

Chapter 10: Wireless LAN

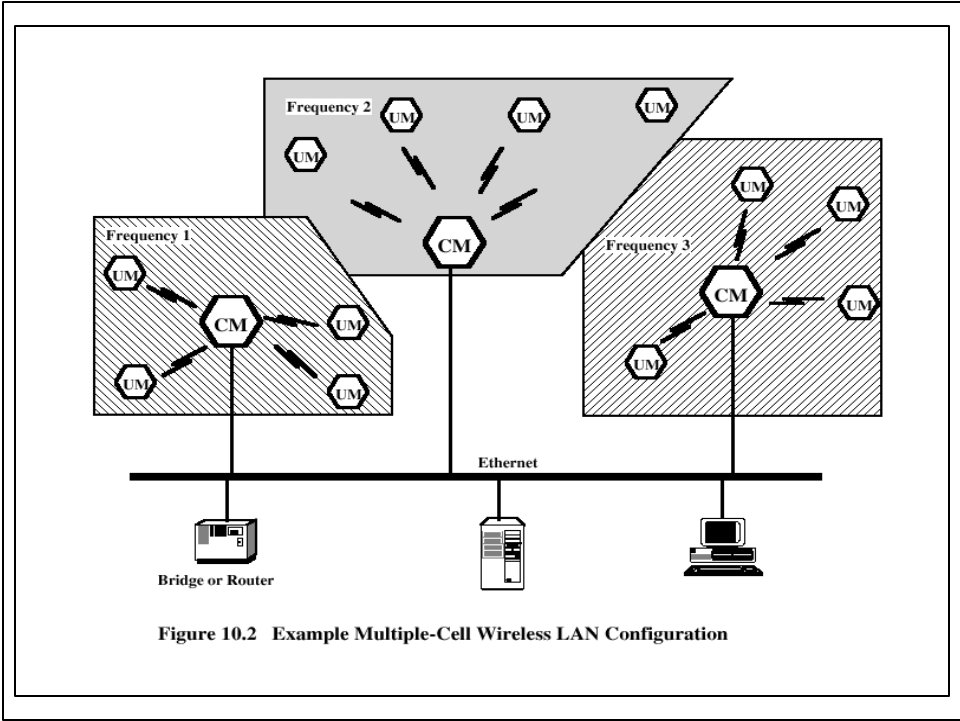
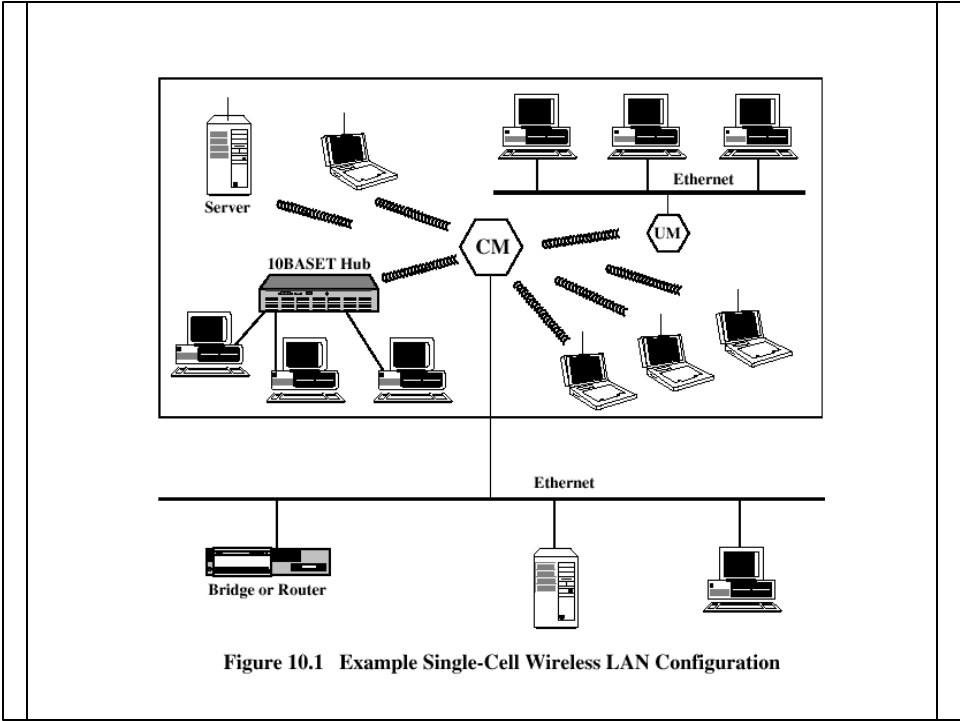
- Overview
- Infrared LANs
- Spread spectrum LANs
- Narrowband Microwave LANs
- IEEE 802.11 Wireless LAN Standard

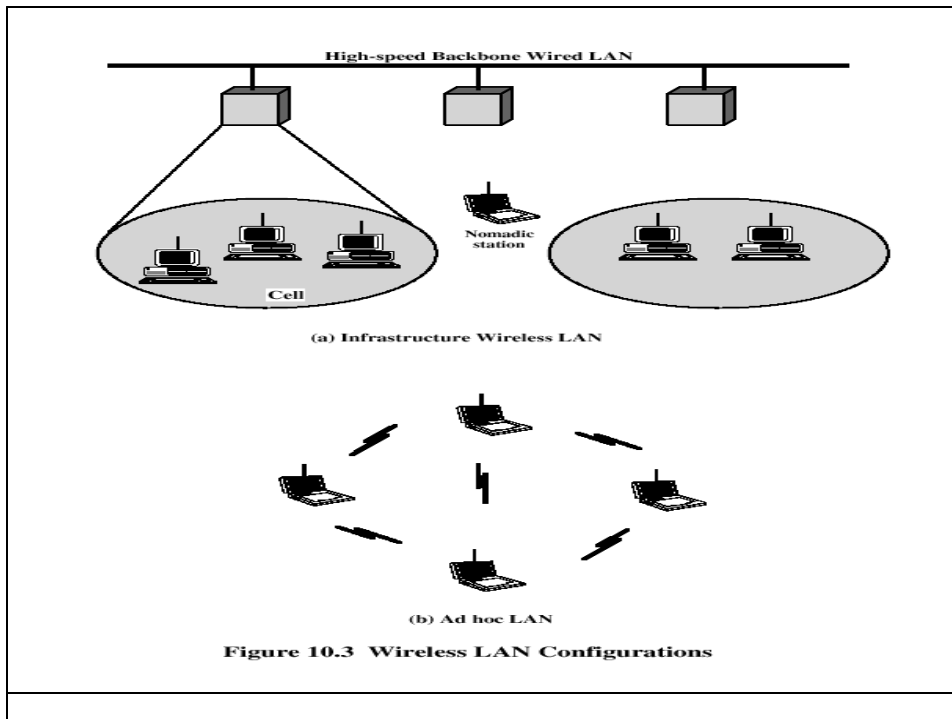
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Overview

- What are the applications of WLAN?
 - » Coverage expansion
 - » Cross-building interconnection
 - » Nomadic Access
 - » Ad hoc networking

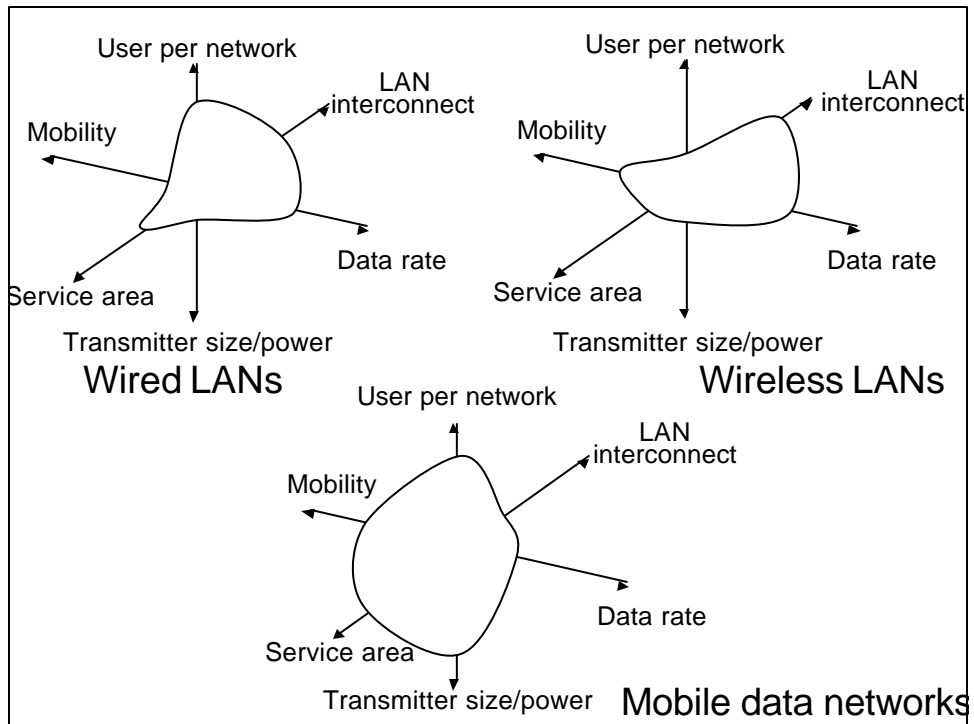
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WLAN Requirements

- ✍ Throughput
- ✍ Number of nodes
- ✍ Connection to backbone
- ✍ Service area
- ✍ Transmission robustness and security
- ✍ Collocated network operation
- ✍ License-free operation
- ✍ Handoff/roaming
- ✍ Dynamic configuration



WLAN technologies

- ✍ Infrared (IR) LAN
- ✍ Spread Spectrum LAN
- ✍ Narrowband Microwave LAN

	Infrared		Spread Spectrum		Radio
	Diffused	Focused	FHSS	DSSS	Narrowband Microwave
Rate (Mbps)	1 -4	1-10	1-3	2-20	10-20
Mobility	S/M	LoS	Mobile	Stationary/Mobile	
Range(ft)	50-200	80	100-300	100-800	40-120
Detectability	negligible		Little		Some
Wavelength/freq	?: 800-900 nm		902 - 928 MHz 2.4 - 2.4835 GHz 5.725-5.85 GHz	902 - 928 MHz 5.2-5.775 GHz 18.825-19.205 GHz	
Modulation	ASK		FSK	QPSK	FS/QPSK
Power	-		< 1W		25 mW
Access	CSMA	Token Ring-CSMA	CSMA		Reservation /ALOHA, CSMA

Infrared (IR) LANs

- ✍ Remote access devices
- ✍ Virtually unlimited spectrum
- ✍ Unregulated
- ✍ Diffusely reflected by light-colored objects
- ✍ Does not penetrate walls or other opaque objects
 - ✍ Secure
 - ✍ Interference confinement
- ✍ Inexpensive, why?

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Transmission Techniques for IR LANs

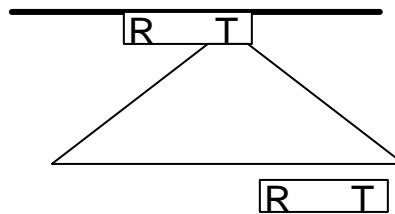
- ✍ Directed Beam Infrared
 - » Focused IR data link could be in a range of kilometers
 - » Point-to-point links
 - » Can be used for cross-building interconnect

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Transmission Techniques for IR LANs

➤ Omnidirectional

- » used in a single room
- » one base station (BS) acts a multiport repeater
- » user use a directional beam aimed at the ceiling BS

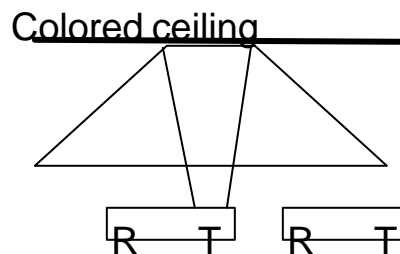


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Transmission Techniques for IR LANs

➤ Diffused

- » all IR transmitters are focused
- » a reflecting ceiling



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Spread Spectrum LANs

- ✍ Initially developed for military and intelligence applications
- ✍ Goal: spread the signal over a wider bandwidth to make the interception and delectability of the signal very difficult

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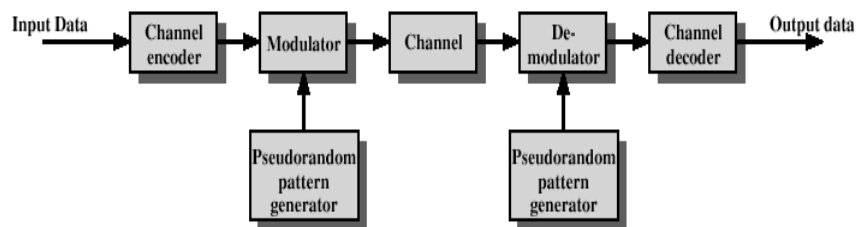


Figure 10.8 General Model of Spread Spectrum Digital Communication System

Frequency Hopping (FH)

- ✍ The signal is broadcast over a seemingly random series of radio frequencies
- ✍ Hopping from frequency to frequency at fixed interval
- ✍ During that interval (T_s), one or more bits (T_b) are transmitted
 - » if $T_s > T_b$, it is called Slow FH
 - » if $T_s < T_b$, it is called Fast FH
- ✍ Spreading factor = $W_s/W_d = 2^k$

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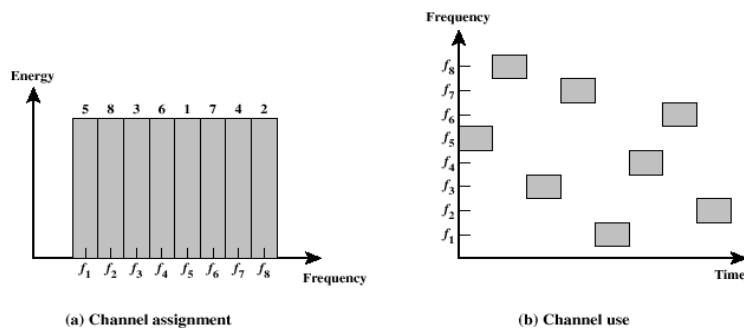
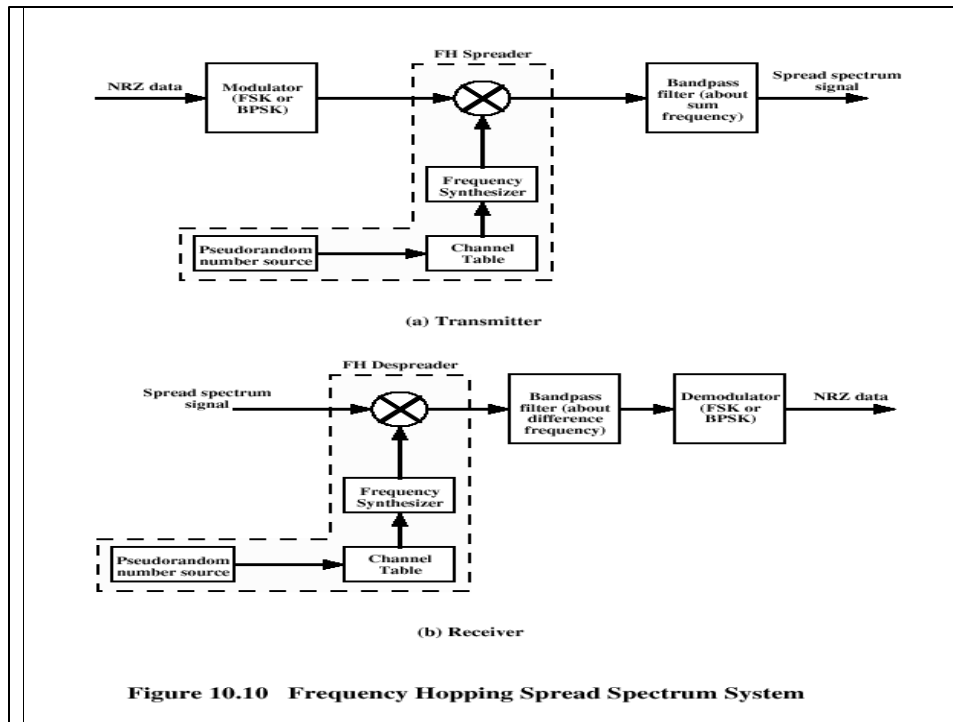
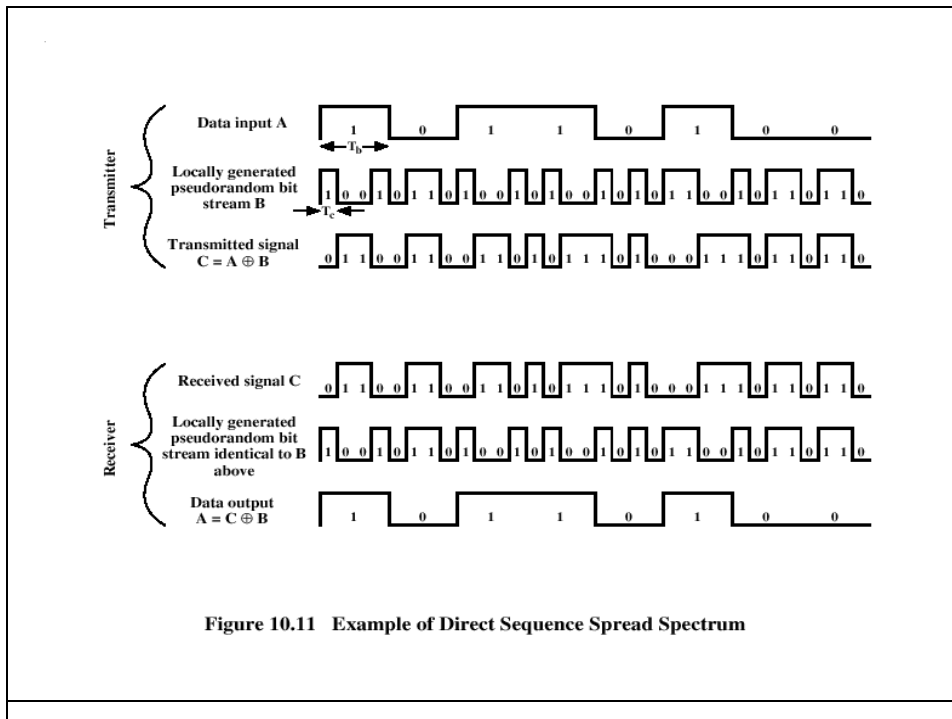


Figure 10.9 Frequency Hopping Example



Direct Sequence

- ✍ Each bit is represented by multiple bits in the transmitted signal
- ✍ Spreading factor = $T_b/T_c = 2^k$
- ✍ T_c is the chip duration



Spread Spectrum LAN Design

✍ Configuration:

» Hub

- acts as a multiport repeater
- Central controller

» Peer-to-Peer

✍ Transmission Issues:

- » 915 MHz band (cordless, wireless microphones)
- » 2.4 GHz band (microwave oven)
- » 5.8 GHz band (little competition, but Expensive)

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