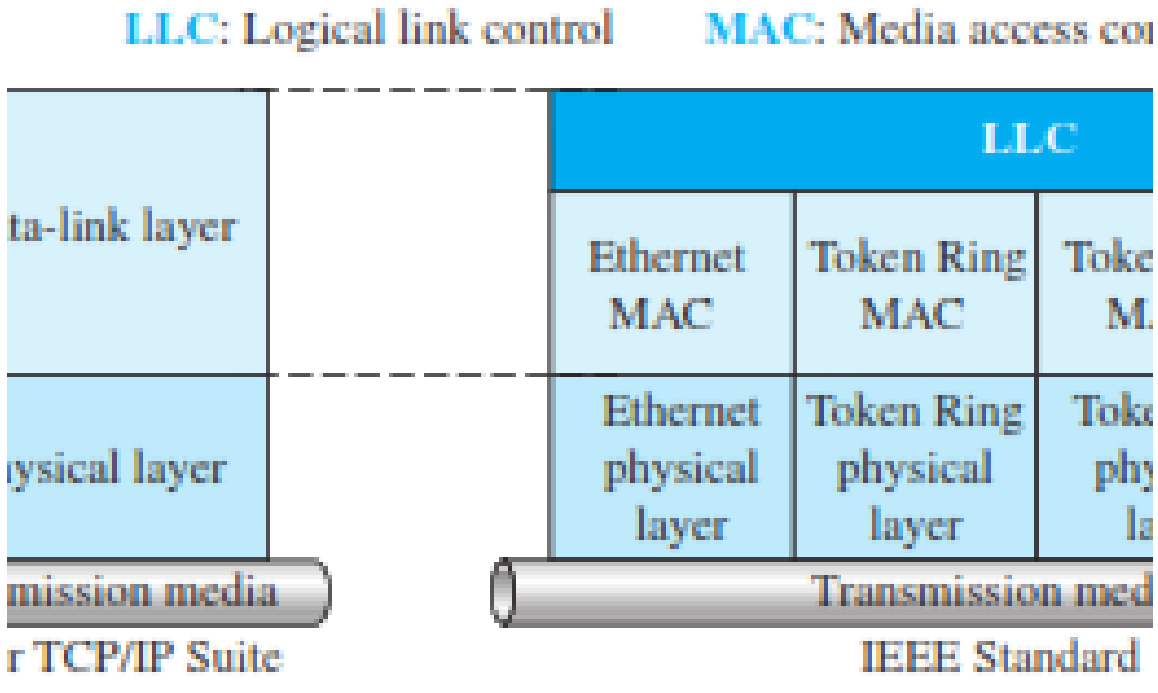
Access control

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

- Standard Ethernet uses the CSMA/CD algorithm.
- each host contends to access the medium and sends its frame if it finds the medium idle.
- If a collision occurs, it is detected and the frame is sent again.
- Collision detection in CSMA/CD serves two purposes. If a collision is detected, it means that the frame has not been received and needs to be resent.
- If a collision is not detected, it is a kind of acknowledgment that the frame was received.

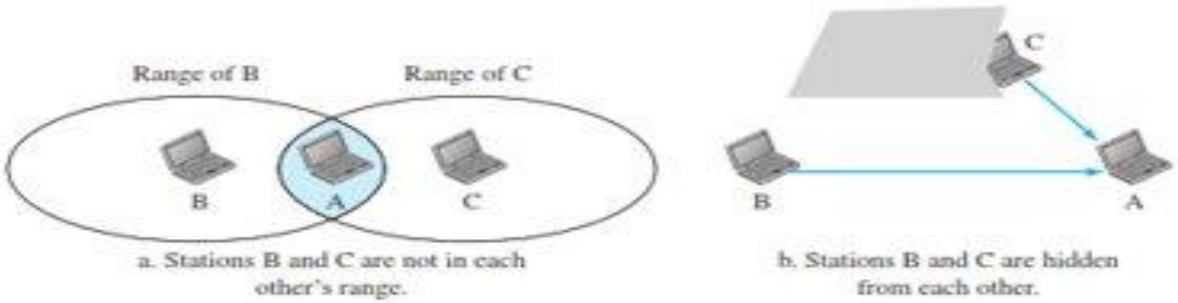
Layers in OSI vs Ethernet





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

1. Wireless hosts do not have enough power to send frame again after occuring collision (the power is supplied by batteries).
2. The hidden station problem(a station may not be aware of another station's transmission due to some obstacles or range problems)



3. The distance between stations can be great. Signal fading could prevent a station at one end from hearing a collision at the other end.

To overcome the above three problems, Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) was invented for wireless LAN

IEEE802.11 Project

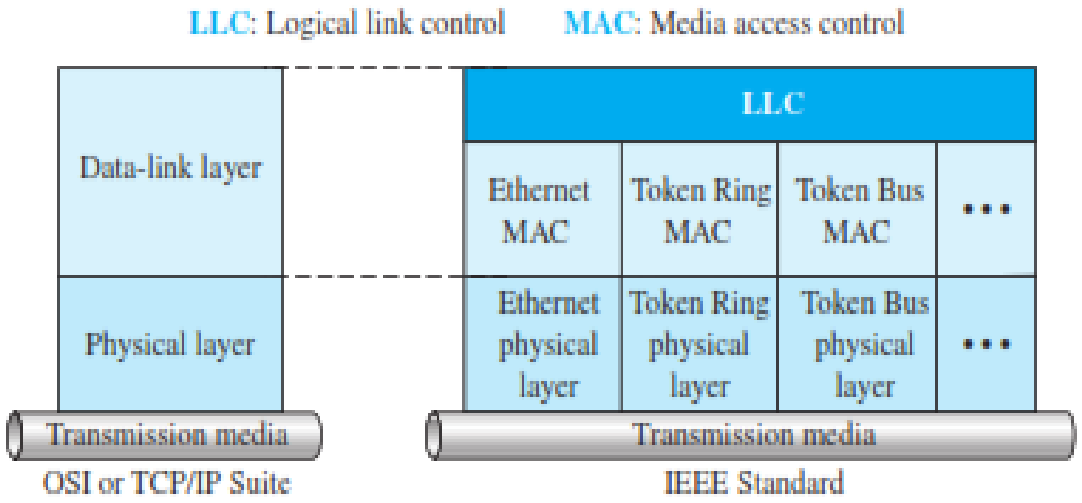
a) IEEE has defined the specifications for a wireless LAN, called IEEE 802.11

b) called wireless Ethernet

c) covers the physical and data-link layers.

- The IEEE has subdivided the data-link layer into two sublayers:
- Logical link control (LLC)
- media access control (MAC).

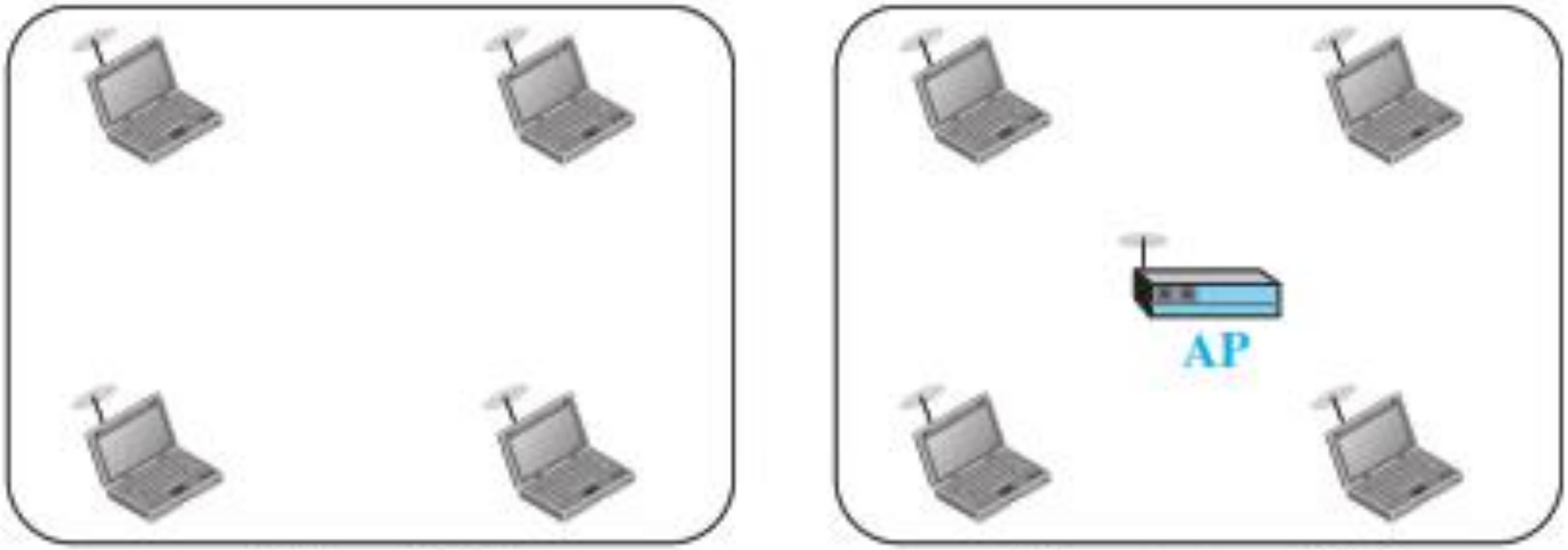
The public uses the term (WiFi)



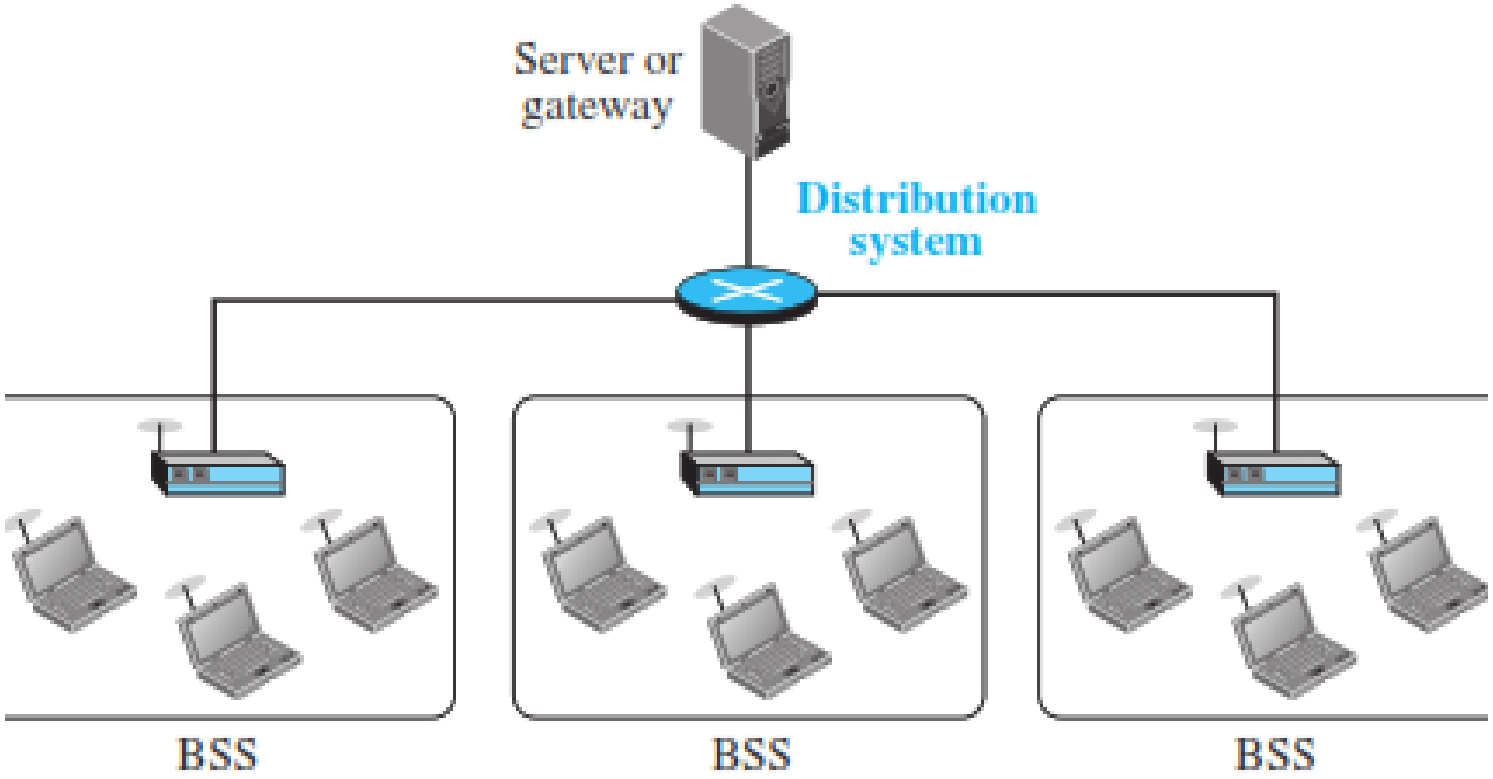
Architecture

The standard defines two kinds of services:

- The basic service set (BSS)
- The extended service set (ESS).



Basic Service Set (BSS)
(building blocks of wireless LANs)



Extended Service Set

- Two or more BSSs with AP
- BSSs are connected through a distribution systems which connects the APs in the BSSs

Types of stations

No transition mobility

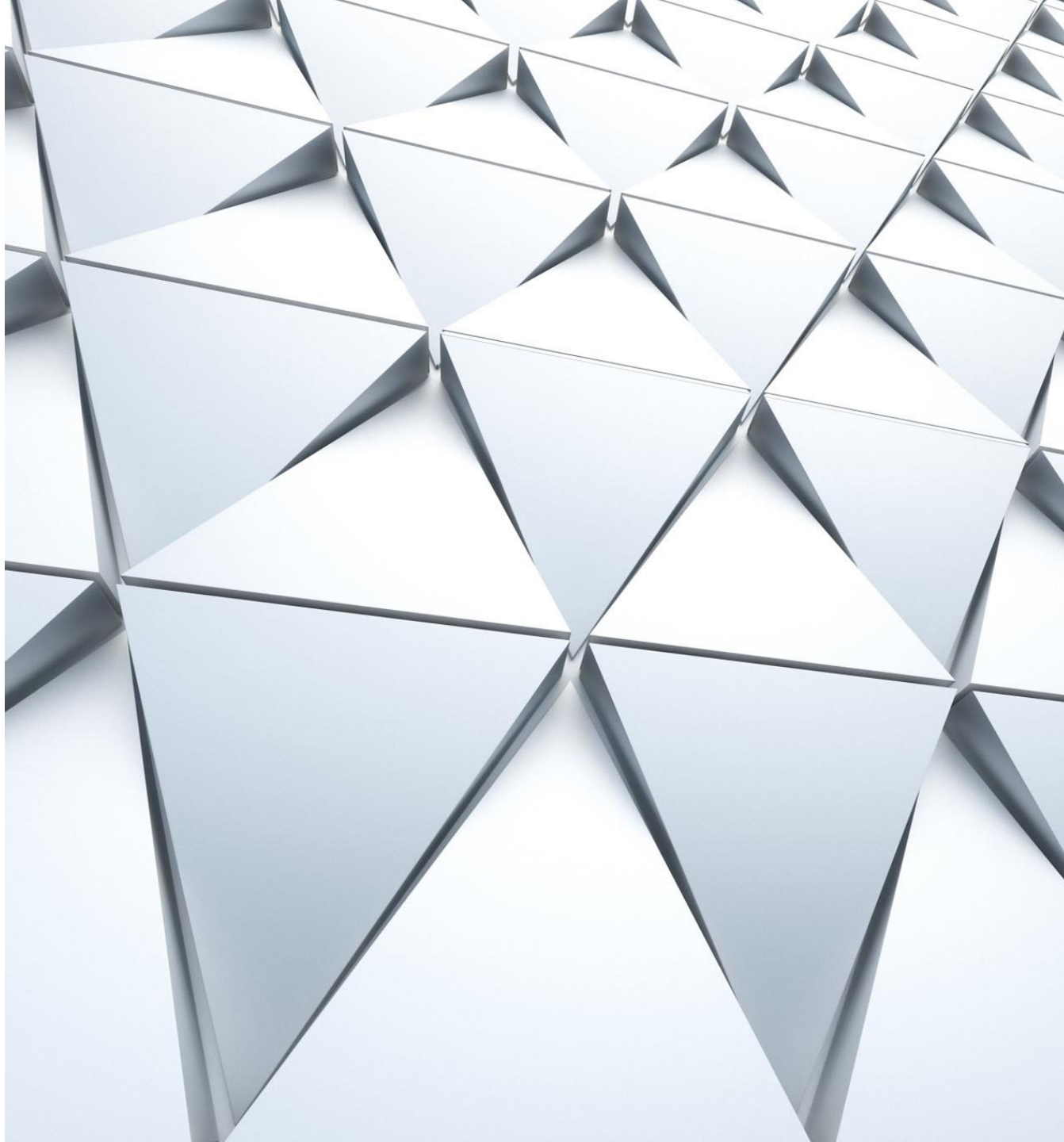
(stationary or moving inside BSS only)

BSS-transition mobility

(move from BSS to another inside one ESS)

ESS transition mobility

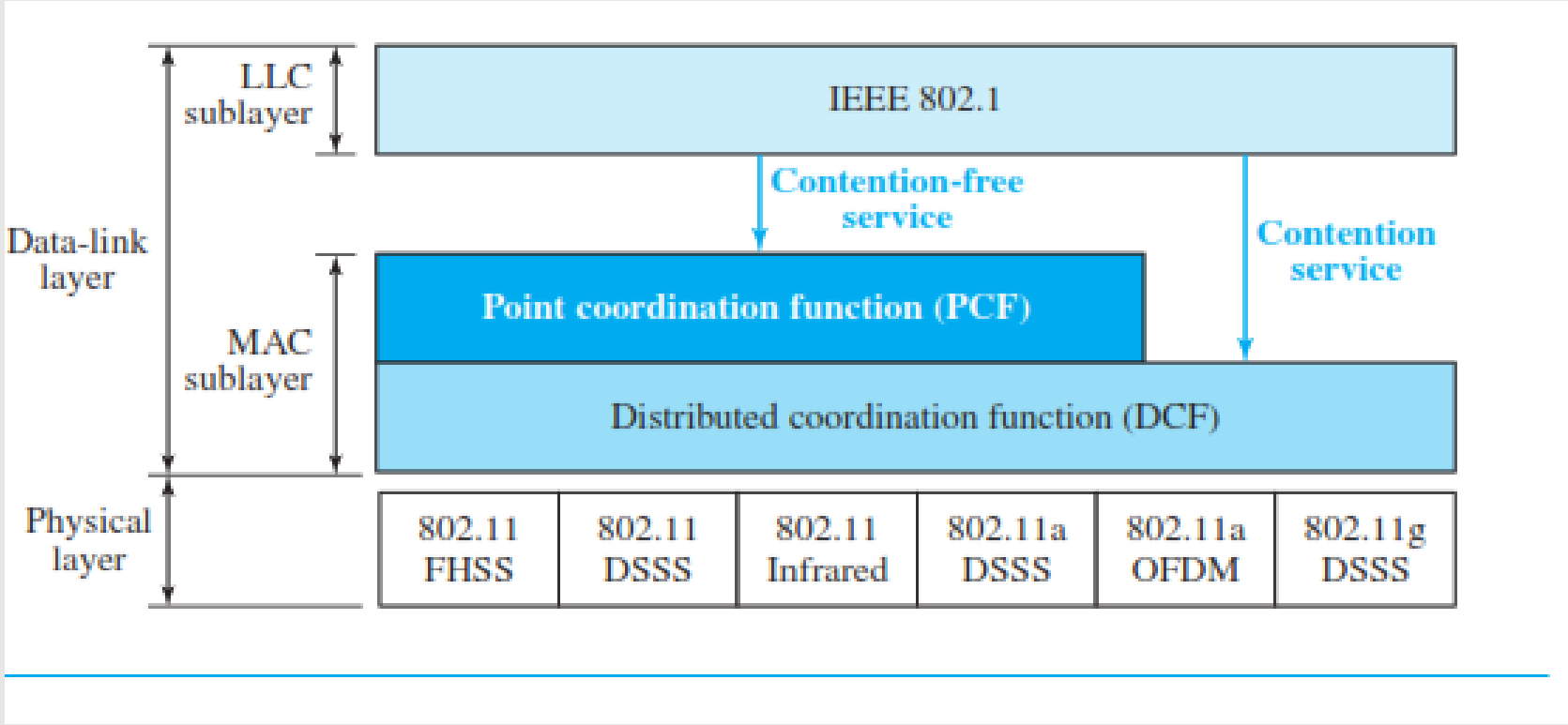
(from ESS to another)



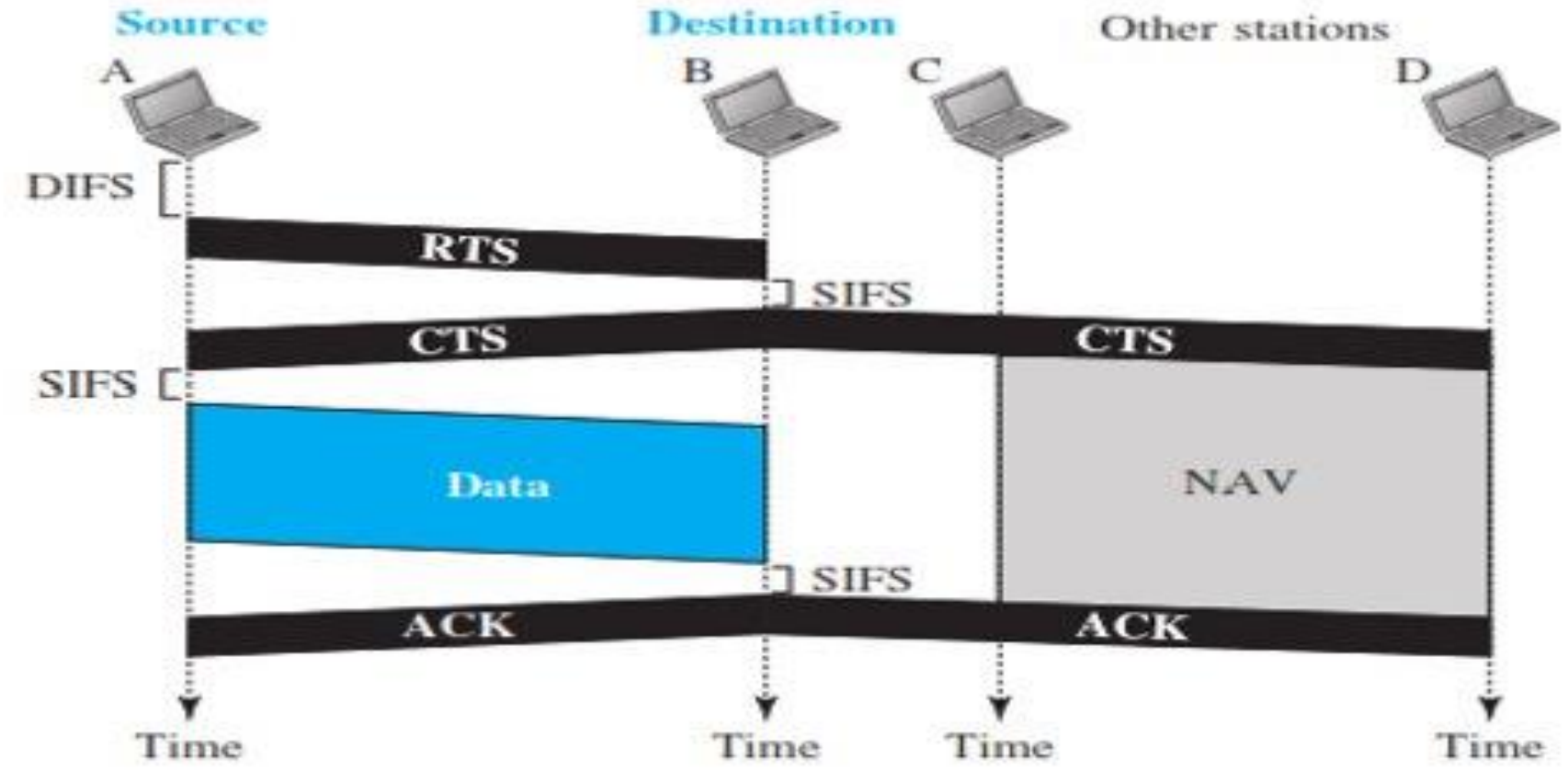
MAC Sublayer

- Media access control that defines the specific access method for each Wireless LANs.
- **Two MAC sublayer**

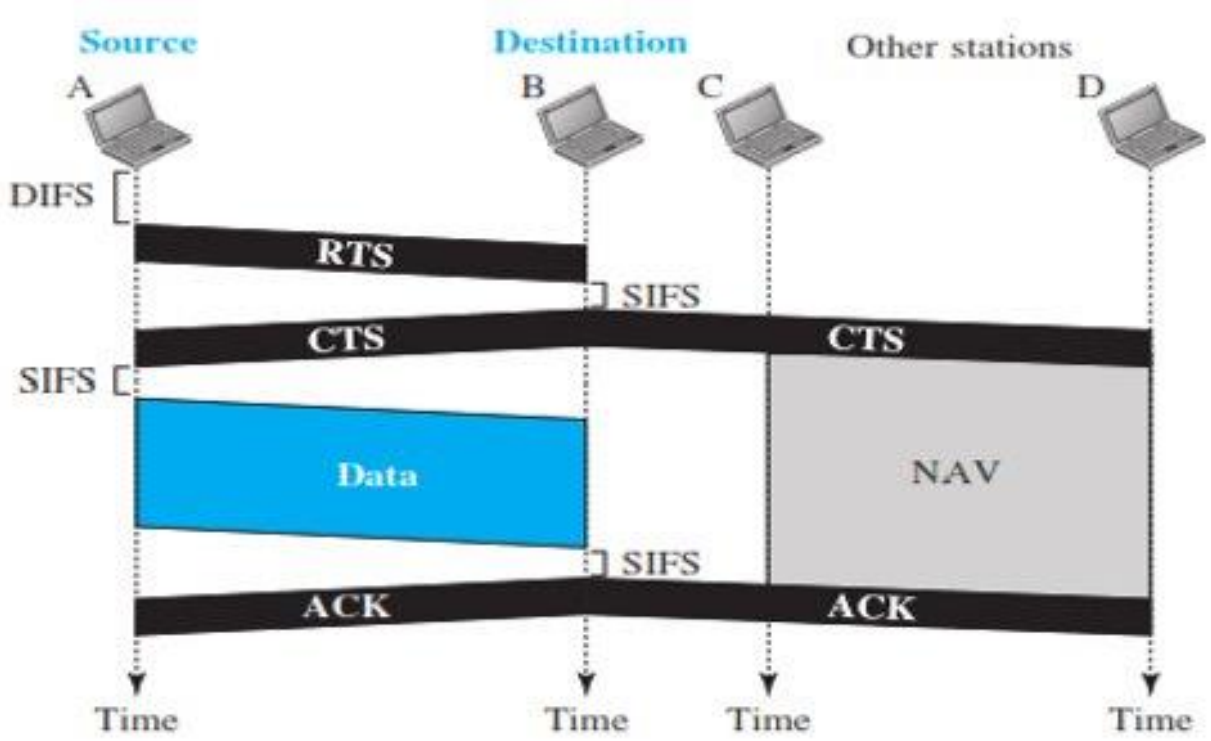
1. Distributed coordination function(DCF)
2. Point coordination function (PCF)



Distributed coordination function (DCF)
Exchange of data & Control frames



Network Allocation Vector (NAV)



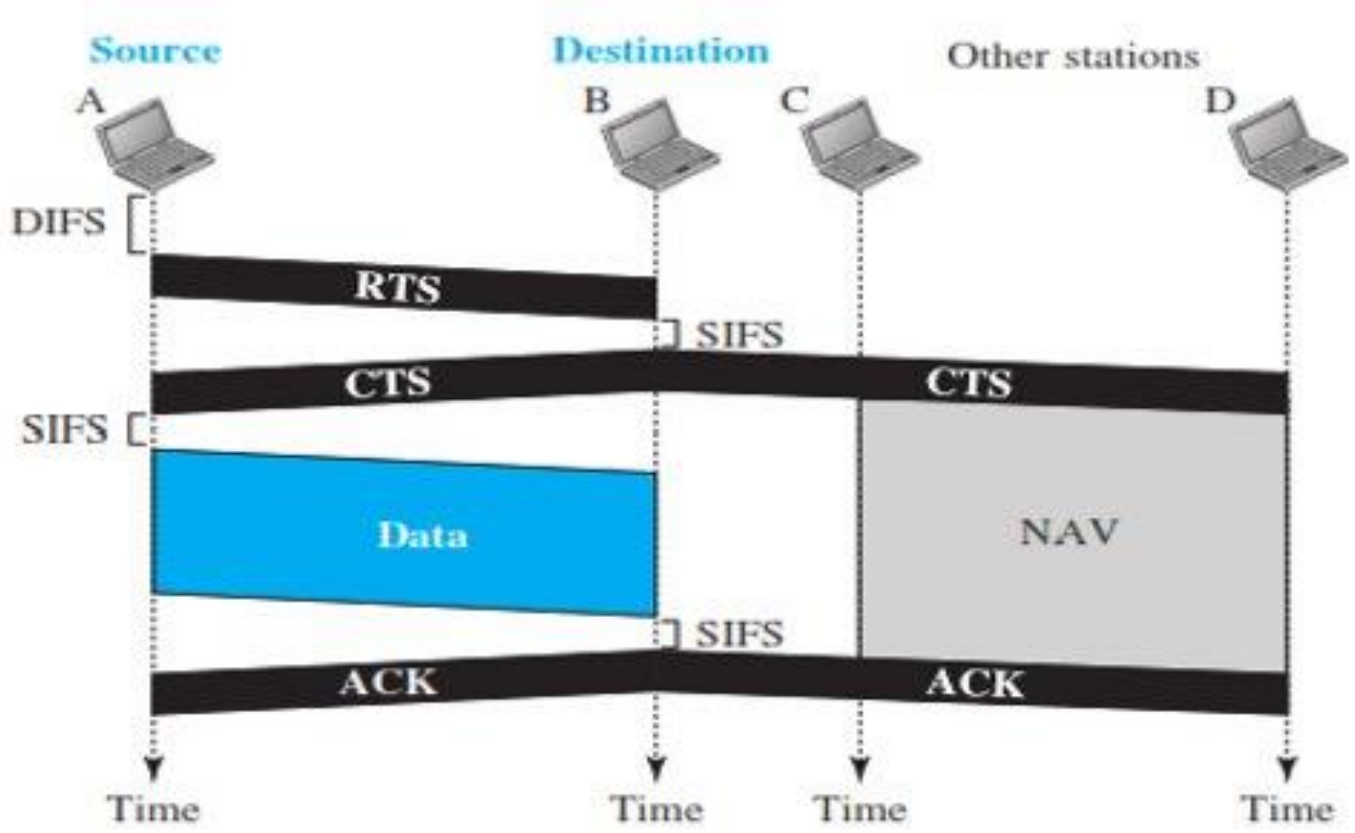
- When a station sends an RTS frame, it includes the duration of time that it needs to occupy the channel.
- The stations that are affected by this transmission create a timer **called a network allocation vector (NAV)** that shows how much time must pass before these stations are allowed to check the channel for idleness.
- Each station, before sensing the physical medium to see if it is idle, first checks its NAV to see if it has expired.

Collision during handshaking

(when RTS or CTS control frames are in transition, often called the handshaking period)

- **Two or more stations may try to send RTS frames at the same time.** These control frames may collide.
- However, because there is no mechanism for collision detection, the sender assumes there has been a collision if it has not received a CTS frame from the receiver. **The back off strategy** is employed, and the sender tries again.

Hidden station problem



- The RTS message from A reaches B, but not C.
  However, because both B and C are within the range of A,
- The CTS message, which

contains the duration of data

transmission from B to A, reaches C.

- Station C knows that some

hidden station is using the

channel and
refrains from transmitting until

that duration is over.

Lecture 3

finished