Fundamentals of Wireless LANs

What is a Wireless LAN?

- Provides all the features and benefits of traditional LAN technologies such as Ethernet and Token Ring, but without the limitations of wires or cables.
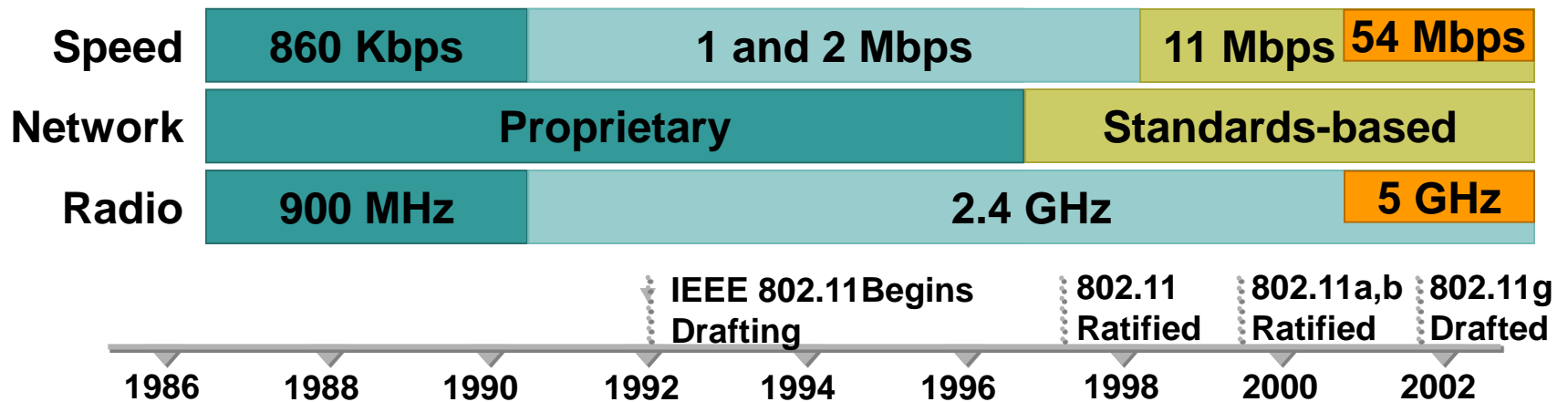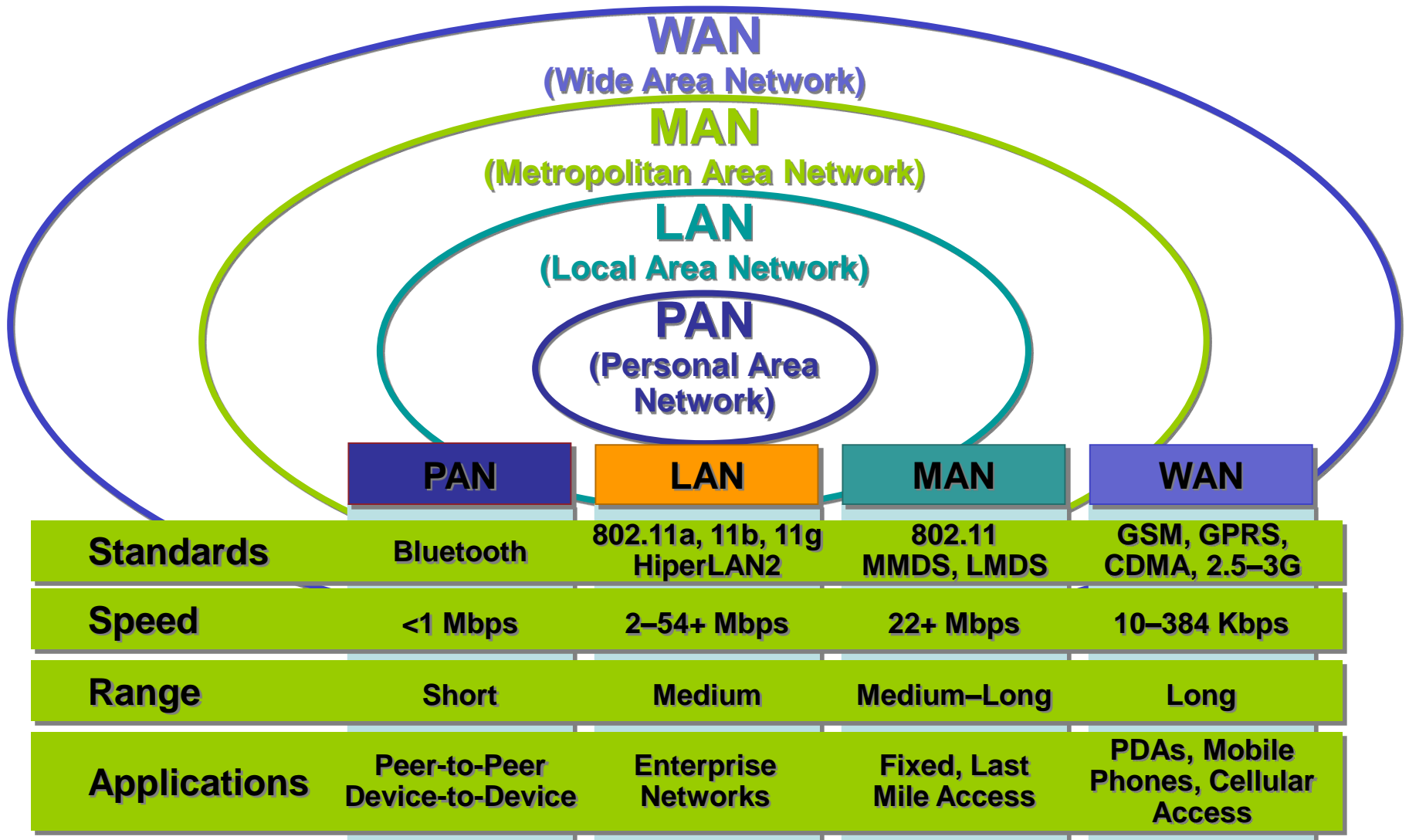
Benefits of WLANs

- Benefits include:
  - Mobility
  - Scalability
  - Flexibility
  - Short and long term savings
  - Installation advantages
  - Reliability in harsh environments
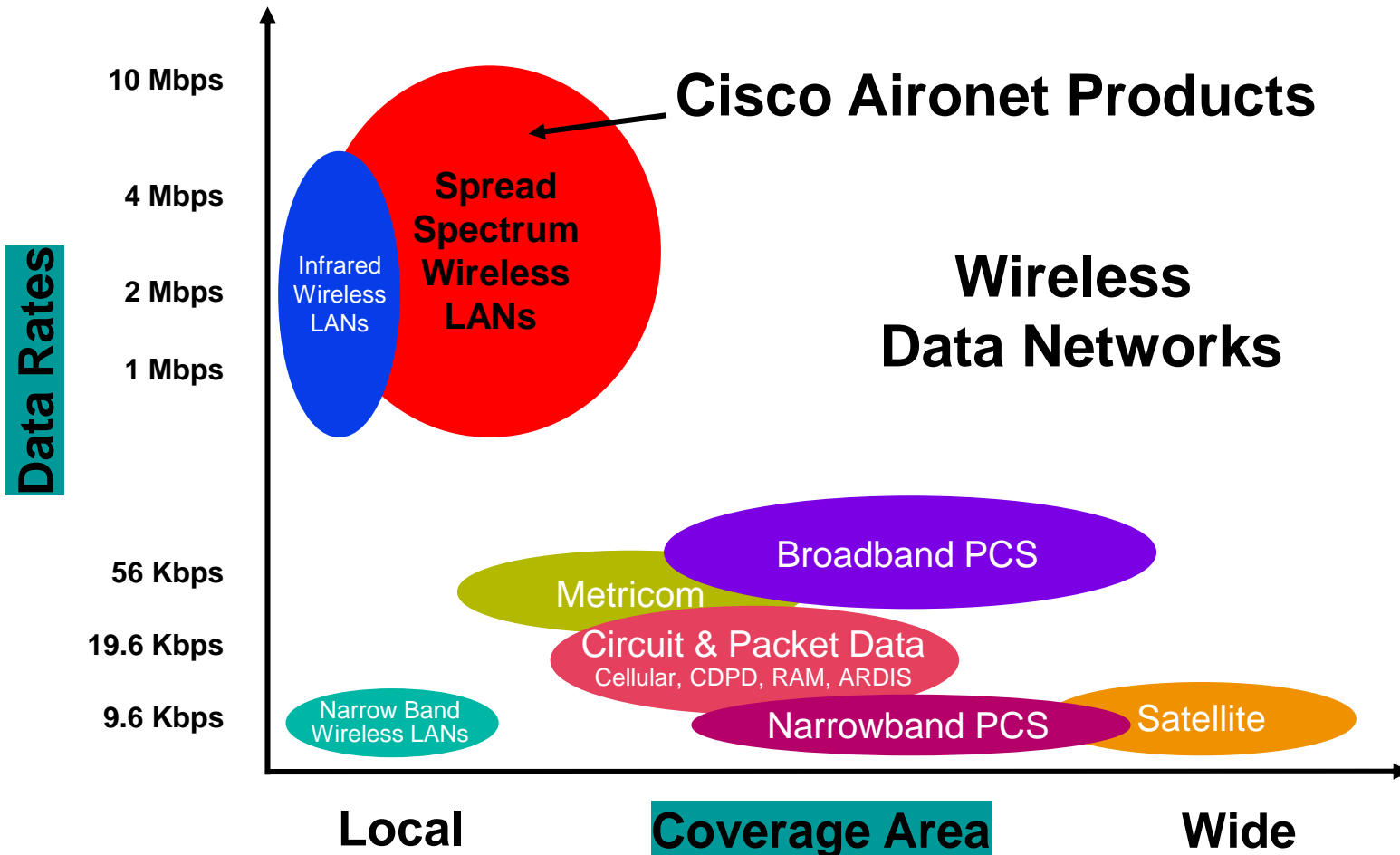 - Reduced installation time

WLAN Evolution

- Warehousing
- Retail
- Healthcare
- Education
- Businesses
- Home

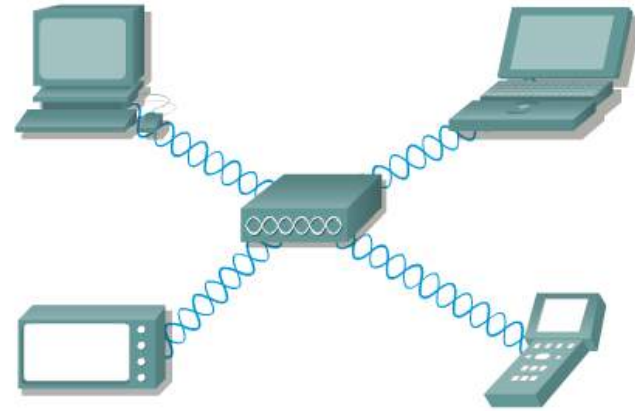| Speed	860 Kbps	1 and 2 Mbps	11 Mbps	54 Mbps
Network	Proprietary		Standards-based	
Radio	900 MHz	2.4 GHz		5 GHz

		IEEE 802.11 Begins Drafting			802.11 Ratified	802.11a,b Ratified	802.11g Drafted
1986	1988	1990	1992	1994	1996	1998	2000	2002

Wireless Technologies

WAN
(Wide Area Network)

MAN
(Metropolitan Area Network)

LAN
(Local Area Network)

PAN
(Personal Area Network)

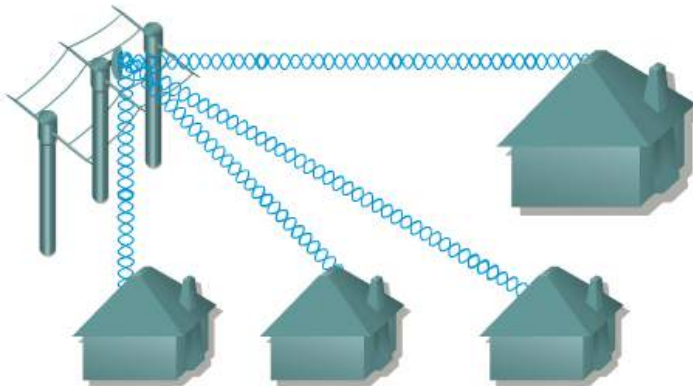|	PAN	LAN	MAN	WAN
Standards	Bluetooth	802.11a, 11b, 11g HiperLAN2	802.11 MMDS, LMDS	GSM, GPRS, CDMA, 2.5–3G
Speed	<1 Mbps	2–54+ Mbps	22+ Mbps	10–384 Kbps
Range	Short	Medium	Medium–Long	Long
Applications	Peer-to-Peer Device-to-Device	Enterprise Networks	Fixed, Last Mile Access	PDAs, Mobile Phones, Cellular Access

Wireless Data Networks

Wireless Technologies

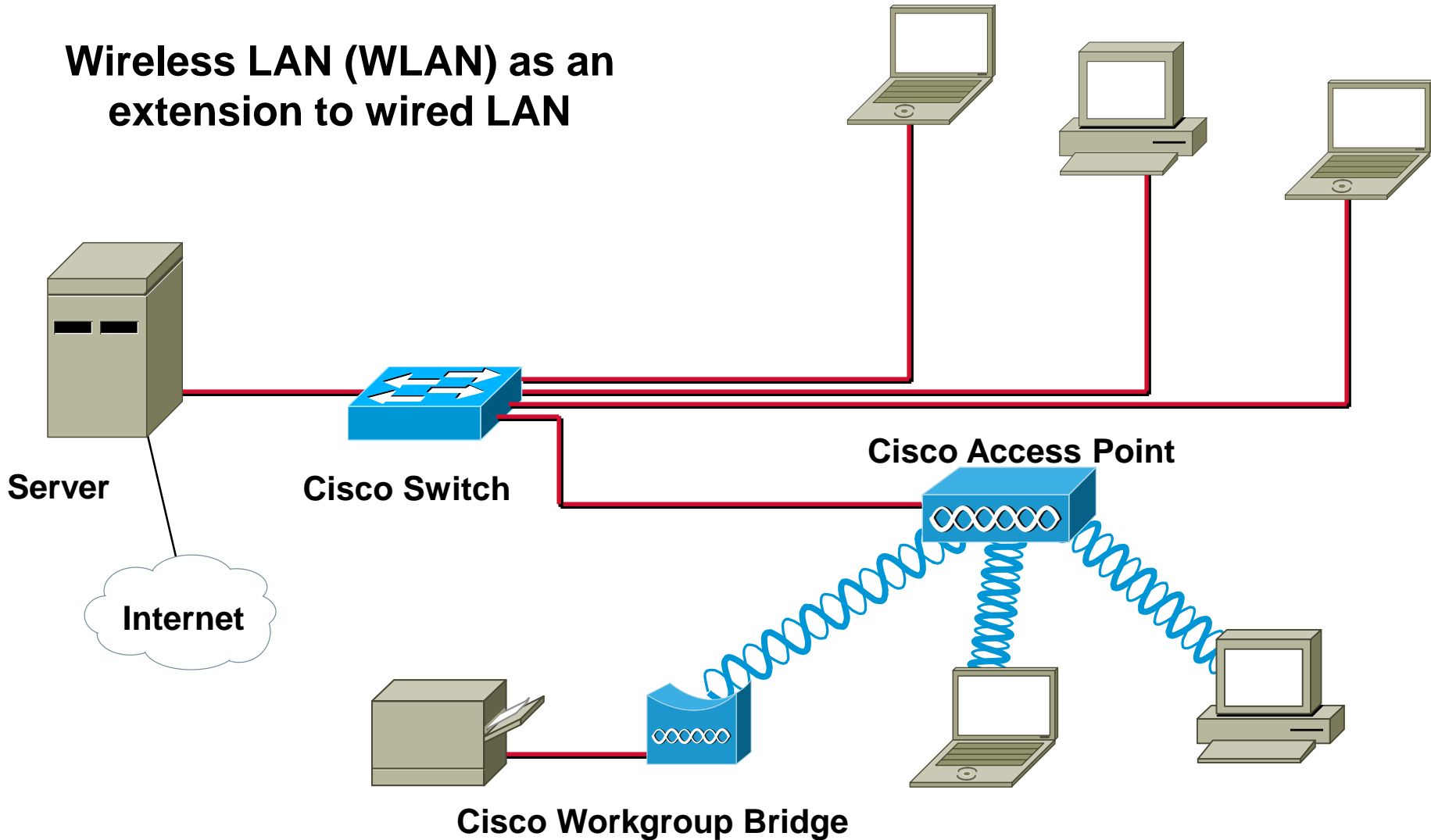Point-to-point / multipoint wireless

Wireless LAN

Local Wireless Loop

Mobile Cellular Voice /Data
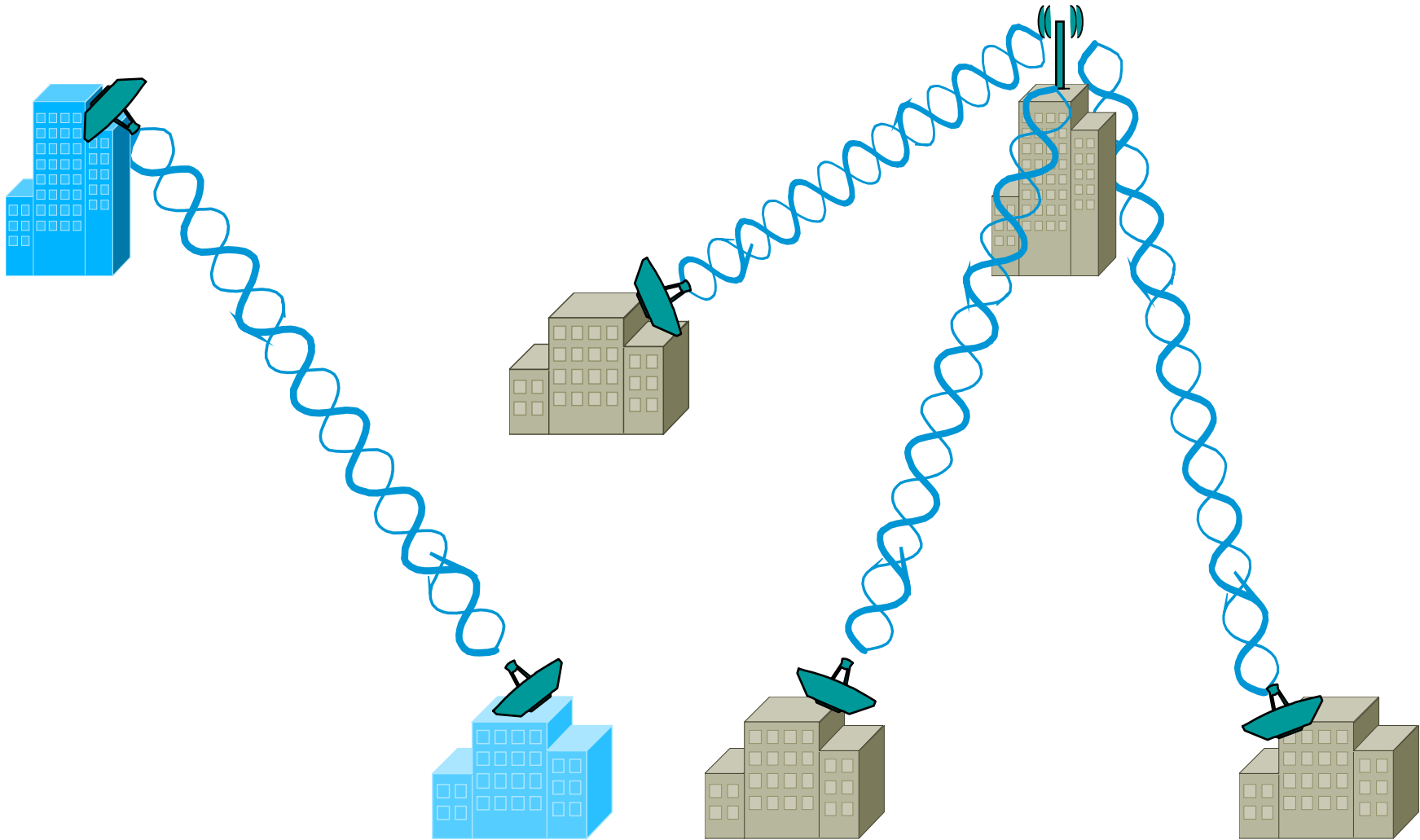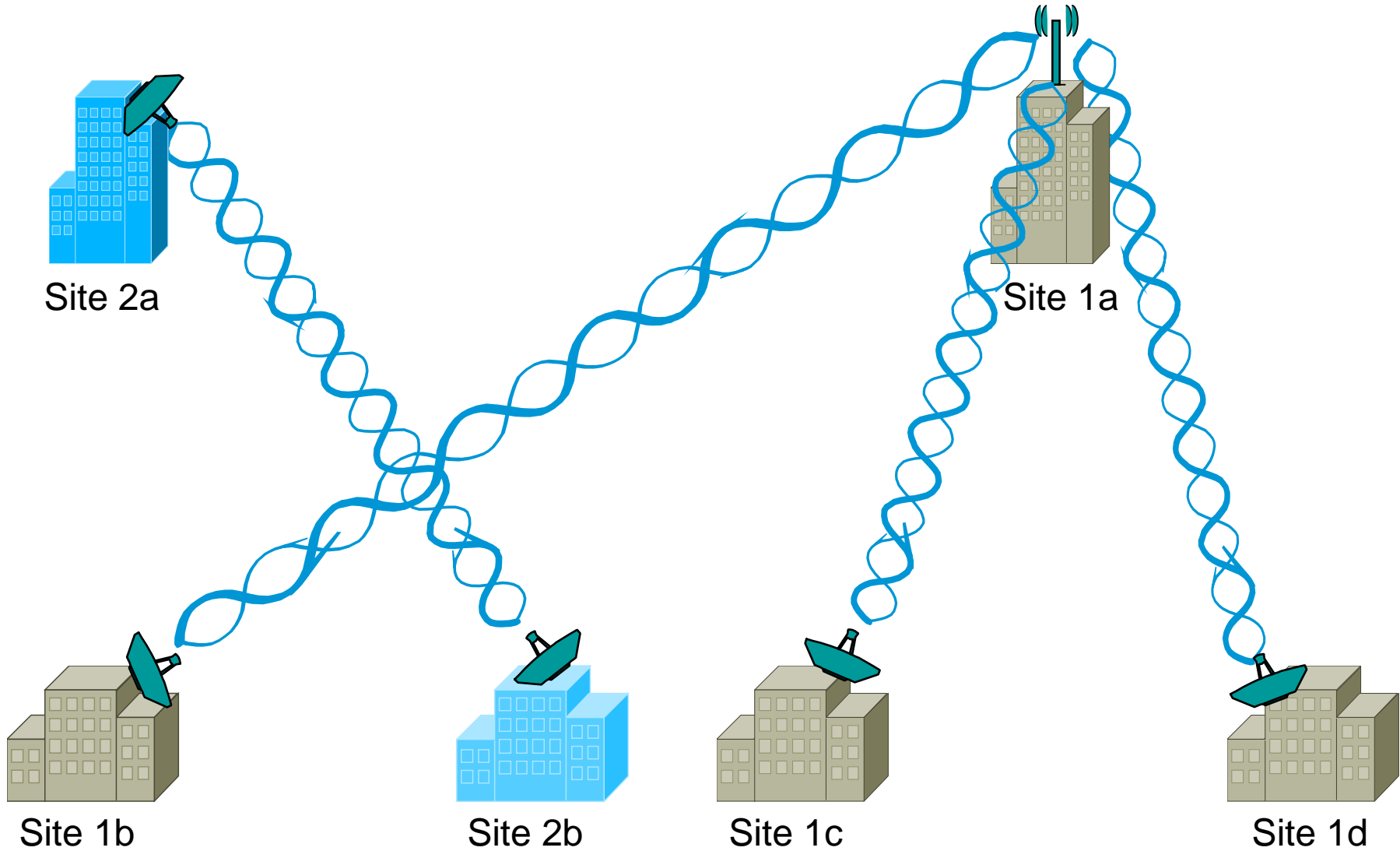
In Building WLAN
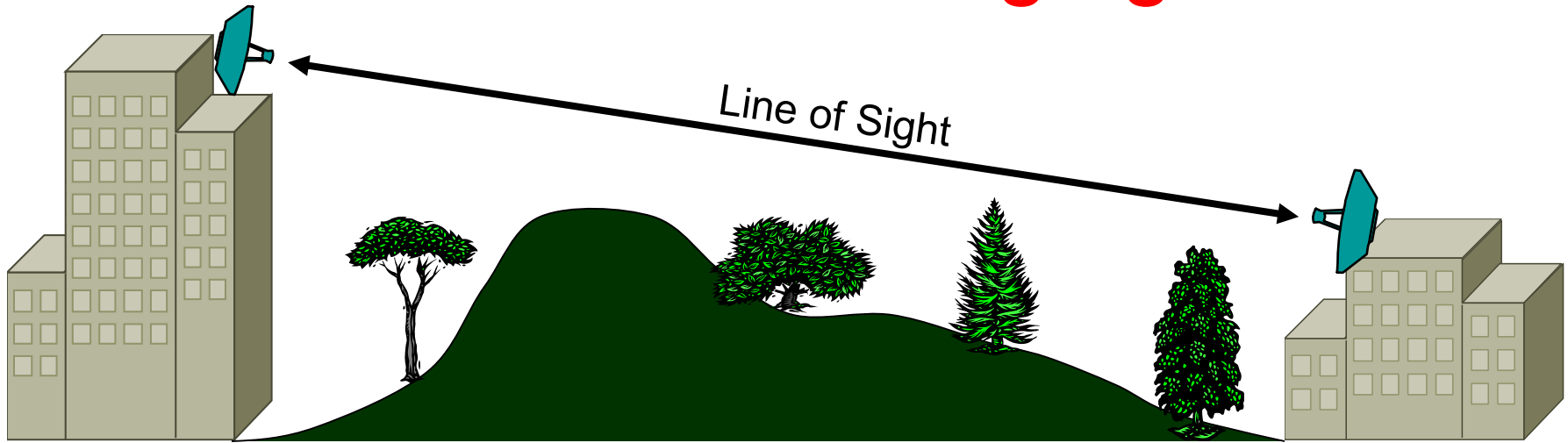
Wireless LAN (WLAN) as an extension to wired LAN

Server

Internet

Cisco Switch

Cisco Access Point

Cisco Workgroup Bridge

Site to Site WLAN

Radio Signal Interference

Site 2a

Site 1a

Site 1b

Site 2b

Site 1c

Site 1d

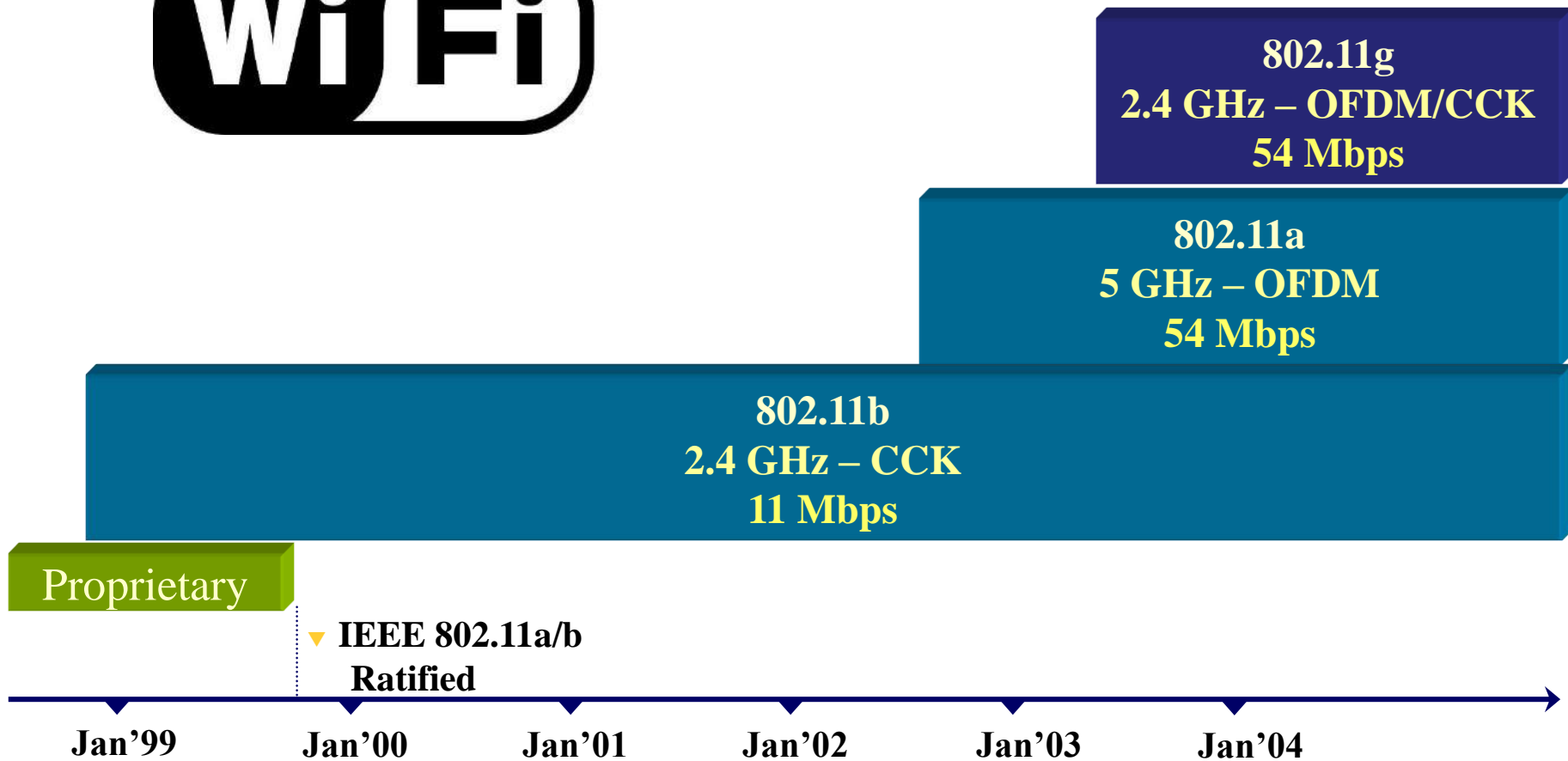# Installation and Site Design Issues —Bridging

Line of Sight

- The following obstructions might obscure a visual link:
  - Topographical features, such as mountains
  - The curvature of the earth
  - Buildings and other man made objects
  - Trees

Installation and Site Design Issues —WLAN

- The following obstructions might obscure the RF link:
    - Metal bookcase
    - Walls
    - Cubicle partitions

WLAN Speeds & Frequencies

802.11g
2.4 GHz – OFDM/CCK
54 Mbps

802.11a
5 GHz – OFDM
54 Mbps

802.11b
2.4 GHz – CCK
11 Mbps

Proprietary

▼ **IEEE 802.11a/b**
   Ratified

| Jan'99 | Jan'00 | Jan'01 | Jan'02 | Jan'03 | Jan'04 |

Quick Preview: Station/AP Connectivity
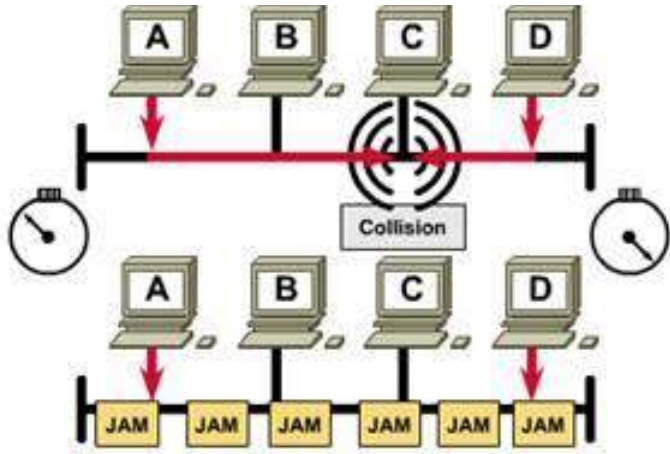
SSID (Service Set Identity)

- At a minimum a client station and the access point must be configured to be using the same SSID.

- An SSID is:
  - Between 2 and 32 alphanumeric characters
  - Spaces okay
  - Must match EXACTLY, including upper and lower case
  - Sometimes called the ESSID
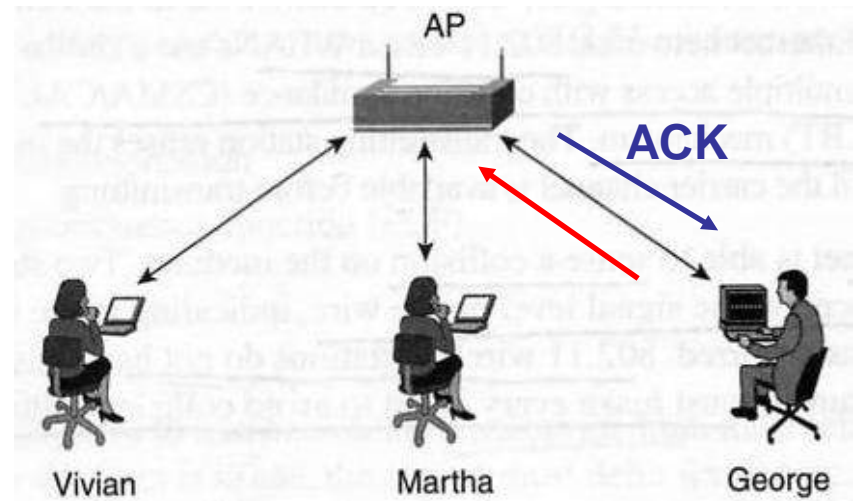

Vivian and the Surrounding APs

AP 3
SSID=Sales

Vivian
SSID=Marketing

AP 1
SSID=Marketing

AP 2
SSID=Marketing
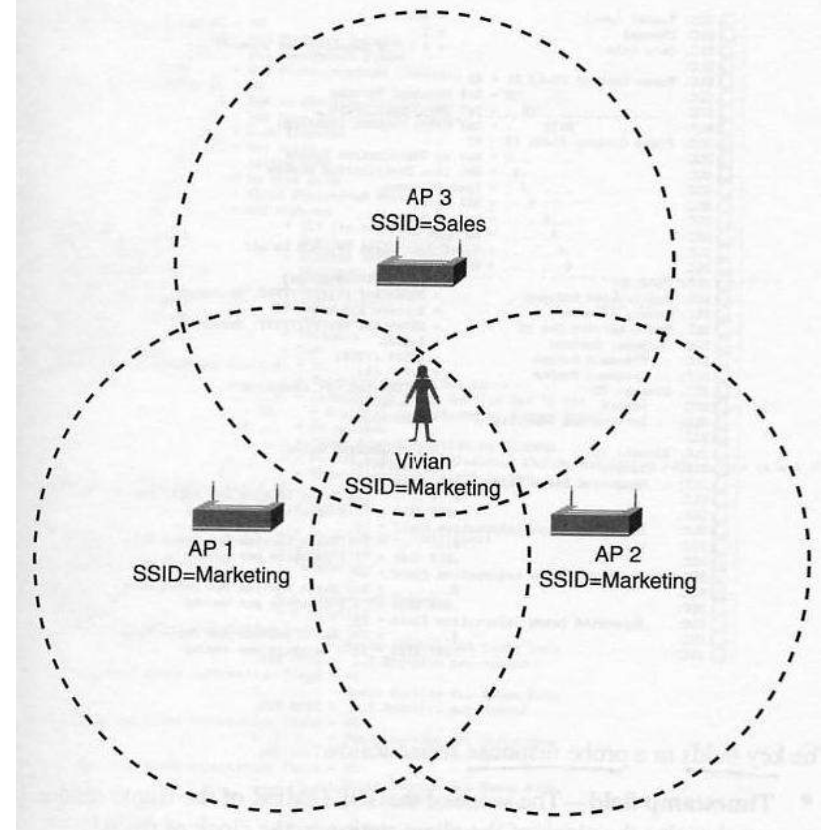
Medium Access – CSMA/CA

All stations detect the collision

CSMA/CD

ACK

CSMA/CA

- Both CSMA/CD and CSMA/CA are **half-duplex architectures**
- Ethernet uses **CSMA/CD** – Collision Detection
  - Ethernet devices detect a collision as when the data is transmitted
- 802.11 uses **CSMA/CA** – Collision Avoidance
  - 802.11 devices only detect a collision when the transmitter has not received an Acknowledgement.
  - Stations also use CS/CCA
  - Stations also use a virtual carrier-sense function, NAV (Network Allocation Vector)