Network Communications
Chapter 15

Wireless LANs

IEEE 802.11b

- 11 Mbit/s
- Encrypted (but questionable security)

Figure 15.1: Peer-to-Peer

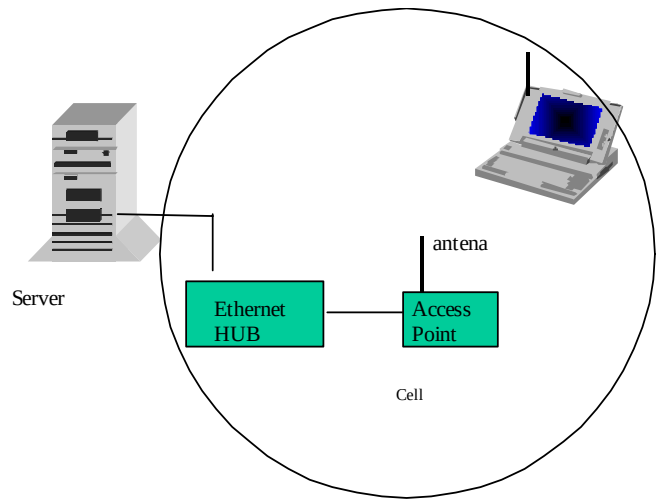

Figure 15.2: Access Point

Multiple Access Points

- Supports roaming

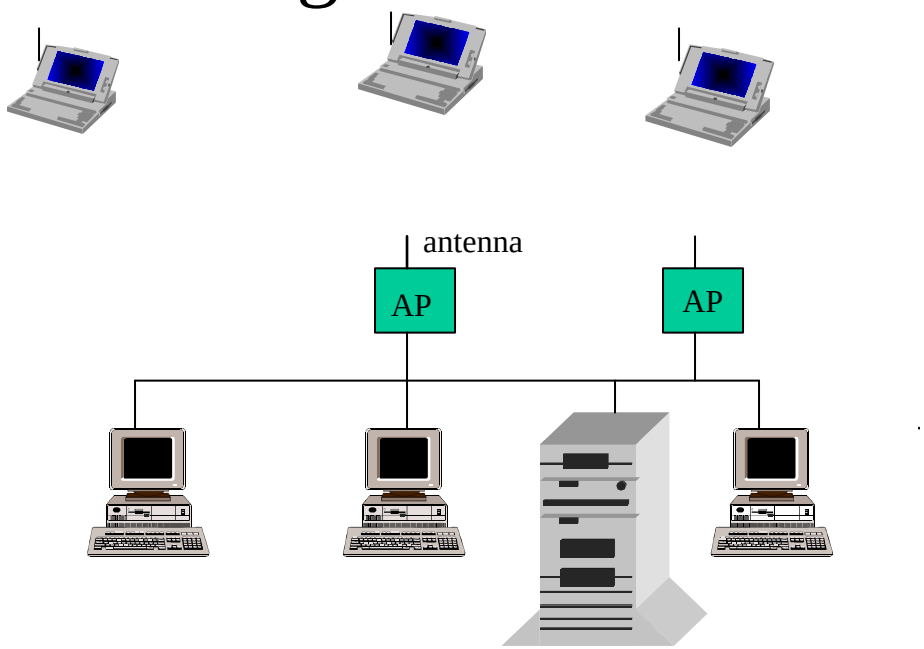

Figure 15.3

Other Wireless Systems

- InfraRed: Short range, slow connection
- Bluetooth: Short range, fast connection
- Cell/PCS: Wide Area Network
  - CDPD: 10 Kbit/sec data on old analog cell systems (Cellular Digital Packet Data)
  - GSM: 13 Kbit/sec data (European cell standard)
  - G3: High Speed (promised)

Radio Frequency Technology

- Wavelength $\lambda = \frac{C}{f}$
  - C = $3*10^8$ m/sec
  - F = frequency (Hz)
- Modulation
  - Narrow Band (AM, FM)
  - Wide Band (Spread Spectrum)

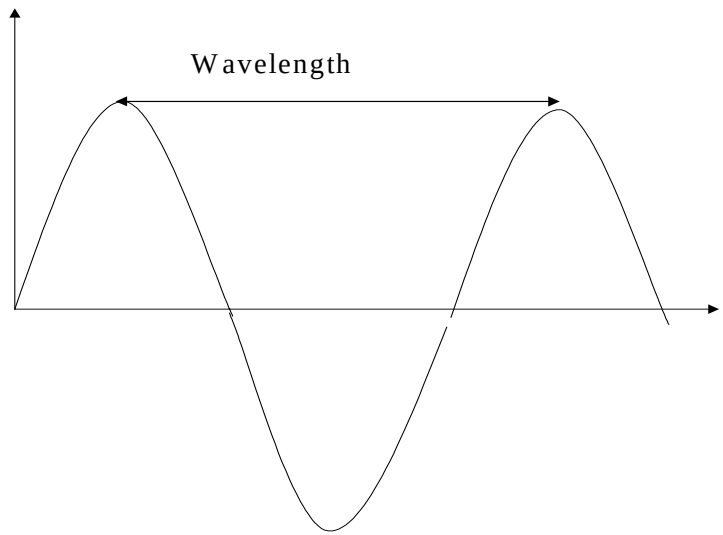

Figure 15.4

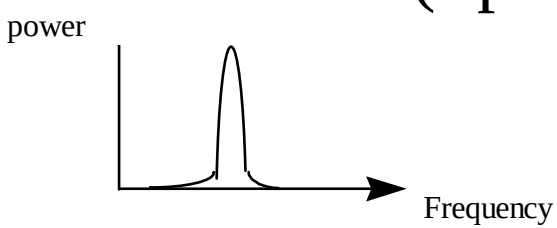

Figure 15.5: Narrow Band

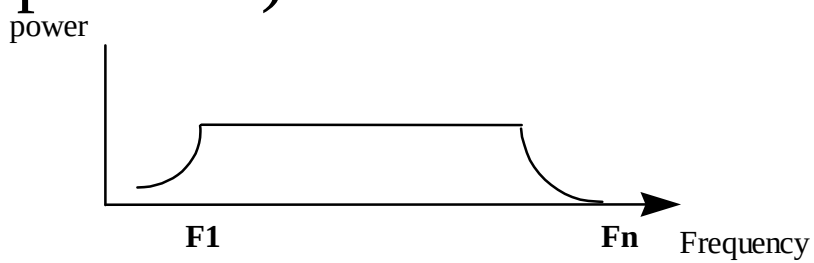

Figure 15.6: Spread Spectrum

Industrial, Scientific, and Medical Frequency Bands

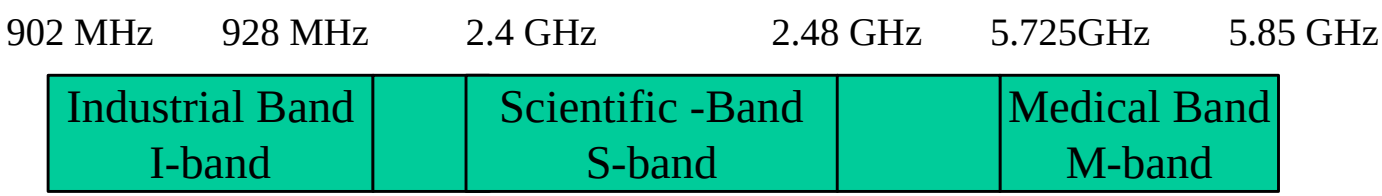

Figure 15.7

Spread Spectrum

- Frequency Hopping:
  Invented by Heddy Lamar during WWII
- Direct Sequence :
  Invented at ITT Labs in Nutley NJ ~1950

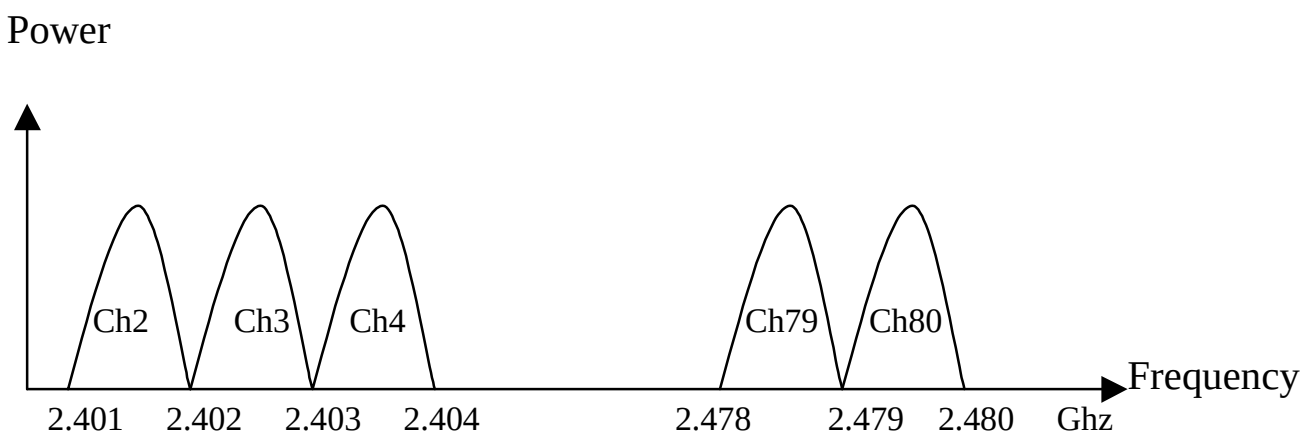

Figure 15.8: frequency Hopping Spread Spectrum

Spread Spectrum (cont.)

- Spread Spectrum Properties
  - Difficult to jam
  - Difficult to eavesdrop
  - Less interference with other services

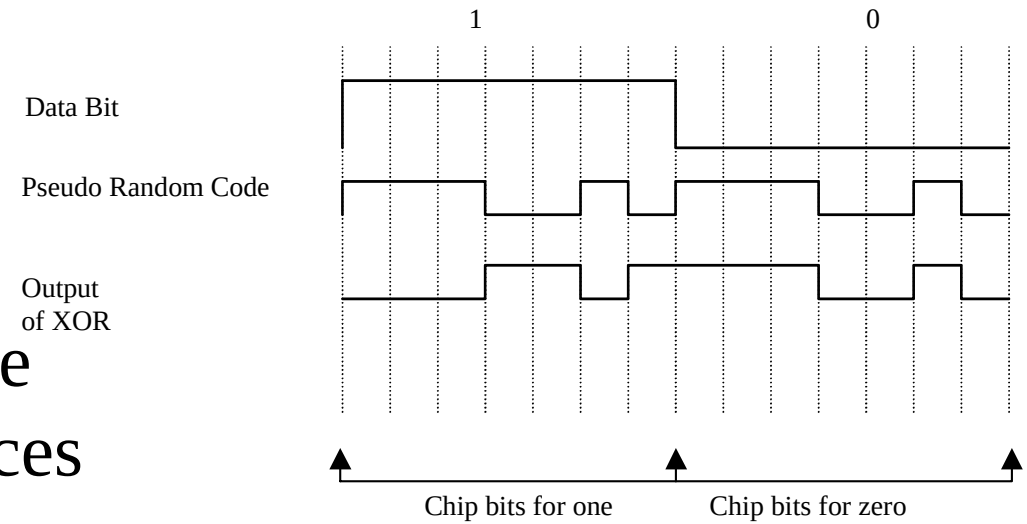

Figure 15.9: Direct Sequence Spread Spectrum

Direct Sequence Hardware

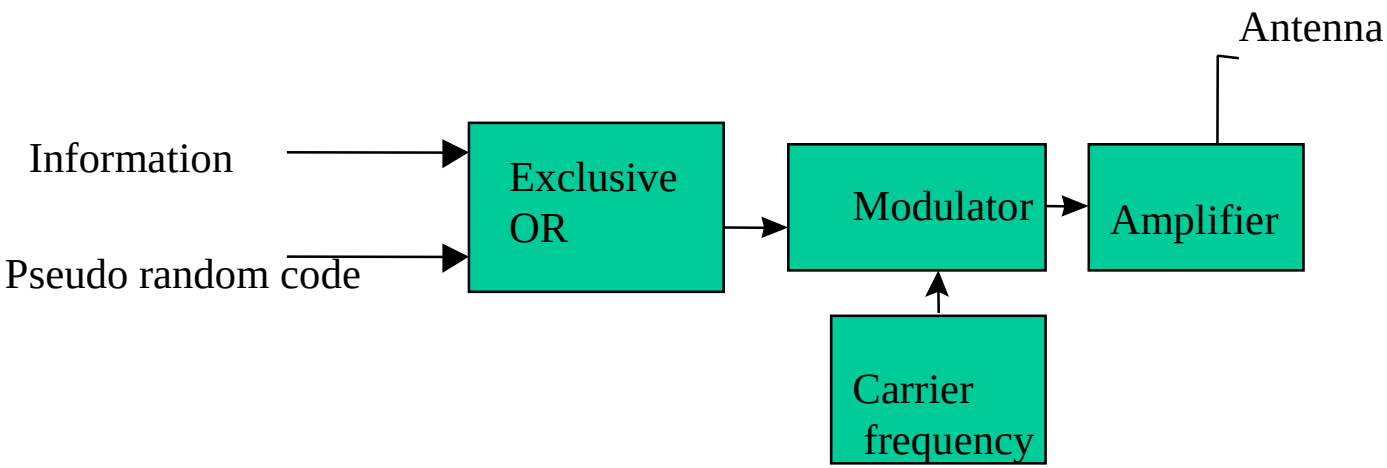

Figure 15.10

CSMA/CA

Carrier Sense Multiple Access / Collision Avoidance

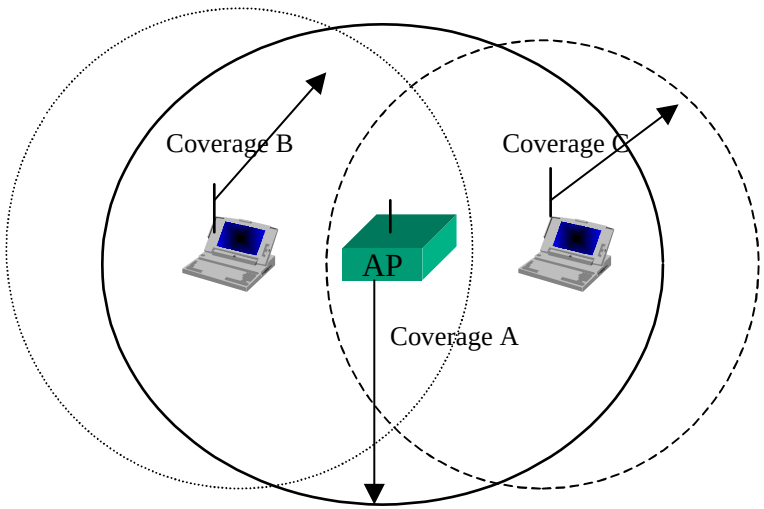

Figure 15.11

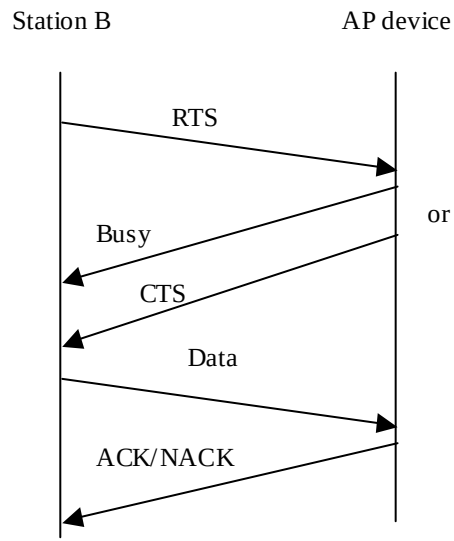

Figure 15.12