Wi-Fi Enabled Healthcare

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Introductions

• My Background
• About You
  • How many of you work or have worked in Healthcare?
  • How many work for institutions that have dedicated Wi-Fi engineers?
Session objectives

• Importance of Wi-Fi in healthcare
• What makes healthcare environment unique
• Overview of Henry Ford Health System
• RF design considerations, and best practices
• Wireless medical devices
• The future
Why mobility is so important in Healthcare

- Focus on mobility can help decrease re-admissions
- Continuous and remote vital signs monitoring
- More efficient communication with staff
- Increased time at the bedside
- Desired end result is less expensive care, and improved clinical outcomes

Americans don’t live longer than people in countries that spend much less on health care.

Note: Data is from 2011 or current year. New Zealand numbers exclude insurance. Not all OECD countries are included. Source: OECD Health Data 2013
Typical Office
Typical Hospital
What makes Healthcare Unique

• Open to the public (patients and guests)
• Mission critical communications can correlate to Life/Death
• Dense pockets of fast moving mobile users
• Ubiquitous, Reliable, Easy to use, and High availability.
• Typically very old structures with complex construction
• Decentralized procurement budgets
• HIPAA and HITECH compliance and government mandates
• Application centric
• Vast variety of device types including medical devices
Henry Ford Health System Wi-Fi Network

- HFHS is a not-for-profit organization primarily located in Southeast Michigan.
- More than 23,000 total employees.
- 3.2 million outpatient visits and more than 88,800 surgical procedures (2013)
- 14 Wireless Controllers
- Over 4,800 wireless access points and sensors
- Overlay IPS/IDS
- Over 100 facilities and 8 million square feet of coverage.
- 7,000+ concurrent guests daily
- 14,000 concurrent Wi-Fi devices
# Mobile landscape in Healthcare

<table>
<thead>
<tr>
<th>Technology</th>
<th>Frequency Range</th>
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<tbody>
<tr>
<td>Indoor Voice handsets</td>
<td>900-928 MHz; DECT 6.0</td>
</tr>
<tr>
<td></td>
<td>1.93 GHz</td>
</tr>
<tr>
<td>Medical Body area networks</td>
<td>2360-2400 MHz</td>
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<tr>
<td>Bluetooth</td>
<td>2.4 - 2.485 GHz</td>
</tr>
<tr>
<td>Cellular Distributed Antenna Systems</td>
<td>(3G, 4G)</td>
</tr>
<tr>
<td>Zigbee</td>
<td>2.4 GHz</td>
</tr>
<tr>
<td>Telemetry WMTS</td>
<td>608-614, 1395-1400, 1429-1432 MHz</td>
</tr>
<tr>
<td>WLAN/Wi-Fi</td>
<td>(2.4 GHz, and 5 GHz)</td>
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</table>
Why focus on Wi-Fi? Interesting statistics

• There will be more than 7 billion new Wi-Fi enabled devices by 2017 (Sys-Con)
• 2/3 of US consumers prefer Wi-Fi to cellular (Deloitte)
• 71% of all mobile communication flows over Wi-Fi (Wi-Fi Alliance)
• By 2017 60% of carrier network traffic will be offloaded to Wi-Fi (Wireless Broadband Association)
• By 2020, the average mobile user could be downloading 1 terabyte of data annually—enough to access more than 1,000 feature films (IEEE Spectrum magazine)
Wi-Fi Devices In the hospital

- Guest Access
- Employee Devices
- Medical Devices
- VoWLAN Phones
- BYOD
- RTLS

2014 CWNP Wi-Fi Conference ~ 15 Years in Wireless
RF Design Best Practices

- Universal RF physics and limitations
- Design for actual devices and applications.
- Design for voice and video (-67dbm)
- High density and accounting for RTLS
- Traditional onsite site survey is recommended
- Scrutinize security requirements.
- Ongoing testing is crucial to success
- ITIL framework – capacity planning, continuous improvement and optimization.
Design Evolution

2014
Design For Dynamic Intelligence
-Dynamic traffic classification and prioritization

2010
Design For High Density
-Microcells, real time applications, and RTLS

2005
Basic RF Coverage
-Focus on Signal Strength and SNR
-Static Channel and Power plan

QoE

QoS
Bandwidth
Proper Design
Clean RF
Focus On Clients

• Upwards of 80% of issues on our network are client related.
• Supported frequencies (2.4 GHz, 5GHz)
• Updated drivers (chipset & manufacturer)
• Roaming characteristics
• Security considerations
• Consumer grade devices
Wireless Medical device onboarding and certification process

- Started with less than 100 medical devices in 2006, and now up to 3000 WMDs at HFHS
- Standard onboarding and certification process
- AAMI IEC 80001 guidance
Real Time Location Services

• Much more than asset tracking
  • Hand Hygiene
  • Staff duress badge
  • Temperature monitoring
  • Patient and guest tracking

• Zone, Room Level, Sub-room level accuracy

• Wi-Fi based system vs. dedicated Infrastructure for RTLS

• Largest ROI when system is used to trend workflow, and drive improvements.
Guest Access

• Make no mistake about it...It is supported.
• Ease of access and use
• Stance on streaming applications
• Marketing platform
• Pay vs. free model
• Authentication and encryption
• Heaviest user count. The numbers don’t lie (7K out of 14K users)
• HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems)
Wearables

- 90 Million Wearables projected to be shipped in 2014
  - Largest area of growth in mHealth
  - Consumer Devices
  - Fitness and adult tracking
  - Medical Devices

<table>
<thead>
<tr>
<th>Wearable Computing Device Shipments by Category (Millions)</th>
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<tbody>
<tr>
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<td>----------------</td>
</tr>
<tr>
<td>Wearable Cameras</td>
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<tr>
<td>Smart Glasses</td>
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<tr>
<td>Smart Watches</td>
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<tr>
<td>Healthcare</td>
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<tr>
<td>Sports/Activity Trackers</td>
</tr>
<tr>
<td>Wearable 3D Motion Trackers</td>
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<tr>
<td>Smart Clothing</td>
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<tr>
<td><strong>Totals:</strong></td>
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Source: Data from ABI Research World Market Forecast: 2013 to 2019
Clinical Engineering & IT

• Clinical device vs. IT knowledge
• Majority of medical devices are now Wi-Fi capable.
• Network architecture driven in part by medical devices.
• Medical device design engineers are not Wi-Fi engineers
• AAMI Wireless Strategy Task Force
Getting it Right

• Having the right people with the correct skillset is increasingly crucial

• Dedicated trained Wi-Fi engineers is key to your success

• All of HFHS Wireless Engineers are certified by CWNP.

• Mandatory requirement to have at least CWNA credential

• The right wireless toolset is equally important
  • Take the guess work out of designing
  • 802.11ac tools are already available
  • Don’t forget to test performance
The Future of Wi-Fi in hospitals

- Upgrades to 802.11 ac (next 3 years)
- Real time location apps
- Increasing use of video
- Mhealth
  - 2 years – Making data actionable
  - 5 years – Smaller or no tether
  - 10 years – More Neil Harbissons (Cyborgs)
Great References

- [www.cwnp.com](http://www.cwnp.com)
- [http://www.revolutionwifi.net/](http://www.revolutionwifi.net/)
- [http://www.slideshare.net/ValaAfshar/50-wifi-techstatsforbusiness?related=1](http://www.slideshare.net/ValaAfshar/50-wifi-techstatsforbusiness?related=1)
Reference