

Wireless Network Configurations (II)



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Outline

- Wireless LANs (WLAN)
 - Radio Waves
 - Infrared Light
 - Carrier currents (“no new wire”)
- **Wireless Point-to-Point Networks**
- Wireless WANs

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Wireless Point-to-point

- Similar to WLAN technologies:
 - Radio waves
 - Laser beam
- Applications
 - Building links
 - Links for traffic control lights
 - Leased line backup

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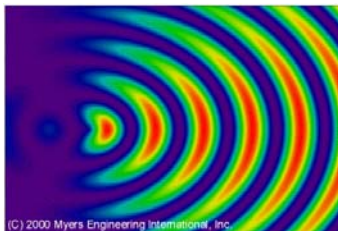
Radio-based Components

- Transceivers
- Wireline interface (bridge/router)
- Directional antenna

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Directional Antenna

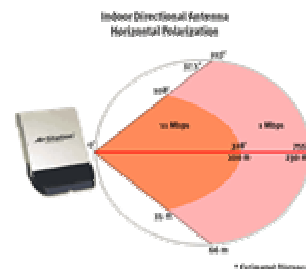


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Indoor Directional Antenna



Source: www.techworks.com

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Outdoor 2.4 GHz Band Antennas



24-dBi **Directional Antenna**
with Up/Down Converter on Mast



6-dBi **Omnidirectional Antenna**
with Up/Down Converter on Mast

Source: *Wi-Lan Technology (UC Wireless)* 7

Radio based Technologies



- Spread spectrum
 - ISM, interference (unknown source)
 - < 1 Watt
 - 4-5 Mbps – short range (2-3 Miles)
 - low bps – long range (30 Miles)
- Narrow band
 - Licenses, BW 25 KHz, 400-512 & 820-960 MHz
 - 30 Miles, 9-125 Kbps

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Laser-based



- Light **A**mplification by **S**timulated **E**mission of **R**adiation
- Narrow beam → infrared light
- Light beam → high data rate (10Mbps)
- Class III (may cause eye damage, birds safe)
- < 2 Miles range
- Weather interference (not from other sources)
- No license (> 300 GHz)
- X-ray images & CAD files transfer
- Secure

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- Wireless Point-to-Point Networks
- **Wireless WANs**

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Wireless WAN technologies



- Packet Radio WAN
- Analog cellular WAN
- Cellular Digital Packet Data WAN
- Satellite
- Meteor burst
- GPS & Wireless WANs

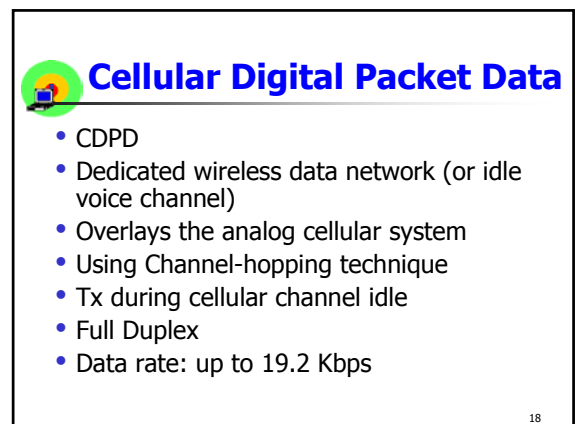
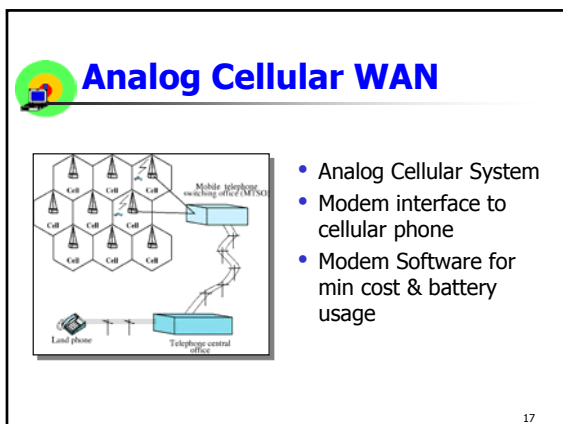
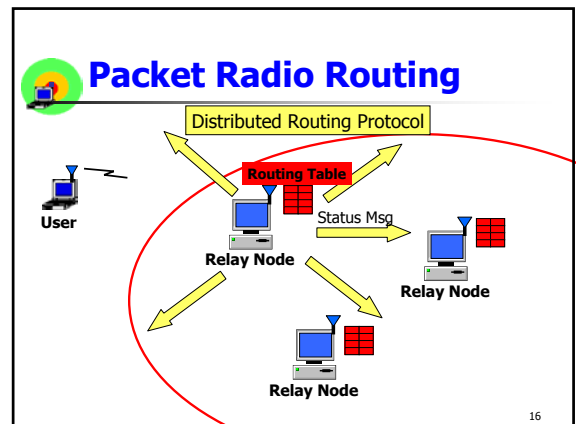
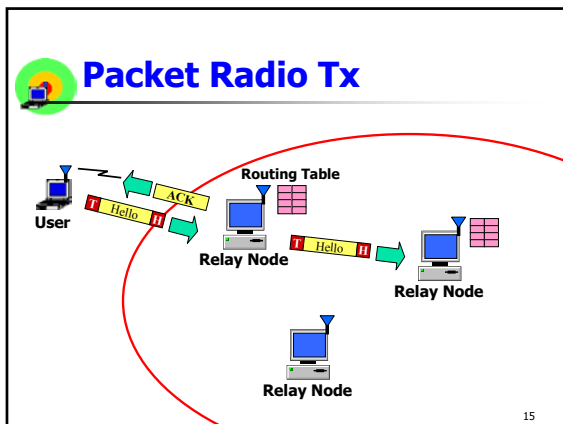
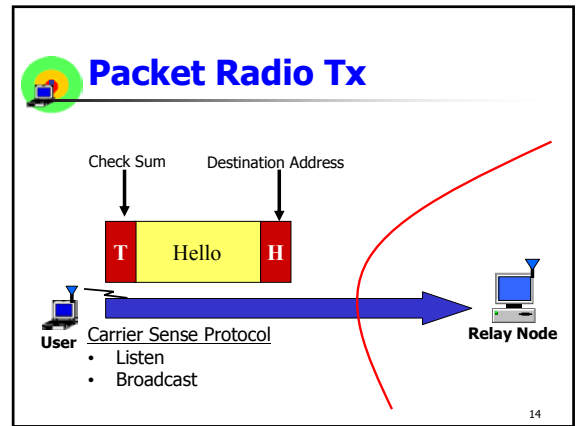
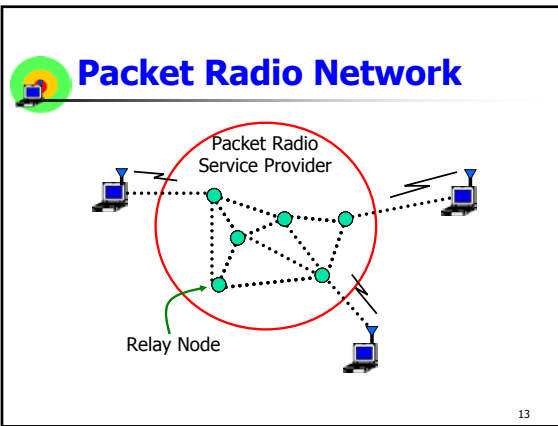
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Packet Radio WAN



- Packet switching
- Components
 - Radio modem
 - Lease access to packet-based wireless network from Service Providers
- Limited coverage area
- Operate on Layer 1,2, and 3
- One or more hops → routing
- Up to 20Kbps, no license needed

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CDPD

- Advantages
 - Wide coverage → piggyback on cellular system
 - Digital signals → encrypt & error control
 - Pay for actual data sent
- Available only in large city (US)
- Interim solution → digital cellular system
- Needed
 - CDPD modem
 - Lease CDPD service from service provider

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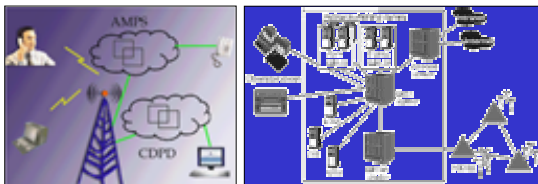
CDPD Modem



The Enfora PocketSpider wireless IP (CDPD) CompactFlash modem.

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CDPD Architecture

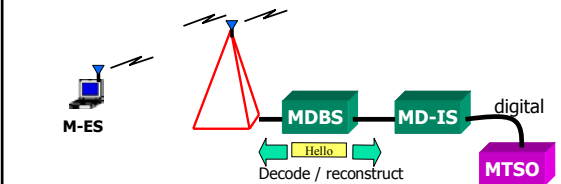


Source: www.ericson.com

<http://connect.to/cdpd>

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CDPD Architecture



MD-BS: Mobile Data Base Station (Wireless/Wire Bridge)
M-ES: Mobile End System (PC + CDPD modem)
M-IS: Mobile Intermediate System (mobility management)

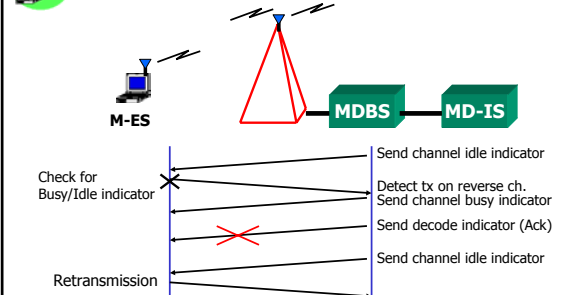
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CDPD transmission

- Protocol
 - Connectionless
 - Reed-Salomon forward error correction (FEC)
 - Digital Sense Multiple Access (DSMA) protocol
- Similar to Ethernet
- Full duplex
 - Forward channel for MD-BS
 - Reverse channel for M-ES

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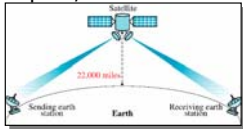
CDPD transmission



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Satellite

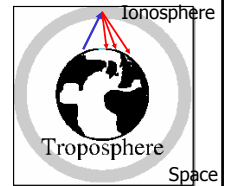
- High data rate & worldwide coverage
- High cost
 - Equipment & monthly fee
- Limited support for mobile users
 - Large dish (antenna)
- Act as a repeater with uplink/downlink
- Data rate ~ 64 Kbps
- Components
 - Antenna
 - Satellite transceiver
 - Computer interface



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Meteor Burst

- 52 miles from earth
- Radio wave modulated with data
- Reflect from the ionized gas
- Cost less than satellite
- 8 Kbps, 1000 miles area
- 40-50 MHz range



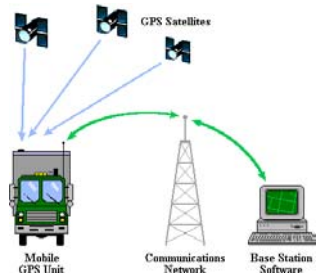
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GPS & Wireless WANs

- Global Positioning System
- Location devices
- Mobile station communicates with its exact location to other stations
- Automatic Vehicle Location (AVL)
- Combination of CDPD & GPS for vehicle tracking system

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Automatic Vehicle Location (AVL)



Source: http://icg.harvard.edu/~maps/hgis/announce_2001.htm

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