

Chapter 4

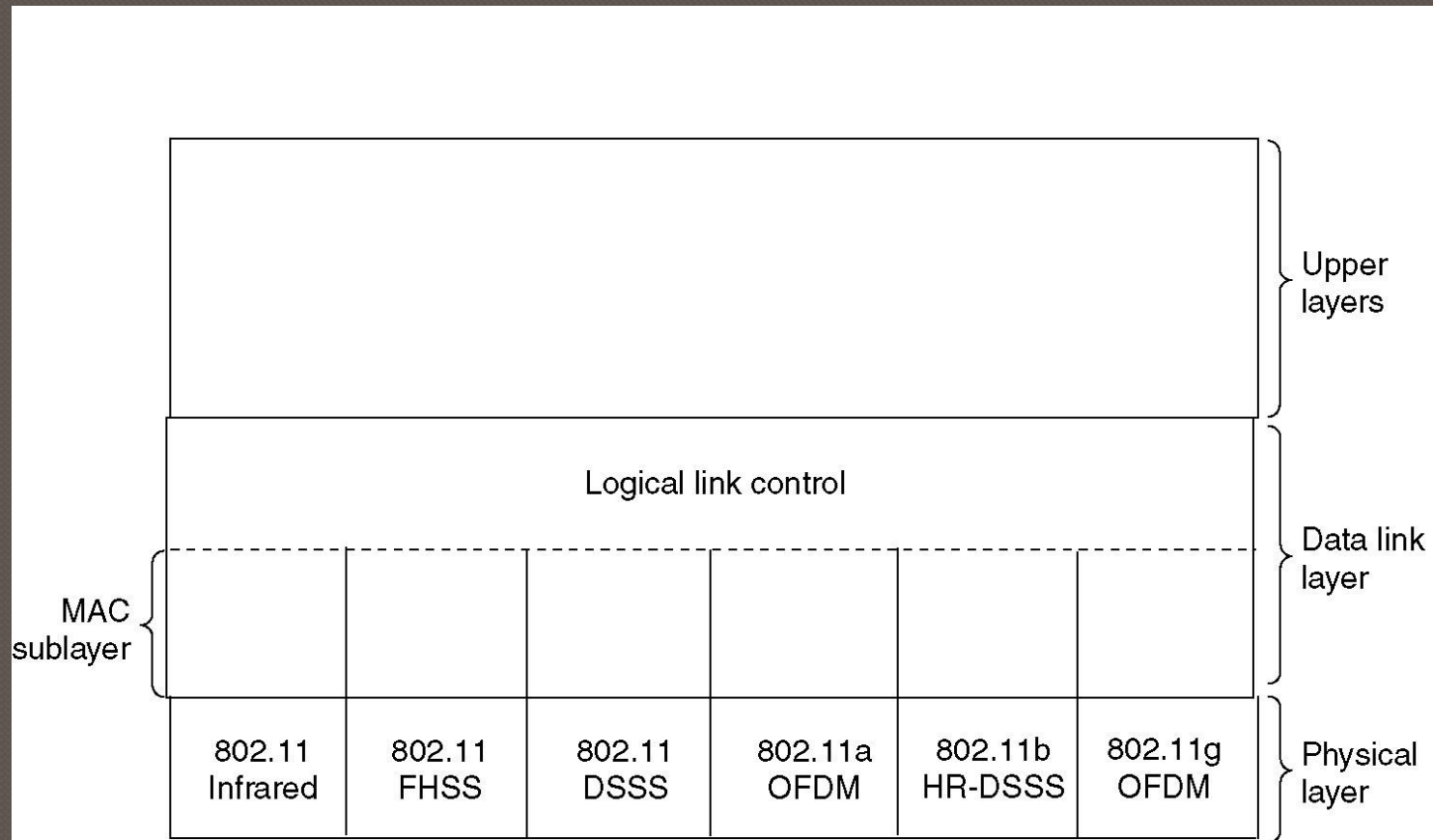
Lesson 12: The Medium Access Control Sublayer

Wireless LANs

- The 802.11 Protocol Stack
- The 802.11 MAC Sublayer Protocol
- The 802.11 Frame Structure
- Services

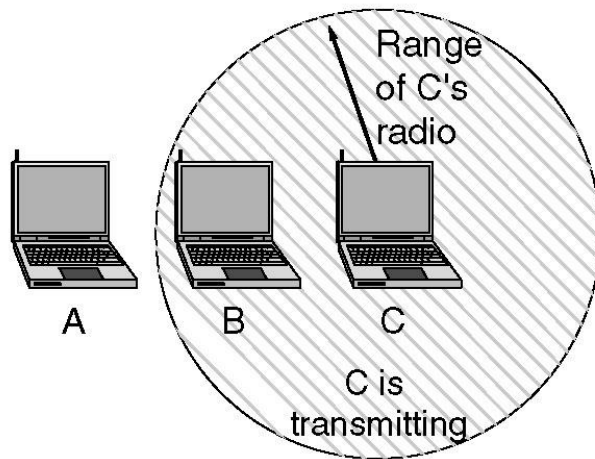
The 802.11 Protocol Stack

Part of the 802.11 protocol stack.



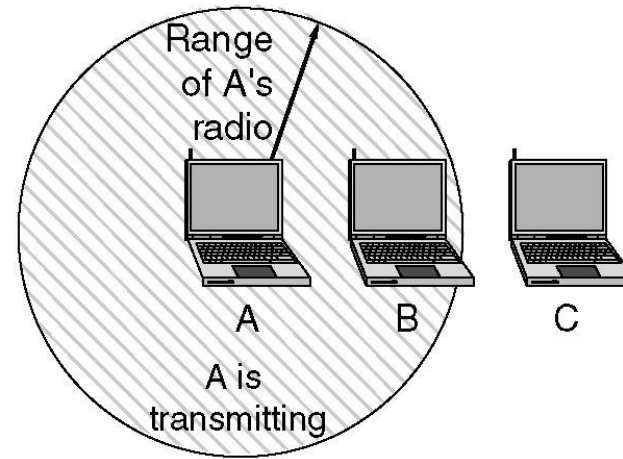
The 802.11 MAC Sublayer Protocol

A wants to send to B
but cannot hear that
B is busy



(a)

B wants to send to C
but mistakenly thinks
the transmission will fail

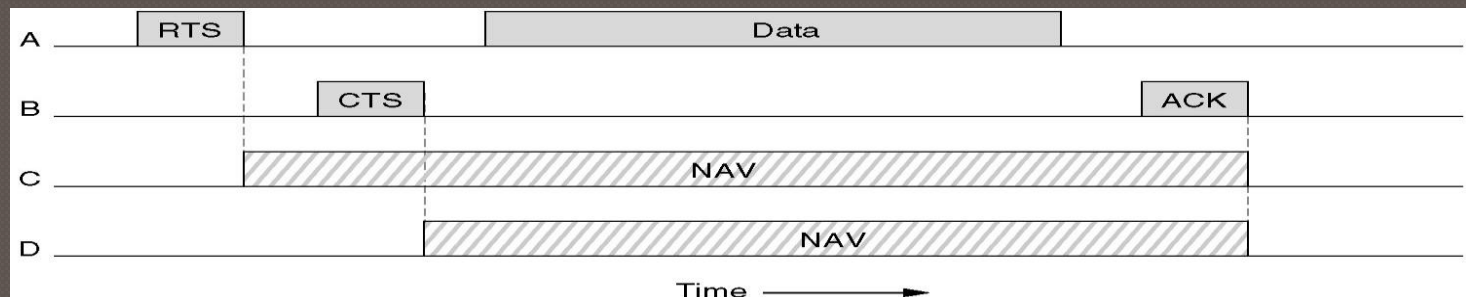


(b)

- (a) The hidden station problem.
- (b) The exposed station problem.

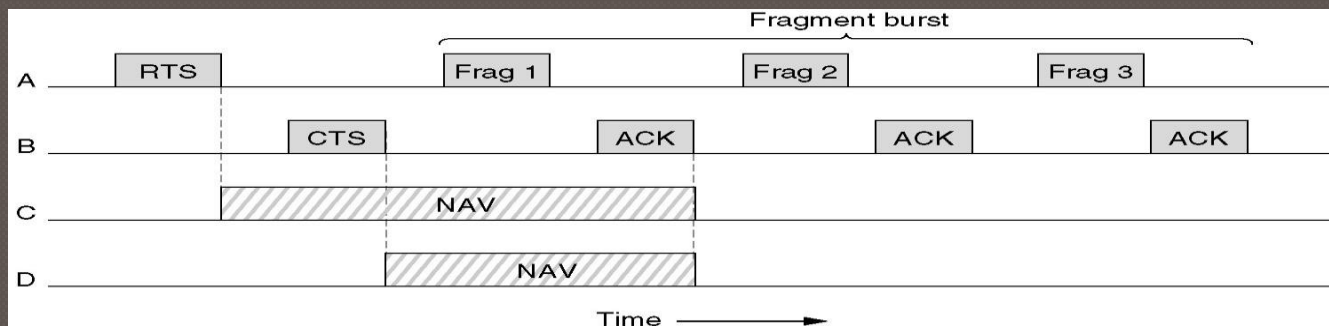
The 802.11 MAC Sublayer Protocol (2)

- The use of virtual channel sensing using CSMA/CA.
- Two modes of operation supported;
 - DCF (Distributed Coordination Function)
 - Who wants to transmit senses the channel
 - PCF (Point Coordination Function)
 - Base station pools other stations and regulates order (no collision)



The 802.11 MAC Sublayer Protocol (3)

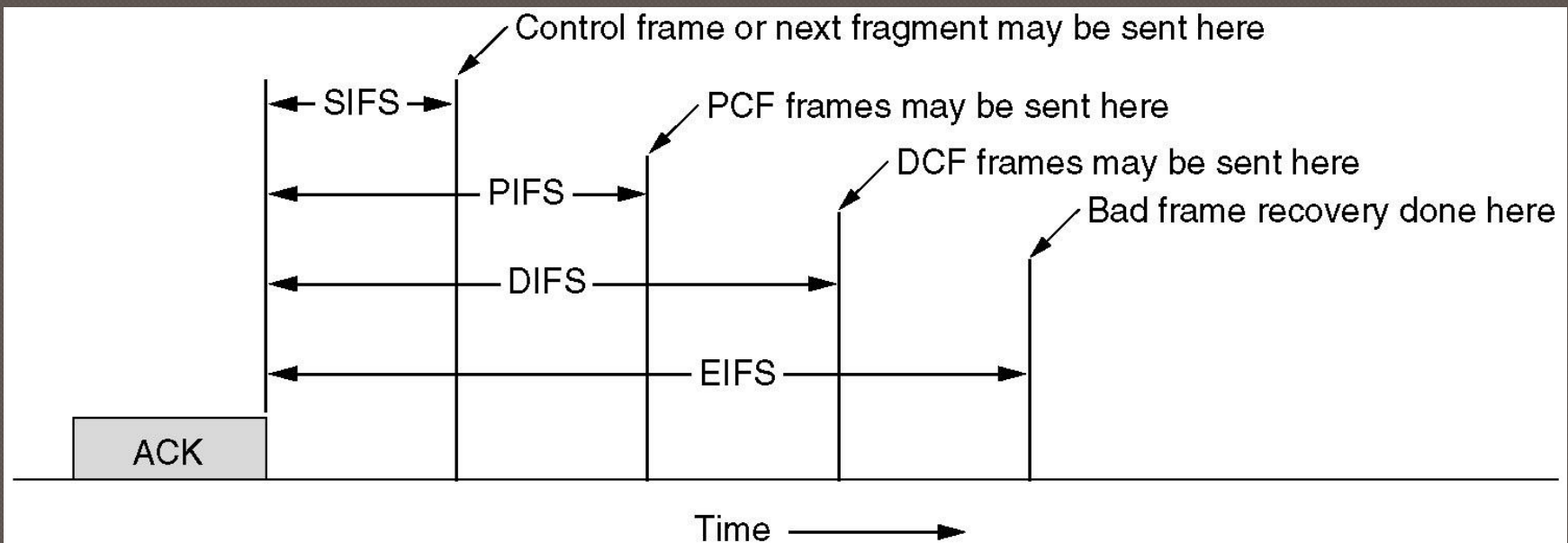
- ◉ A fragment burst.
- ◉ Fragmentation increases throughput
- ◉ Fragment size depends on the cell parameter
- ◉ NAV keeps station quiet only until next ACK



The 802.11 MAC Sublayer Protocol (4)

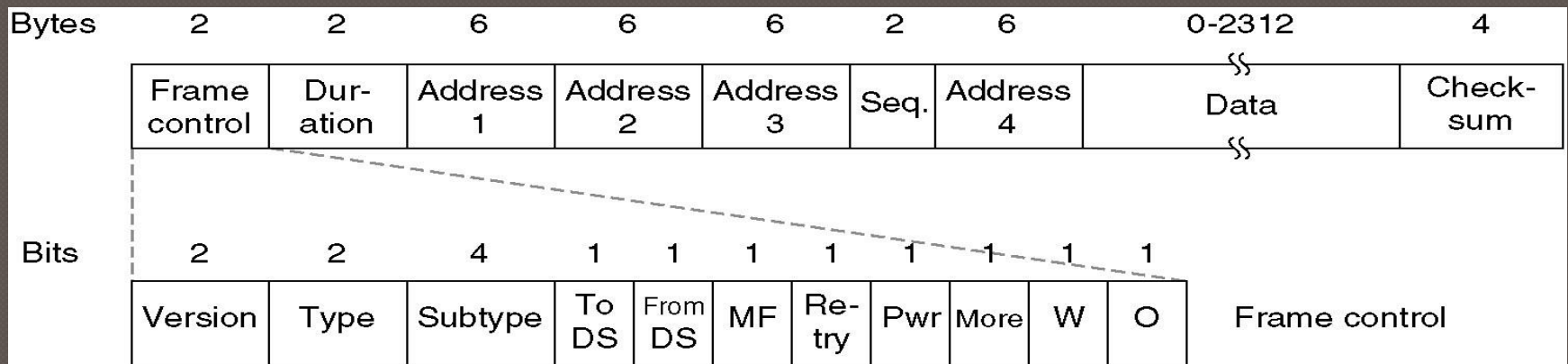
Interframe spacing in 802.11.

- Both DCF and PCF are used in specific time intervals



The 802.11 Frame Structure

The 802.11 data frame.



802.11 Services: Distribution Services

1. Association

- Connecting to a base station

2. Disassociation

- Disconnecting from a base station

3. Reassociation

- Reconnecting to a base station in a different cell

4. Distribution

- Route frames sent to base station

5. Integration

- Handle translation from 802.11 format to destination network format

802.11 Services: Intracell Services

1. Authentication

- Identify station before transmission with the use of a password

2. Deauthentication

- After deauthentication station cannot use the network anymore

3. Privacy

- Data must be encrypted

4. Data Delivery

- Perform data transmission. Transmission is not guaranteed to be reliable. High layer must deal with error detection/correction

Broadband Wireless: 802.16

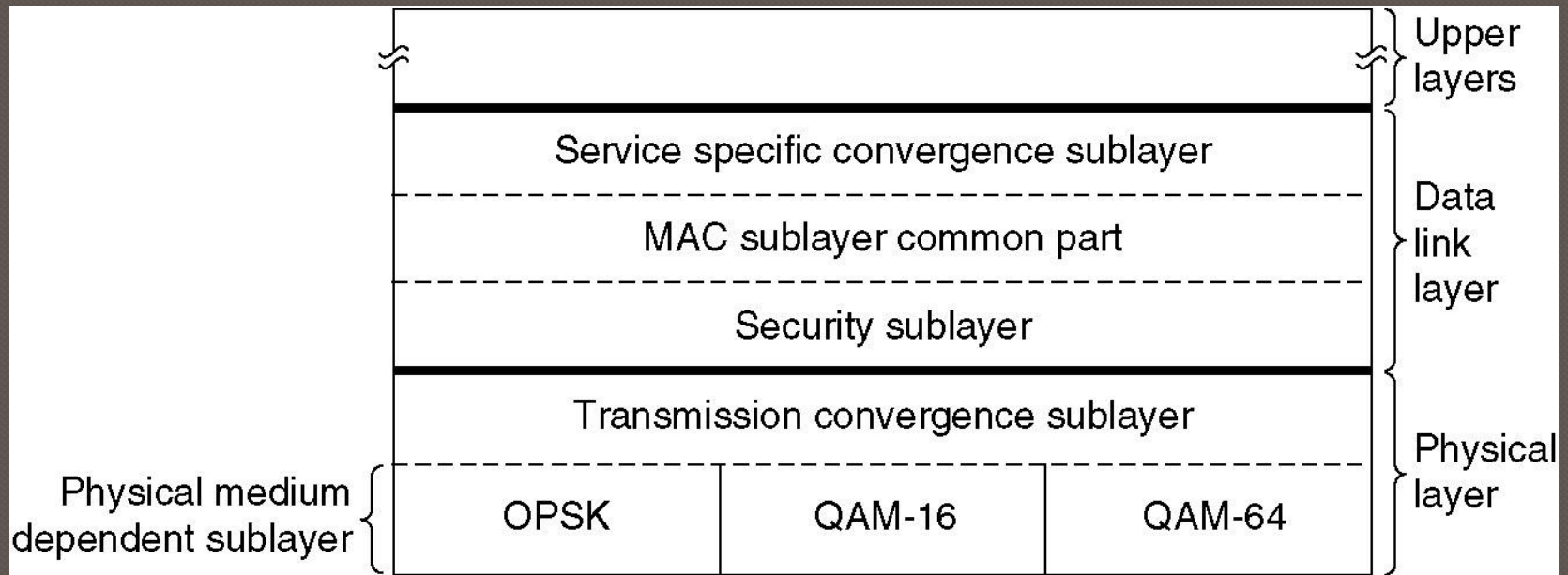
802.11	802.16
Provide service to mobile notebook computers	Provides service to not mobile buildings
Use low cost radio	Better quality radio (millimeter waves) (full duplex)
Waves are omnidirectional	Waves are directional and affected by weather
Security and privacy desired	Security and privacy mandatory
Less users → less bandwidth saturated	More users → more bandwidth saturated
Covers a small area	Covers a larger area
Supports low quality of service	Supports high quality of service
Less demanding	More demanding

Comparison of 802.11 and 802.16

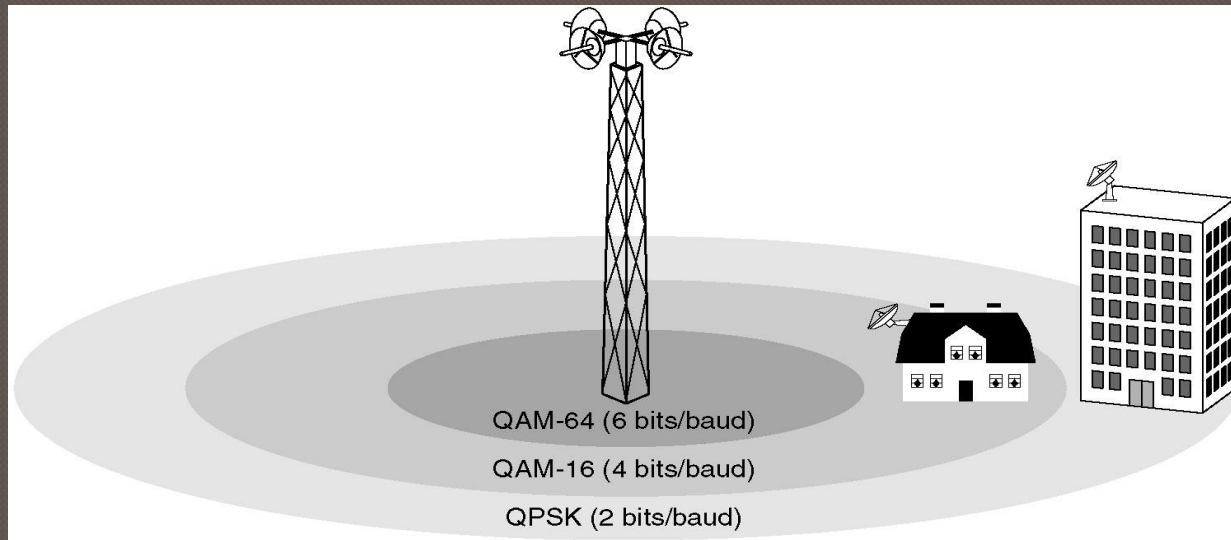
- They solve a different problem

The 802.16 Protocol Stack

The 802.16 Protocol Stack.



The 802.16 Physical Layer



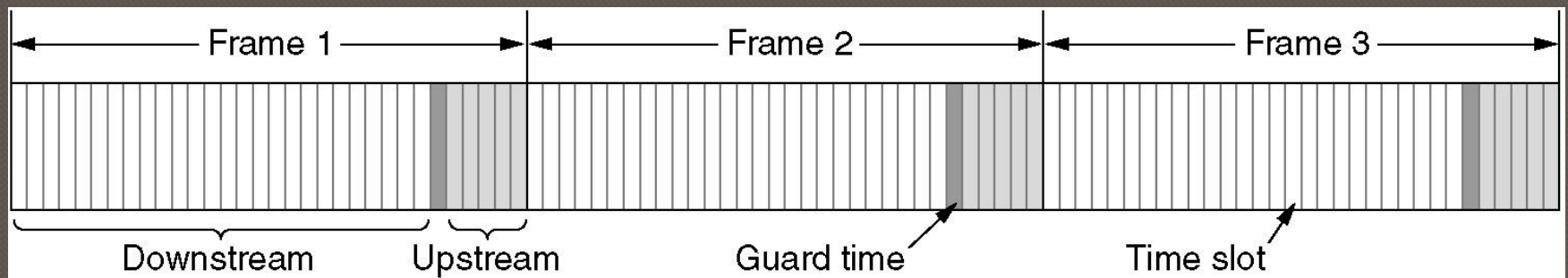
The 802.16 transmission environment.

- Modulation used depends on distance
 - For a typical value of 25 MHz spectrum
 - QAM-64 gives 150 Mbps
 - QAM-16 gives 100 Mbps
 - QPSK gives 50 Mbps
 - i.e. the farther the subscriber the lower the data rate

The 802.16 Physical Layer (2)

○ Frames and time slots for time division duplexing.

- Frames are packed back-to-back in a single physical transmission for efficiency
- Hamming code is used for error correction



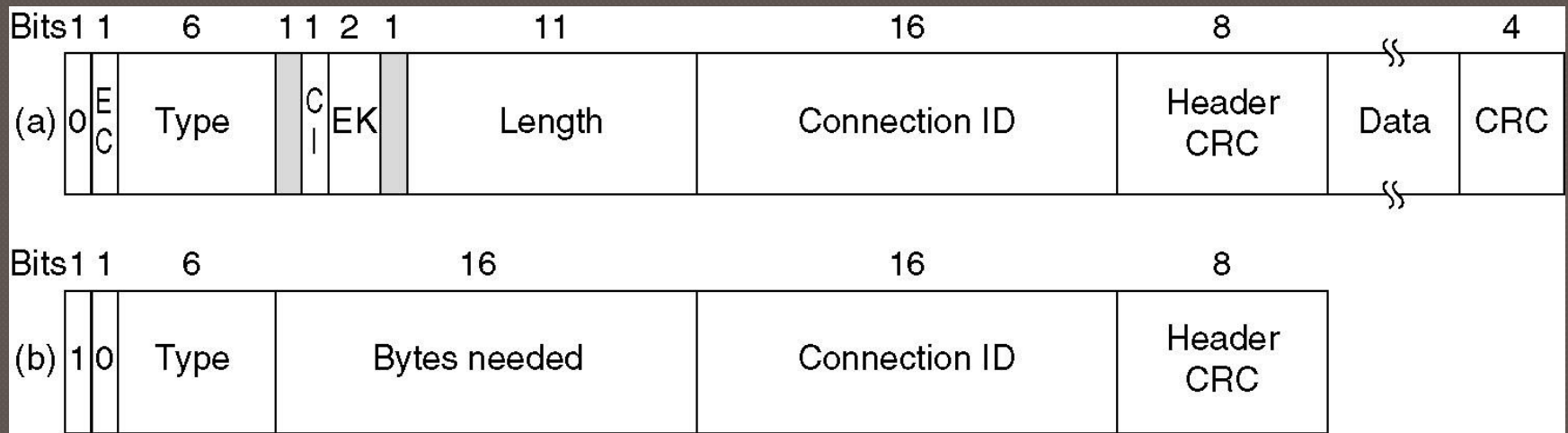
The 802.16 MAC Sublayer Protocol

Service Classes

- Constant bit rate service
- Real-time variable bit rate service
- Non-real-time variable bit rate service
- Best efforts service

The 802.16 Frame Structure

(a) A generic frame. (b) A bandwidth request frame.



Next Time

- ◉ Bluetooth
- ◉ VLAN
- ◉ Switching Devices