COMP3049 – Intermediate Wireless Technology

Chapter 1 – CWNA

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Objectives

- Define the roles of the follwing organizations:
  - Regulatory Domain Governing Bodies
  - IEEE
  - Wi-Fi Alliance
  - ITU
- Identify technology roles for WLAN technologies
- Explain radio communications fundamentals and their role in learning about wireless technologies

Introduction

It all began in the 19th century with:

- Heinrich Rudolf Hertz
- Nikola Tesla
- Guglielmo Marconi

History

- Wireless networking began during WW II
  - First use of spread spectrum tech.
- ALOHAnet U of Hawaii 1970
  - OSI Layer 2 protocol
- 1997 – first IEEE WLAN standard 802.11
  - 1 or 2 Mbps
- 2009 – 1,000,000,000 chipset shipped

History

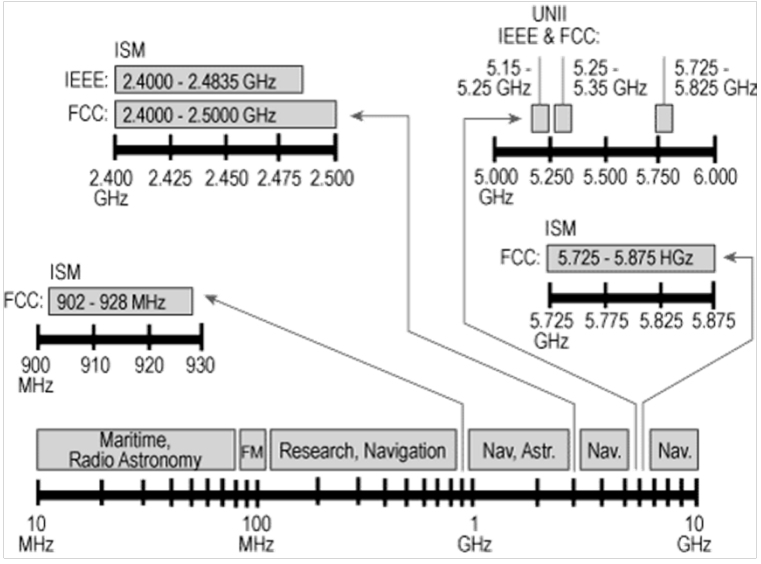
- 450 Million (est.) WLANs worldwide
- 2009 – Wi-Fi Alliance survey
  - Users would rather give-up chocolate than live without Wi-Fi

Industry Organizations

Regulatory Domain Bodies

- Regulate use of limited radio frequency spectrum
  - Radio frequencies available
  - Output power levels
  - Indoor and outdoor usage

Frequency Bands



Unlicensed Frequencies (used for WLANs)

Frequency Band	Total Bandwidth	License-Free Band
2400-2500 MHz	100 MHz	ISM
5.15-5.25 GHz	100 MHz	U-NII 1
5.25-5.35 GHz	100 MHz	U-NII 2
5.470-5.725 GHz	255 MHz	U-NII 3
5.725-5.825 GHz	100 MHz	U-NII 4

Note: Max. output power for ISM band is 1 Watt at the intentional radiator (indoor is typically 30-300 mW)

Unlicensed Frequencies (used for WLANs)

Band	Power Output Limits	Area Usage
U-NII 5.15-5.25 GHz	40 mWatts	Restricted to indoor
U-NII 5.25-5.35 GHz	200 mW	Indoor/Outdoor
U-NII 5.470-5.725 GHz	200 mW	Indoor/Outdoor
U-NII 5.725-5.825 GHz	800 mW	Outdoor only

Regulatory Domain Bodies

- OfCom (UK) and ETSI (rest of Europe)
- MIC and ARIB (Japan)
- ACMA (Australia)

- These also manage the use of frequencies and power levels

Other Organizations

- ITU-R – International Telecommmunications Union – Radio Communications Sector
  - Maintains, promotes and enhances the use of telecomm, as well as its benefits, to all the nations in the world
  - Promotes and enhances international standards for use of frequencies
  - Maintains a database of frequency assignments

Other Organizations

- IEEE – Institute of Electrical and Electronic Engineers
  - Mission is the world's leading professional association for the advancement of technology
  - Provide standards and technical guidance for industry
  - > 400,000 members

IEEE WLAN Standards

- 802 project
  - 802.3 (Ethernet, PoE, etc.)
  - 802.5 Token Ring
  - 802.11 and all amendments
  - See www.ieee.org or the course book for more information

Other Organizations

- IETF – Internet Engineering Task Force
  - Working groups create RFCs
    - Not all become standards
  - Two standards impact WLANs:
    - RFC 3748 EAP
    - RFC 2865
  - Also visit the IETF website at http://ietf.org for additional information

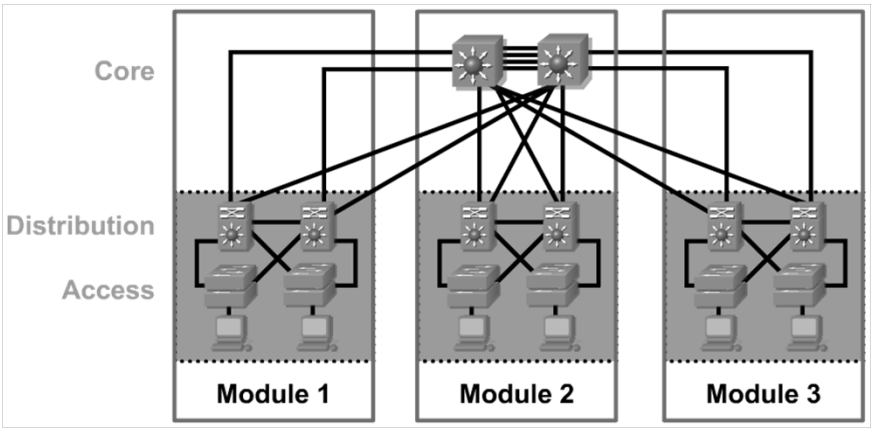
Other Organizations

- Wi-Fi Alliance
  - Is a certification organization
  - Provides testing and interoperability analysis for the wireless industry
  - Certification ensures compatibility of devices from different vendors
  - The Wi-Fi Certified logo can only be used by devices that have undergone the cert tests at the alliance's lab ..\WFA_Brand_StyleGuide_May2007.pdf

WLAN Technology

- 802.11 Wireless LANs provide:
  - Mobility
  - Nomadic ability
  - Unwired fixed connectivity
- Three primary roles of Wireless LANs
  - Access role
  - Distribution role
  - Core role

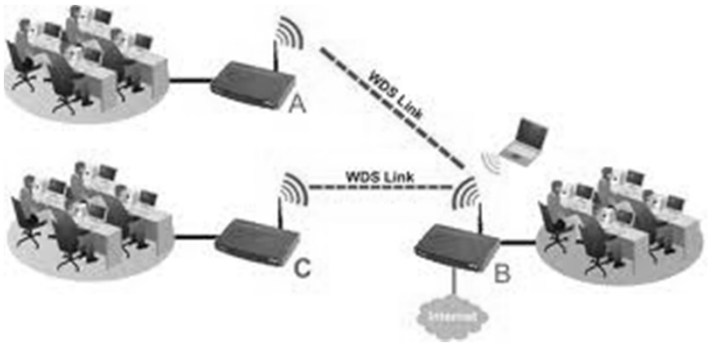
Wireless Roles



Wireless LAN Roles

- Access role
  - Provide wireless clients with access to wired resources
  - Access points are connected to a wired network and the Internet
- Distribution role
  - Wireless bridges provide a backhaul connection between disconnected wired networks

Wireless Bridging Distribution Layer



Wireless LAN Roles

- Core role
  - The wireless LAN is the network!
  - Suitable for smaller LANs
  - Limited data throughput capacity prevents WLANs from becoming the core of enterprise networks
  - Future technologies may change the above

Fundamentals of Communications

- CWNA - entry-level certification?
- Advanced certification in the IT field
- Most computer professionals learn “as needed” or “on-the-job”
- Most people in IT understand “bits”
- But do they really understand some of the fundamental principles?

Fundamentals of Communications

- The more you understand about data comm, the better you will understand wireless
- Communications:
  - Using a signal
  - Modulation
  - Characteristics of a wave
  - What constitutes a carrier?

Fundamentals of Communications

- Radio Waves: CW >> Carrier
  - Amplitude
  - Wavelength
- Modulation
  - Amplitude
  - Frequency
  - Phase

Fundamentals of Communications

- Keying methods
  - ASK
  - FSK
  - PSK

Spread Spectrum Uses

Use	Examples	Range	Speeds
WLAN/ Backhaul	IEEE 802.11	112 metres/375 feet to several miles	2 Mbps and higher
WPAN	Bluetooth	1 – 3 metres	723 Kbps to 3 Mbps
WMAN/ Backhaul	WiMAX and Edge	10 Kilometres	40 – 75 Mbps
WWAN/ Backhaul	AT&T Microwave	Variable	75 – 135 Kbps estimated

Wireless PANs

- Small scale Personal Area Networks
- Bluetooth (LR)
- Zigbee (LR)
- RFID sometimes also classified as WPAN
- Bluetooth and ZigBee also operate at 2.4 GHz and can cause interference
- The standards deal with reducing this problem

WMANs and WWANs

- Free Space Optics, WiMAX, Microwave
- Short- and long-range
- Satellite Communications
- DSL, Cable, ISDN, T1, etc, over wireless

WLAN Technology Roles

- Corporate data access and End-user mobility
- Network Extension to remote areas
- Building-to-building connectivity
  - Bridging
- Last-mile data delivery
  - Wireless ISP

WLAN Technology Roles

- Small Office/Home Office
- Mobile Office
- Educational/Classroom
- Industrial: Warehousing and Manufactruring
- Health Care: Hospitals and Offices
- Hotspots: Public Internet access

Summary

- Standards and regulatory organizations
- WLAN roles
  - Acess
  - Core
  - Distribution
- Technology roles

What you will be learning in this course…