IEEE 802 EC 5G/IMT-2020 SC draft report

Glenn Parsons - Ericsson

glenn.parsons@ericsson.com
+1 613 963 8141

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5G SC report
Philosophy

• Include and describe all options
  ▫ That are derivatives of the four requested cases
• Expand cost/benefit for each
  ▫ In a prioritized manner
• SC conclusion recommended
  ▫ Consensus preferred on preference
    • not required
    • Worst case straw poll preference
  ▫ Recommend way forward for preference (s)
What are “costs and benefits”?

- This is a cost-benefit analysis
  - But without monetary cost, only relative costs
  - A quantitative pros vs cons
  - Strengths, Weaknesses, Opportunities and Threats
- Brainstorm all costs and benefits
  - E.g., resource cost, standards development cost, installation cost, operational cost, energy cost, etc.
  - Are the unexpected costs?
  - Are there unanticipated benefits?
- Estimate value relative to a baseline
# Proposed Table of Contents

- **Introduction**
  - IEEE 802 5G related projects
- **Options Considered**
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     - Benefits
     - Costs
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  3. **IMT-2020 – set of technologies**
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  4. **IMT-2020 – external proposal**
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- **Conclusion**

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<tr>
<td>P802.1CF – OmniRAN architecture</td>
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<td>P802.1CM – TSN for Fronthaul</td>
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<td>P802.11ax – high aggregate throughput. High density of users.</td>
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<td>IEEE Std 802.11ad – high individual throughput, short range.</td>
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<td>P802.11ay – next generation of 802.11ad.</td>
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<td>P802.11ah - &lt;1 GHz for IoT requirements</td>
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What is 5G?
There are two contexts for 5G

- **IEEE 5G**
  - Some sort of description will be required
  - This may include use cases and requirements

- **IMT-2020**
  - **Usage scenarios (as defined by ITU-R M.2083)**
    - Enhanced Mobile Broadband (eMBB)
    - Ultra-reliable and low latency communications (UrLLC)
    - Massive machine type communications (mMTC)
  - **Capabilities (as defined by ITU-R M.2083)**
    - Peak Data rate, User experienced data rate, Latency, Mobility, Connection density, Energy efficiency, Spectrum efficiency, Area traffic capacity
IMT-2020 (per ITU-R M.2083 - Figure 2)

Enhanced mobile broadband

Gigabytes in a second

Smart home/building

3D video, UHD screens

Work and play in the cloud

Voice

Augmented reality

Smart city

Industry automation

Future IMT

Mission critical application

Self driving car

Massive machine type communications

Ultra-reliable and low latency communications
5G architecture

... simplified
What are all the derivatives of options?
1. IEEE 5G

- **Description**
  - Cost/benefit analysis does not include submission to IMT-2020
  - At least simplified architecture, but likely more
  - A combination of multiple IEEE standard technologies, profiled in a single standard

a) **IEEE 802 wireless 5G**
   
   i. **802.11 only**
      
      a. P802.11ax – high aggregate throughput. High density of users.
      b. P802.11ay, IEEE Std 802.11ad – high individual throughput, short range.
      c. P802.11ah - <1 GHz for IoT requirements

   ii. **802.15 only**
      
      a. P802.15.3d
      b. 100Gb/s THz project
      c. P802.15.7 REVa, Optical Wireless Communications,
      d. P802.15.4 family.

b) **All IEEE 802 5G**

c) **All IEEE 5G**

d) **IEEE 5G plus others**

   i. **3GPP 5G**
2. IMT-2020 - single technology

- Description
  - Just radio interface of simplified architecture. Single or multiple singles...
  - IMT-2020 proposal by IEEE
    - eMBB(<6GHz)
      i. IEEE 802.11ax
      ii. IEEE 802.11ac
      iii. IEEE 802.11n
    - eMBB (>6GHz)
      i. IEEE 802.11ay
      ii. IEEE 802.11aj
      iii. IEEE 802.11ad
    - UrLLC – IEEE 802.11p
    - mMTC – IEEE 802.11ah
    - eMBB
      a) P802.15.3d
      b) 100Gb/s THz project
      c) P802.15.7 REVa, Optical Wireless Communications,
    - mMTC - P802.15.4 family.
3. IMT-2020 - set of technologies

- Description
  - At least radio interface of simplified architecture, but likely more
  - A combination of multiple IEEE 802 standard technologies, profiled in a single standard
  - IMT-2020 proposal by IEEE

  a) IEEE 802.11
     i. eMBB (<6GHz) – IEEE 802.11 ax, ac, n
     ii. eMBB (>6GHz) – IEEE 802.11 ay, aj, ad
     iii. UrLLC – IEEE 802.11p
     iv. mMTC – IEEE 802.11ah

  b) IEEE 802.11 with 802.1/3

  c) IEEE 802.15
     a) eMBB
        a) P802.15.3d
        b) 100Gb/s THz project
        c) P802.15.7 REVa, Optical Wireless Communications,
     b) mMTC - P802.15.4 family.

  d) IEEE 802.11 with 3GPP 5G
     i. LWA
     ii. LWIP
     iii. New?
4. IMT-2020 - external proposal

- Description
  - Part of a complete architecture
  - A combination of IEEE 802 standard technologies with other technologies (e.g., 3GPP)
  - IMT-2020 proposal by external party (e.g., 3GPP)

a) IEEE 802.11 with 3GPP 5G
  i. LWA
  ii. LWIP
  iii. Release 16?
Next Steps
Contributions requested

- Derivative options
  - Expand list
  - Prioritize list

- Report content
  - Indicate which option
  - Expand costs and benefits