Medical Grade Wireless Utility

Case Study for Hospitals

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October 28 2011
West Wireless Health Institute

Independent, nonprofit medical research organization launched in March 2009, funded by the Gary & Mary West Health Foundation

Primary mission is to lower health care costs

Wireless Health Enabled

Infrastructure Independence
Small Cell Deployments & Healthcare

Recent developments in technology offer an increasingly wide array of products to provide wireless coverage and capacity in limited or confined areas. Together, they offer potentially useful solutions to addressing the exploding demand for spectrum that is being driven by the exponential growth in wireless data services.

The forum will provide an overview of small cell technologies currently available or soon to come on line, including software defined radios and enhanced Wi-Fi in both licensed and unlicensed spectrum. In addition, panelists will explore the business opportunities and challenges involved in expanding wireless data coverage. Finally, the forum will assess the potential economic impact of small cell deployments, particularly with respect to job creation, and explore possible policy approaches.
The Perfect Storm...
Medical Grade Wireless Utility

A not for profit, hospital led initiative to ...

Create – a platform for wireless health in hospitals & senior living facilities ... the Medical Grade Wireless Utility (MGWU)

Open – the MGWU to existing and new low-cost wireless health devices and solutions that will promote innovation

Enable – ubiquitous & democratized access to health care data in pursuit of infrastructure independence

Achieve – more assured, effective, affordable and pervasive wellness, health and acute care solutions

The Small Cell architecture can and will play a key role ...
Medical Grade Wireless Utility

- Support Consumer Grade use of wireless
- Deliver Enterprise Grade wireless applications
- Create Medical Grade wireless for critical care

All with appropriate & defined levels of assurance

Open – Managed -- Vendor neutral
The Four Pillars of the MGWU

Medical Grade Wireless Utility

A base building wireless distribution system
Supporting Consumer, Enterprise and Medical Wireless devices and solutions
To an known and managed level of Assurance
Assurance Drivers

- Time Critical
  - High
  - Medium
  - Low

- Acuity
  - Low
  - Medium
  - High

- Consumer Grade
- Enterprise Grade
- Medical Grade
Assurance

Coverage
- % square and/or cubic feet

Signal Quality
- Signal to Noise Ratio

Capacity
- Simultaneous Voice and Data Users

Security
- Over the Air
- Physical
- Digital
- Privacy

Certainty

Redundancy
<table>
<thead>
<tr>
<th>Network</th>
<th>Consumer Grade</th>
<th>Enterprise Grade</th>
<th>Medical Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage</td>
<td>Best Effort 85%</td>
<td>Engineered 95%</td>
<td>Guaranteed 100% Clinical Space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signal Strength</th>
<th>Nominal</th>
<th>Engineered</th>
<th>Engineered Guaranteed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received at device in presence of RF interference</td>
<td>Will Vary</td>
<td>Prioritized</td>
<td>Guaranteed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Shared</th>
<th>Prioritized Not Dedicated</th>
<th>Engineered Guaranteed Per unit area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available to the “devices” within the area</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Security</th>
<th>Best Effort</th>
<th>By Policy Engineered</th>
<th>Comprehensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical, Over the Air, and Digital measures to protect</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Certainty</th>
<th>Vary Widely</th>
<th>Engineered Prioritized</th>
<th>Very High Mission &amp; Life Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability of protocol to operate in the area’s RF environment</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
## Frequencies/Protocols (Example)

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<th>Enterprise Grade</th>
<th>Medical Grade</th>
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</thead>
<tbody>
<tr>
<td><strong>Wireless Wide Area</strong></td>
<td>700L/LTE, 800iDen, 850/GSM/HSPA/CDMA/EVDO, 900/iDen/paging, 1900/GSM/HSPA/CDMA/EVDO, 2100/CDMA/EVDO/LTE, 2600/WiMax</td>
<td>700L/LTE, 700U/SMR, 800SMR, 850iDen, 850/GSM/HSPA/CDMA/EVDO, 900/iDen/paging, 1900/GSM/HSPA/CDMA/EVDO, 2100/CDMA/EVDO/LTE, 2600/WiMax</td>
<td>Future ...</td>
</tr>
<tr>
<td><strong>Wireless Local, Room, Personal, Body Area</strong></td>
<td>915/Zigbee/DECT, 2400/WiFi/Bluetooth/Zigbee/DECT, 5500/WiFi/DECT</td>
<td>915/Zigbee/DECT, 1920/DECT, 2400/WiFi/Bluetooth/Zigbee/DECT, 5500/WiFi/DECT</td>
<td>401-406/Proprietary, 608/Prop, 915/Prop, 1400/Prop, 2400WiFi, 5500/WiFi</td>
</tr>
<tr>
<td><strong>Location Local Area</strong></td>
<td>1575/GPS, 2400/WiFi, 5500/WiFi</td>
<td>433/Prop, 915/RFID/Zigbee, 2400/WiFi/Zigbee, 5500/WiFi</td>
<td>Future ...</td>
</tr>
</tbody>
</table>
The Unit Techno-Economic of Wireless Hospital View

\[
\frac{\text{Capacity / MHz / Ft}^3}{\text{Cap Ex + Op Ex}} \quad \text{Per Service Wireless Grade Assurance}
\]
The Unit Techno-Economic of Wireless Service Provider View

\[
\frac{\text{Revenue} / \text{MHz} / \text{Ft}^3}{\text{Cap Ex + Op Ex}} \quad \text{Per Service Wireless Grade Assurance}
\]
Wireless Service Grades Can be Mapped to Areas
WWHI address need for Medical Grade Wireless

WWHI

Health Care

Medical Grade Wireless

FDA FCC

Wireless Application Providers

Wireless Equipment Providers

Wireless Service Providers

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