Traffic safety applications requirements

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G. Karagiannis, R. Wakikawa, J. Kenney
VSC traffic safety applications

- Traffic signal violation warning
- Curve speed warning
- Emergency Electronic Brake Lights
- Pre-crash sensing
- Cooperative Forward Collision Warning
- Left Turn Assistant
- Lane Change Warning
- Stop Sign Movement Assistance
VSC-A traffic safety applications

• Emergency Electronic Brake Light
• Forward Collision Warning
• Intersection Movement Assist
• Blind Spot Warning
• Lane Change Warning
• Do Not Pass Warning
• Control Loss Warning
# Traffic safety application requirements

*(from VSC project results)*

<table>
<thead>
<tr>
<th>Constraint type</th>
<th>Constraint value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate bandwidth</td>
<td>6 Mb/s</td>
</tr>
<tr>
<td>Maximum received packets/sec</td>
<td>4000</td>
</tr>
<tr>
<td>Maximum allowable latency</td>
<td>100 ms</td>
</tr>
<tr>
<td>Maximum network latency</td>
<td>10 ms</td>
</tr>
<tr>
<td>Maximum packet size</td>
<td>200 bytes</td>
</tr>
</tbody>
</table>
# Network security constraints

(from VSC-A project results)

<table>
<thead>
<tr>
<th>Constraint type</th>
<th>Constraint value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate size</td>
<td>&lt; 300 bytes</td>
</tr>
<tr>
<td>Authentication generations per second</td>
<td>10</td>
</tr>
<tr>
<td>Authentication verifications per second</td>
<td>1000</td>
</tr>
<tr>
<td>Time delay (authentication + verification)</td>
<td>&lt; 20 ms</td>
</tr>
<tr>
<td>Over-air-bandwidth overhead introduced by security mechanisms (including certificates); certificates with each message</td>
<td>1,810 bytes/s</td>
</tr>
</tbody>
</table>
Discussion

• Due to traffic safety application communication requirements IEEE 1609 and ISO CALM recommend non IP network and transport solutions for traffic safety applications

• New traffic safety application ideas could come forward and communication requirements might change
Discussion

• In IEEE 1609.4 switching between control channel and service channel done every 50 ms
  – Safety messages sent only on control channel, thus incurring up to 50 ms delay

• Due to unreliable wireless medium (802.11p):
  – expected that traffic safety applications can generally tolerate at least delay between two successfully delivered packets (300 ms)
Discussion

• Could these new traffic safety communication requirements be supported by IP network and IP transport based solutions that will be standardized by the IETF?