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Wireless LAN Technology

Chapter 13



Wireless LAN Applications

- LAN Extension
- Cross-building interconnect
- Nomadic Access
- Ad hoc networking



LAN Extension

- Wireless LAN linked into a wired LAN on same premises
 - Wired LAN
 - Backbone
 - Support servers and stationary workstations
 - Wireless LAN
 - Stations in large open areas
 - Manufacturing plants, stock exchange trading floors, and warehouses

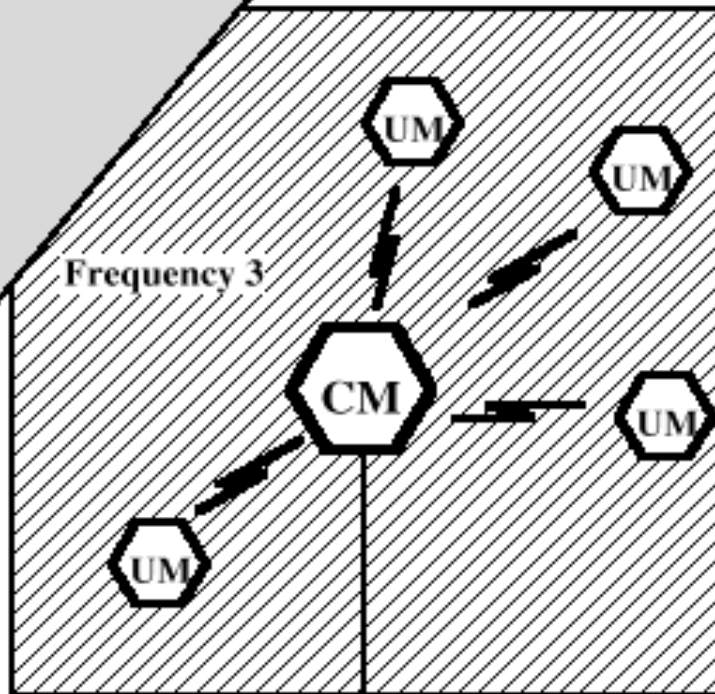
Frequency 2



Frequency 1



Frequency 3



100-Mbps
Ethernet Switch



Bridge or Router

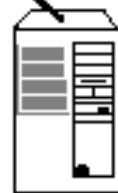


Figure 13.2 Example Multiple-Cell Wireless LAN Configuration



Cross-Building Interconnect

- Connect LANs in nearby buildings
 - Wired or wireless LANs
- Point-to-point wireless link is used
- Devices connected are typically bridges or routers



Nomadic Access

- Wireless link between LAN hub and mobile data terminal equipped with antenna
 - Laptop computer or notepad computer
- Uses:
 - Transfer data from portable computer to office server
 - Extended environment such as campus



Ad Hoc Networking

- Temporary peer-to-peer network set up to meet immediate need
- Example:
 - Group of employees with laptops convene for a meeting; employees link computers in a temporary network for duration of meeting



Wireless LAN Requirements

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



Wireless LAN Categories

- Infrared (IR) LANs
- Spread spectrum LANs
- Narrowband microwave

Strengths of Infrared Over Microwave Radio

- Spectrum for infrared virtually unlimited
 - Possibility of high data rates
- Infrared spectrum unregulated
- Equipment inexpensive and simple
- Reflected by light-colored objects
 - Ceiling reflection for entire room coverage
- Doesn't penetrate walls
 - More easily secured against eavesdropping
 - Less interference between different rooms



Drawbacks of Infrared Medium

- Indoor environments experience infrared background radiation
 - Sunlight and indoor lighting
 - Ambient radiation appears as noise in an infrared receiver
 - Transmitters of higher power required
 - Limited by concerns of eye safety and excessive power consumption
 - Limits range

Techniques

- Directed Beam Infrared
- Ominidirectional
- Diffused



Directed Beam Infrared

- Used to create point-to-point links
- Range depends on emitted power and degree of focusing
- Focused IR data link can have range of kilometers
 - Cross-building interconnect between bridges or routers



Ominidirectional

- Single base station within line of sight of all other stations on LAN
- Station typically mounted on ceiling
- Base station acts as a multiport repeater
 - Ceiling transmitter broadcasts signal received by IR transceivers
 - IR transceivers transmit with directional beam aimed at ceiling base unit



Diffused

- All IR transmitters focused and aimed at a point on diffusely reflecting ceiling
- IR radiation strikes ceiling
 - Reradiated omnidirectionally
 - Picked up by all receivers



Configuration

- Multiple-cell arrangement (Figure 13.2)
- Within a cell, either peer-to-peer or hub
- Peer-to-peer topology
 - No hub
 - Access controlled with MAC algorithm
 - CSMA
 - Appropriate for ad hoc LANs



Configuration

- Hub topology
 - Mounted on the ceiling and connected to backbone
 - May control access
 - May act as multiport repeater
 - Automatic handoff of mobile stations
 - Stations in cell either:
 - Transmit to / receive from hub only
 - Broadcast using omnidirectional antenna



Narrowband Microwave LANs

- Use of a microwave radio frequency band for signal transmission
- Relatively narrow bandwidth
- Licensed
- Unlicensed



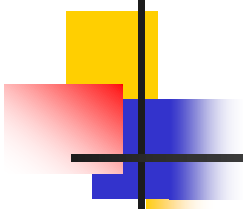
Licensed Narrowband RF

- Licensed within specific geographic areas to avoid potential interference
- Motorola - 600 licenses in 18-GHz range
 - Covers all metropolitan areas
 - Can assure that independent LANs in nearby locations don't interfere
 - Encrypted transmissions prevent eavesdropping



Unlicensed Narrowband RF

- RadioLAN introduced narrowband wireless LAN in 1995
 - Uses unlicensed ISM spectrum
 - Used at low power (0.5 watts or less)
 - Operates at 10 Mbps in the 5.8-GHz band
 - Range = 50 m to 100 m



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