Can You Future Proof Your DAS System?

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Vision Technologies
Who Writes the Rules

• ITU = International Telecommunications Union
  – Part of the United Nations, recommends policy world wide
• WRC = World Radio Communication Conference, negotiates and writes world wide policy with member participation
• FCC = Federal Communications Commission
  – Write and Ensure policy in the US
Legacy Systems

• How old is your system?
• What will your passive infrastructure support?
Modern Systems

- Traditional Coax Infrastructure
- Fiber to the Edge
Emerging Cellular Technologies

- WiFi Phones
- VoIP
- VoLTE
- Internet of Things
- Qualcomm has a 1 GPS LTE-U Modem
- pCELL alternate to 5G?
- LTE-A and LTE-A Pro?
Current Cellular Frequencies

- 700 MHz
- 700 MHz
- 850 MHz Cellular
- 1900 MHz PCS
- 2100 MHz AWS
- 2300 MHz WCS
Cellular Spectrum 700 MHz
Cellular Spectrum 850 Cell

850 MHz Cellular Uplink Band Plan

- A: 11 MHz
- B: 10 MHz
- A: 1 MHz
- B: 26 MHz

850 MHz Cellular Downlink Band Plan

- A: 11 MHz
- B: 10 MHz
- A: 1.6 MHz
- B: 2.5 MHz
Cellular Spectrum 1900 MHz

PCS Uplink Band Plan

<table>
<thead>
<tr>
<th>1850</th>
<th>1865</th>
<th>1870</th>
<th>1885</th>
<th>1890</th>
<th>1895</th>
<th>1910</th>
<th>1915</th>
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<tbody>
<tr>
<td>A</td>
<td>D</td>
<td>B</td>
<td>E</td>
<td>F</td>
<td>C</td>
<td>G</td>
<td></td>
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<tr>
<td>15 MHz</td>
<td>6 MHz</td>
<td>15 MHz</td>
<td>6 MHz</td>
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PCS Downlink Band Plan

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<tr>
<th>1830</th>
<th>1845</th>
<th>1850</th>
<th>1865</th>
<th>1870</th>
<th>1885</th>
<th>1900</th>
<th>1905</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>D</td>
<td>B</td>
<td>E</td>
<td>F</td>
<td>C</td>
<td>G</td>
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<td>15 MHz</td>
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Some C licenses have been split into multiple licenses

<table>
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<th>1975</th>
<th>1980</th>
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<tr>
<td>C1</td>
<td>C2</td>
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<tr>
<td>7.6 MHz</td>
<td>7.6 MHz</td>
</tr>
<tr>
<td>C3</td>
<td>C4</td>
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<tr>
<td>5 MHz</td>
<td>5 MHz</td>
</tr>
<tr>
<td>C5</td>
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Cellular Spectrum 2100 MHz
Cellular Technologies

- GSM – Global System for Mobile Communications
- CDMA – Code Division Multiple Access
- HSPA – High Speed Packet Access
- LTE – Long Term Evolution
- AWS – Advanced Wireless Services
- VoLTE – Voice over LTE
## Carrier Modulation

<table>
<thead>
<tr>
<th>Modulation</th>
<th>AT&amp;T</th>
<th>Verizon</th>
<th>Sprint</th>
<th>T-Mobile</th>
<th>Metro PCS</th>
<th>Cricket</th>
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<tbody>
<tr>
<td>GSM</td>
<td>850, 1900</td>
<td>850, 1900</td>
<td>1900</td>
<td>1900</td>
<td>1700</td>
<td>1700</td>
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<tr>
<td>EDGE</td>
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<td>1700</td>
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<td>Wi-Max</td>
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<td>1900</td>
<td>1900</td>
<td>1900</td>
<td>1900</td>
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<td>EV-DO</td>
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<td>1700, 1900</td>
<td>1700, 1900</td>
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Public Safety

- VHF
- 700 MHz
- 800 MHz
- Modulation Agnostic
700 Public Safety Band
800 Public Safety Band
PS Band 14

- LTE E-UTRA Band
- FDD Frequency Band
- Uplink 788-798 MHz
- Downlink 758-768 MHz
5G!

- WRC + World Radio Communication Conference
- WRC15 500 MHz to 6G
- WRC 19 6G to 100 G
- Visible light starts at 100 G
- Backwards compatible with 2G, 3G and 4G
Questions!