cs570

802.11 Wireless LAN

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802.11 Background

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- The idea: a wireless version of the Ethernet
- Standards Developed by IEEE
- AKA "WiFi"
- Compatible with other 802's at L3
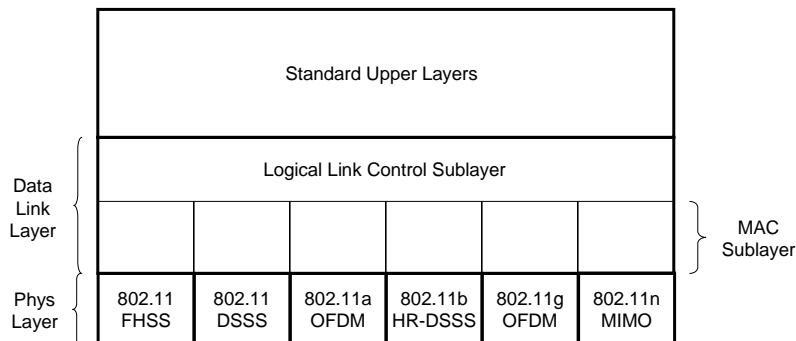
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802.11 standards

	Basic	11a	11b	11g	11n
Released	1997	1999	1999	2003	2008
Freq. band	2.4Ghz	5Ghz	2.4GHz	2.4GHz	2.4, 5GHz
Max data rate	2 Mbps	54 Mbps	11 Mbps	19 Mbps	74 Mbps
Modulation	FHSS DSSS	OFDM	DSSS	OFDM	MIMO
Max Range (approx)	100m	100m	150m	150m	250m

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802.11 Protocol Stack

Standard Upper Layers

Data Link Layer

Logical Link Control Sublayer

MAC Sublayer

Phys Layer

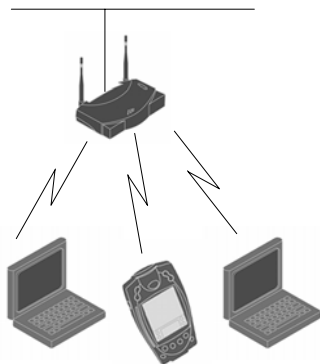| 802.11 FHSS	802.11 DSSS	802.11a OFDM	802.11b HR-DSSS	802.11g OFDM	802.11n MIMO

After Tanenbaum, Computer Networks, 4e, 2002, p293.
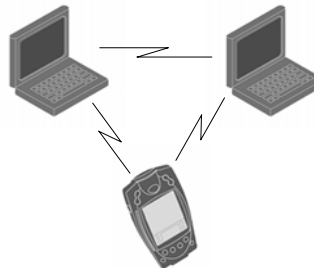
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Basic Operating Configurations

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With Wired Access Point

Without Access Point
"ad hoc mode"

Clipart courtesy Symbol Technologies, www.symbol.com
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Operating Modes

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- "Point Coordination Function" (PCF)
  - Designed for Infrastructure Mode
  - Base unit is the "root" that controls the network, schedules all transmission and passes all traffic
- "Distributed Coordination Function" (DCF)
  - Similar in intent to Ethernet
  - Designed for Ad-hoc Mode
  - Stations communicate directly with each other

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Some major differences from Ethernet

- Hidden node problem prevents CS
  - A station can't be assured of hearing other stations that are in range of a destination
- Most radios are half-duplex, so can't Listen While Talk, so no CD

- So we can't use CSMA/CD in DCF

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Multiple Access Collision Avoidance for Wireless (MACAW)

- Note: Collision <u>Avoidance</u>, not Detection
- The protocol:
  1. Station wishing to send broadcasts "Request to Send" (RTS) – identifies desired receiver and length of message*
  2. Receiver broadcasts "Clear to Send" (CTS) – identifies sender and length
  3. Sender knows it can proceed with transmit. Any other station that hears the CTS knows it must stay silent.
  4. Sender proceeds with transmit.
  5. At end of transmission, receiver broadcasts "ACK". This is a signal to other stations that they can try an RTS.

  * If there is a collision between two RTS's, the receiver will hear garbage and will not CTS. Senders will time out and retry according to Exponential Backoff Algorithm.

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