

Wireless Ethernet (802.11) Overview

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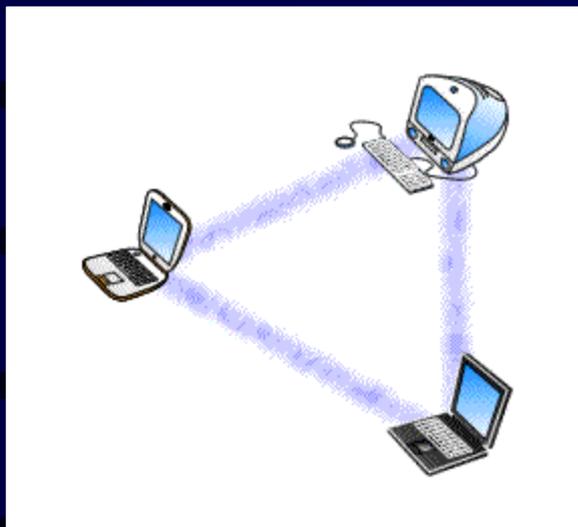
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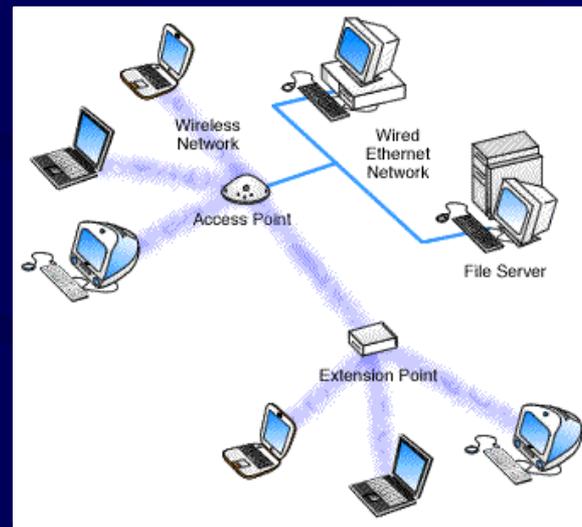
What is IEEE 802.11?

- IEEE 802.11 is extension of Ethernet standard (IEEE 802.3) into wireless communications
- Allows roaming computers to talk to other devices (peer-to-peer) or connect to wired network (transmitter/receiver)
- IEEE standard allows interoperability between multiple vendors products

Examples of 802.11 Networks



Peer-to-Peer Network



Transmitter/Receiver
(Wired/Wireless Network)

Pictures from Vicomsoft Web Site, <http://www.vicomsoft.com/>

802.11 Specification

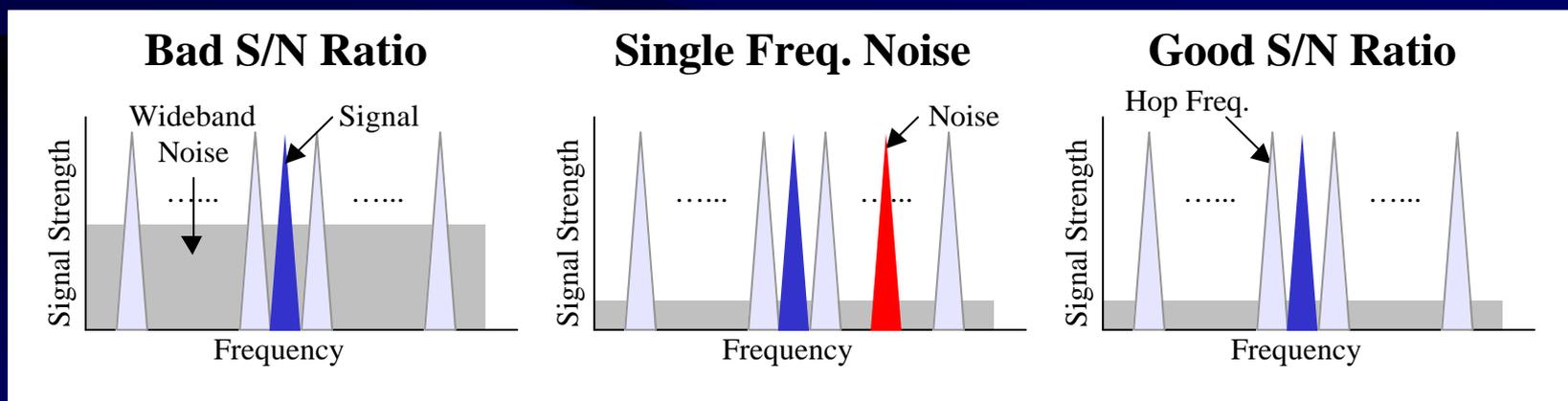
- Speeds of 1-2 Mb/sec
- Operating Range: 10-100m indoors, 300m outdoors
- Power Output Limited to 1 Watt in U.S.
- Frequency Hopping (FHSS), Direct Sequence (DSSS), & Infrared (IrDA)
 - Networks are NOT compatible with each other
- Uses unlicensed 2.4 GHz band (2.402-2.480 GHz)
- Provide wireless Ethernet for wired networks

802.11 Variations

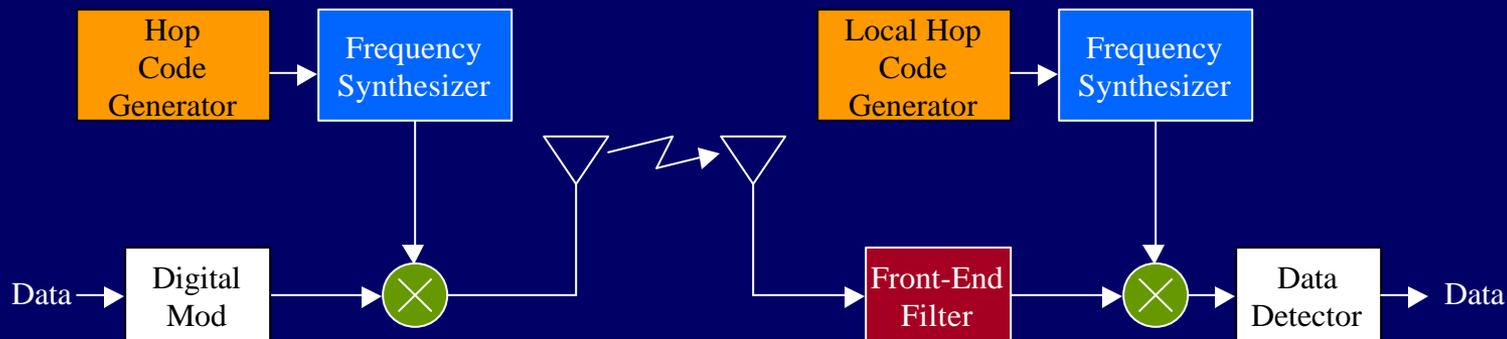
- 802.11a
 - Speeds of 6-54 Mb/sec
 - Uses 5 GHz band instead
 - Not commercially available, at the moment
- 802.11b
 - Speeds of 5.5 or 11 Mb/sec
 - Direct Sequence Spread Spectrum (DSSS) Only
 - Backward compatible with 802.11 DSSS components

Freq. Hopping Spread Spectrum

- Uses 79 separate 1 MHz channels from 2.402-2.480 GHz
- Hops about every 0.1 sec (22 hop pattern, 2.5 hop/sec minimum in US)
- Immune to single frequency noise, has trouble with wideband noise
- Many networks can be located in the same area
- Uses less power to transmit & less expensive to build than DSSS



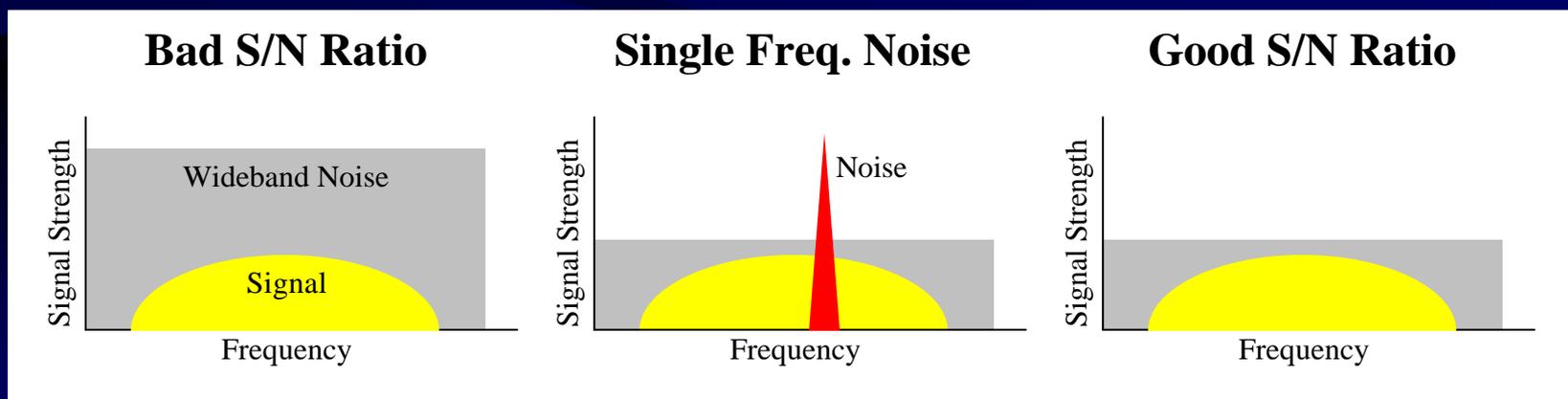
FHSS Block Diagram



From Wayne Manges Presentation @ ISA Conference on Wireless Communications

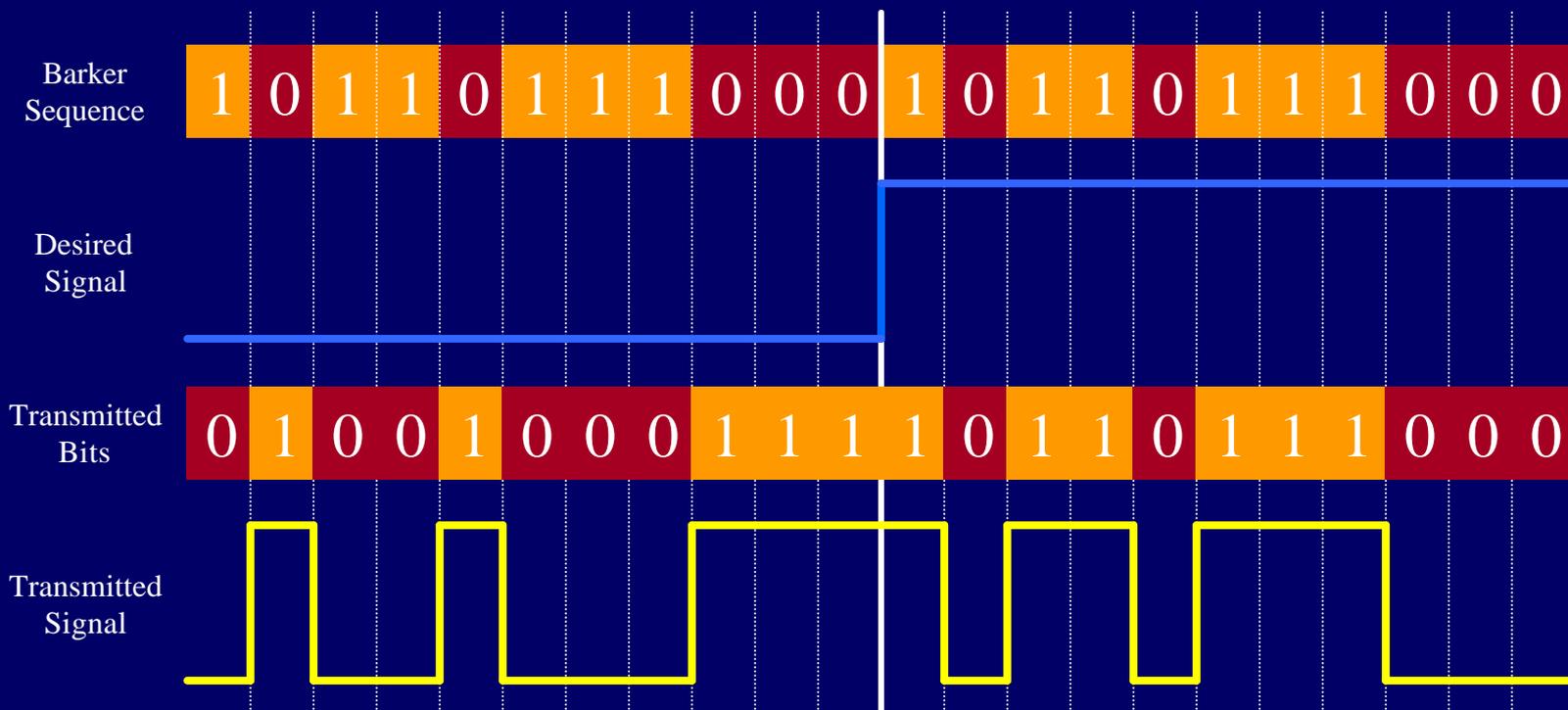
Direct-Sequence Spread Spectrum

- Signal modulated with a spreading code (11-bit Barker Sequence)
- All 802.11b compliant products use the same spreading code
- Higher data rates because of “fatter pipe” (about 11 MHz)
- Allows for some single frequency noise & higher wideband noise
- Only allows for 3 networks in same area
- Uses higher power to transmit & more expensive to build than FHSS

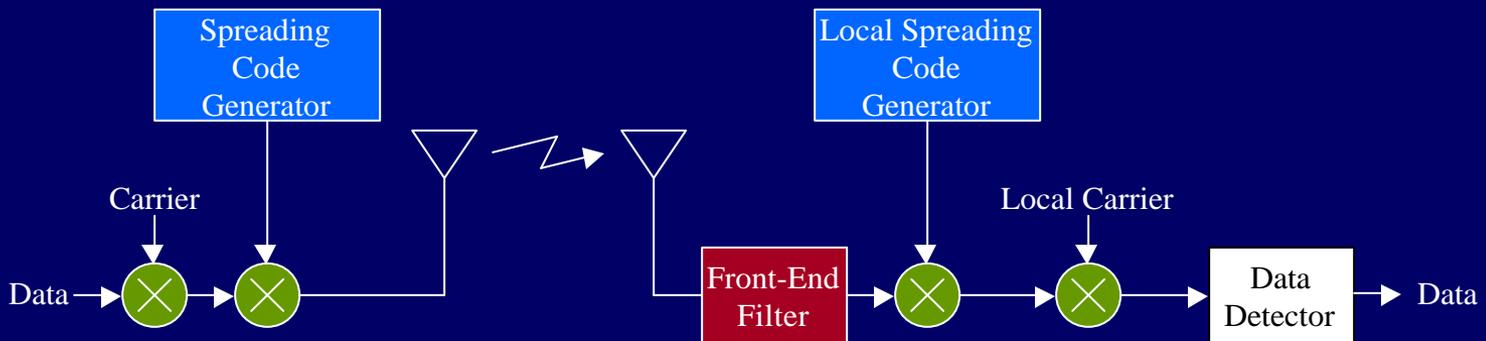


DSSS (cont'd)

Transmit data bits 01 using DSSS spreading code 10110111000



DSSS Block Diagram



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802.11b Security (WEP Protocol)

- 802.11b uses Wired Equivalent Privacy (WEP) protocol for encryption and authentication
- WEP protocol is self-synchronizing
- 64-bit key (40-bit secret code, 24-bit “init” vector)
 - 128-bit keys available for extra \$\$\$
- Additional info sent with message for data integrity checks (i.e. CRC-32)
- Uses same key to encrypt/decrypt message

802.11b Equipment

- IEEE standard allows for many vendors
 - Access Point Base Stations \$200-\$1200
 - Access Point Software \$175
 - PCMCIA Cards \$80-\$375
 - PCI Cards \$50-\$300
 - Extension Point Base Stations \$1400
- Prices vary greatly due to different features like security options, number of users, etc.
- <http://www.wirelesscentral.net/>

References

- <http://www.cwt.vt.edu/>
- <http://www.unc.edu/depts/oit/ns/wireless/>
- <http://www.vicomsoft.com/>
- <http://www.wirelessethernet.org/>
- <http://www.wlana.com/>
- <http://www.wirelesscentral.net/>
- <http://www.nortelnetworks.com/>
- <http://www.proxim.com/>
- <http://www.cisco.com/>