Trends in WLAN management

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Agenda: a few models

- UT Knoxville Wireless
- Deployment Models
- Cost Models
- Design Approaches
- Roaming Models
- Rogue Wireless Device Detection
- Special Projects

UT Knoxville Wireless

- ~26,000 Students
- ~4,000 Fac/Staff
- 1270 Access Points
- 12,000 Registered Wireless Users
- up to 1500 Concurrent WU
- 2000 daily WU

Decentralized Deployment

- Often happened by accident, over time
- no ip roaming
- no guaranteed service
- RF nightmare
- security, a la carte
- Can lead to interesting developments (Univ of Utah's 802.1x RADIUS proxy)
- Get a CIO on Steroids, an AUP and an attractive cost model

Centralized Deployment

- Choice of IP roaming
- Integrated RF planning
- One time registration
- One phone number to complain!
- Allow Exceptions for your peace of mind (FBI grants, Scientific apps…)

Exceptions?

Collaborative Robots from Prof. Parker's Lab at UTK

Cost Models: Free

- "Free" (centrally funded)
  - works well if wired is free too
  - wired tends to be replaced by wireless otherwise
  - Minimizes Rogues
  - Monitor usage (constantly connected, bandwidth hogs, …)

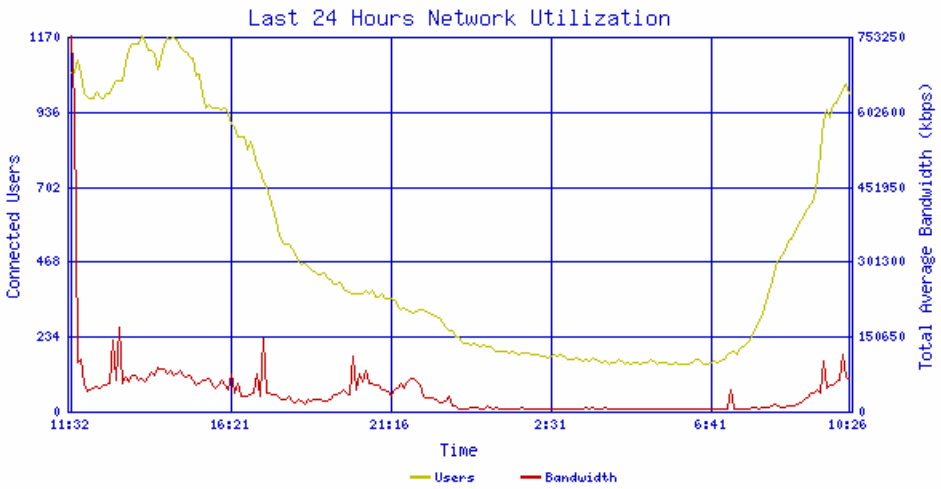
SWING

Status

Total APs: 1182
Total Users: 12257

Users Last Cycle: 559
Users Last 24 Hours: 3070

Average Bandwidth: 538.16 Mbps
Average Bandwidth/User: 175.30 kbps



Click to Analyze

Dead APs (18)

WTC31 (10.1.135.133)
WPD11 (10.1.136.66)
WTB03 (10.1.21.4)
WTB04 (10.1.21.5)
WPH32 (10.1.28.14)
WPH02 (10.1.28.8)
WHE15 (10.1.54.13)
WHE25 (10.1.54.19)
WHE2E (10.1.54.28)
WHE3B (10.1.54.39)
WHE3D (10.1.54.41)
WHE42 (10.1.54.44)
WHE06 (10.1.54.7)
WHE07 (10.1.54.8)
WSC11 (10.1.8.2)
WVM1AA (10.2.62.41)
WPO04 (10.249.14.6)
W1X01 (10.5.1.12)

Top Bandwidth Users
(Last 24 Hours)

Rank	MAC	Total Data (kB)	Average BW (kbps)
1	000C415EAE55	15778915.73	1461.01
2	00904B630339	10935065.74	1012.51
3	000D9384FC99	10654146.33	986.50
4	000FEA9134B7	10621096.55	983.43
5	000475E579B0	9697262.81	897.89
6	00042377DF45	8726433.59	808.00
7	00904B0A5DA5	7592084.11	702.97
8	00408C682DA3	7171645.82	664.04
9	00045A0E35D7	6326213.10	585.76

Top Bandwidth APs
(Last 24 Hours)

Rank	AP	Total Data (kB)	Average BW (kbps)
1	WLB33	33876442.78	3136.71
2	WAA34	33186233.28	3072.80
3	WAA41	26867895.07	2487.77
4	WSE22	25876537.99	2395.98
5	WVM1X	24641082.35	2281.58
6	WFH33	24156662.57	2236.73
7	WAA43	22081250.15	2044.56
8	WMH34	21627471.32	2002.54
9	WHL38	21299204.38	1972.15

Cost Model: Charge

- Management/Accounting nightmare
- Subcontract with a Provider, which might lead to interesting Cellular/WiFi integrations
- Rogues?
- WLAN2 for advanced applications ;-)

Design Approach (vendor)

- Aggregated APs with controller
  - One proprietary switch port per proprietary AP or non prop. AP but with loss of functionality
  - Controller takes care of registration and authentication
  - Lots of features
  - In-line technology: reliability of switch? (PC based)

Design Approach (vendor)

- Tunneled APs with controller
  - One proprietary tunnel per AP to decentralized controller
  - not forced to use vendor port for AP
  - Controller takes care of registration and authentication
  - Lots of features
  - In-line technology: reliability of switch, capacity for 802.11n?

Design Approach (vendor)

- Everything through gateways, any AP
  - Can do 802.1x, MAC, visitors
  - Traffic control
  - IP roaming
  - in-line, PCs passing traffic
  - …lots of subnets, lots of gateway
  - How much CPU required with 802.11n?

Design Approach (in-house)

- VLAN/SSID
  - SSID for Registration and visitors
  - SSID for 802.1x
  - SSID for MAC authentication (RADIUS)
  - SSID for Voice over WLAN
  - Does require SSID juggling for users
  - Does not require in-line devices
  - Separate management of AP from traffic

Design Approach

- Home-Grown (cont.)
  - Prevent static IPs by correlating ARP/DHCP/AP

    (some AP vendors provide IP info)
  - Monitor traffic through polling of APs

    (IP-MAC-Signal Strength-in/out packets)
  - Decrease MAC authentication over time and limit it to special cases

Roaming Models

- Vertical Subnetting (to limit broadcast)
  - Trunk multiple Wireless VLAN in parallel.
  - Assign VLAN according to specific criteria (with VLAN assignment through 802.1x, part of the Identity Based Networking concept)
- Horizontal Subnetting
  - gateways or controller with IP Mobility
  - proprietary agents (requests client software)
  - Wait for a standard IP Mobility

Rogue Device Detection, APs

- Wired Side
  - OUIs (first 24 bits of MAC)
    - not always trivial since some vendor use same OUI for ethernet cards and APs
  - Fingerprinting
    - HTML, telnet, SSH, except when the device is firewalled
  - TTL (NAT boxes and APs)
    - These devices have often different TTL than OSes
  - Our NetReg can detect NAT as well: compare MAC from DHCP lease and MAC from the executable that runs on machines during NetReg

Rogue Device Detection, APs

- Wireless Side
  - Rogue AP Detection built-in AP. Compare Detection report (eg: SNMP trap sending MAC/Signal Strength) to exclusion list. Use RAD report from multiple APs to triangulate location on maps, or directional antenna
  - QA of coverage comes for free in the process.

    Use RAD reports to measure the health of your wireless network
  - Use your segway and a laptop with netstumbler

Rogue Device Detection, Ad-Hoc

- Detection
  - MAC addresses of Ad-Hocs are random (cannot correlate with MAC of NIC)
  - Local search with directional antenna can only show culprit (or local probes)
  - Good luck in an Auditorium with 200 laptops
- Remediation
  - Configure Windows (infrastructure only) and Macs (uncross “allow computer to create networks”) appropriately
  - Use defensive devices to disrupt Ad-Hoc traffic

Special Projects

- Put UT's WLAN on Uninterruptable Power Source. Batteries from Core to User.
- APs on Solar Panels
- Prevent our Physical Plant people from Sheet-rocking APs.
- Have a way to Authenticate an infrastructure, besides using EAP-TLS