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Wireless Problem Discovery, Solutions and Troubleshooting

Chapter 12

COMP3049 – CWNA

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Objectives

- Identify and explain how to implement and use a variety of wireless analysis systems
- Identify and explain how to solve WLAN implementation challenges, such as:
  - System throughput
  - Co-Channel and Adjacent-Channel interference
  - RF Noise and Noise Floor
  - Narrow and Broadband interference
  - Multipath, hidden nodes, near-far problem, weather and VoWLAN issues

WLAN Analysis Systems

- Handheld or Laptop based
  - Basic protocol analysis
  - RF Spectrum analysis
- Usually require a PC-Card or Express Card
- Ensure OS is supported
- Wireless IPS
- Distributed RF Spectrum Analysis

WLAN Analysis Systems

- WildPackets
  - OmniPeek
    http://www.wildpackets.com/products/overview
- AirMagnet
  - Protocol analysis
    http://www.airmagnet.com/products/wifi_analyzer/
  - RF Spectrum analysis
- CommView
  - Handheld Wi-Fi analyzer (shareware for Pocket PC)

WLAN Analysis Systems

- Cognio Spectrum Expert (now Cisco)
  - RF Spectrum analysis
- Tektronix
  - Handheld spectrum analyzer
  - http://www.tek.com/products/spectrum_analyzers/sa2600/
- Willtek
  - Handheld spectrum analyzer
  - http://www.staging.willtek.com/english/products/gp

WLAN Analysis Systems

- Wi-Spy USB Spectrum Analyzer
  - http://www.metageek.net/Products/Wi-Spy?gclid=CLPOi-itlJcCFQRhswodVkg0_Q
- Network Stumbler
  - http://www.netstumbler.com/

Wireless Troubleshooting

- No one can teach you how to troubleshoot anything!
- If anyone ever tells you they can teach you troubleshooting, walk away quickly!
- Having said that…
- You can benefit from…

Troubleshooting Methodologies

- Methodology: a standard way to do something
- Learning to troubleshoot requires
  - Practice, practice, practice
- Employing a methodology can help you learn, at the early stages
- Not part of the CWNA exam

Troubleshooting Methodologies

- REACT
  - Research, Engage, Adjust, Configure, Take note
- OSI Model
  - If you can determine at which layer the problem is happening, troubleshooting will be a lot easier
  - One of the many benefits of the OSI model…

Troubleshooting Methodologies

- Hardware/Software Model
  - Narrow the problem to hardware or software
  - Adapter failed; is driver loading correctly?
  - Is the client software correctly configured?
- Symptom, Diagnosis, and Solution
  - Carefully define the symptom
  - Diagnose the areas that the symptom can affect
  - Move suspect hardware to a known good computer

Troubleshooting Methodologies

- Systems Thinking
  - What are the systems and devices between this and the network with which it wants to communicate?
  - Are other devices working?
  - What, if anything, has changed?
  - Has the system been "moved" recently?

WLAN Implementation Challenges

- Mortal enemy
  - Layer 2 retransmissions (no ACK received)
  - Collisions
  - Frame corruption (CRC check fails)
  - Increased latency and jitter for applications
    - Choppy audio and video
  - Not more than 10% for data apps
  - Use good protocol analyzer to troubleshoot

WLAN Implementation Challenges

- System throughput
  - PHY limitations: data rates, etc.
  - Wired-side limitations
  - Testing tools
    - http://www.axencesoftware.com/index.php?action=FreeNT
  - Possible solutions:
    - Install more APs
    - Install OFDM/MIMO/802.11n

WLAN Implementation Challenges

- Co-channel and adjacent channel interference
  - Reduce or eliminate overlap
  - Co-locate APs if throughput is the issue
  - Adjust xmit power to requirements of design
- RF noise and noise floor
  - Interference from other devices
  - Adjust xmit power on nearby devices

WLAN Implementation Challenges

- Narrowband RF interference
  - Excessive CRC errors
  - Adjust fragmentation, reduce data rates
- Wideband RF Interference
  - Rare, but jammers do exist
  - DoS attacks
- All-band RF interference
  - FHSS (2.4 GHz phones in ISM band)
  - Use spectrum analysis tool (SA or Wi-Spy)

WLAN Implementation Challenges

- Multipath
  - Increased or decreased signal amplitude at receiver
  - Data corruption, very weak signals (nullification)
  - If you suspect, move to newer devices that use OFDM and MIMO
  - Reposition APs and/or antennas

WLAN Implementation Challenges

- Hidden node problem
  - Enable RTS/CTS
  - Increase power at STAs
  - Remove obstacles/move STAs
  - IEEE 802.11h and TPC
- Near-far problem
  - High-power STAs drowning far STAs

WLAN Implementation Challenges

- Weather (outdoors)
  - Wind can shake/misalign antennas that are not properly mounted
  - Accumulating snow can encroach on Fresnel zone
  - Ice on antennas and other surfaces
  - Thunderstorms can disrupt signal

WLAN Implementation Challenges

- Troubleshooting VoWLAN issues
  - System capacity, throughput and latency are really big issues
  - Common problems:
    - Dropped calls during roaming – no "fast roaming" yet
    - Dropped calls when within a BSS – WLAN capacity
    - Calls not going through – target out of coverage area; re-evaluate/re-do your site survey

WLAN Implementation Challenges

- Capacity vs. Coverage
  - Interference through signal leaks
  - Oversized coverage cells
  - Physical obstructions
  - Construction/changes

WLAN Implementation Challenges

- Voice vs. Data

IP Voice	IP Data
Small, uniform-size packets	Variable-size packets
Even, predictable delivery	"Bursty" delivery
Highly affected by late or inconsistent packet delivery	Minimally affected by late or inconsistent packet delivery
"Better never than late"	"Better late than never"

WLAN Implementation Challenges

- Performance
  - Tx power (range)
  - Antenna gain
  - Antenna type
  - Wavelength
  - FSPL
  - Physical Env.
  - CSMA/CA

  - Encryption
  - Application use
  - No. of clients
  - Layer 2 retransmissions