Traffic safety applications requirements

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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)

```
                         Network constraints
       +------------------------------+-------------------+
       |         Constraint type      |.Constraint value. |
       +------------------------------+-------------------+
       |  Aggregate bandwidth         |       6 Mb/s      |
       |                              |                   |
       |  Maximum received packets/sec|       4000        |
       |                              |                   |
       |  Maximum allowable latency   |       100 ms      |
       |                              |                   |
       |  Maximum network latency     |       10 ms       |
       |                              |                   |
       |  Maximum packet size         |       200 bytes   |
       +------------------------------+-------------------+
```

Network security constraints

(from VSC-A project results)

```
                  Network security constraints
+-------------------------------------+---------------------+
|          Constraint type            |.Constraint value.   |
+-------------------------------------+---------------------+
|   Certificate size                  |      < 300bytes     |
|                                     |                     |
|   Authentication generations        |      10             |
|   per second                        |                     |
|                                     |                     |
|   Authentication verifications      |      1000           |
|   per second                        |                     |
|                                     |                     |
|   Time delay (authentication +      |      < 20ms         |
|    + verification)                  |                     |
|                                     |                     |
|   Over-air-bandwidth overhead       |      1,810 bytes/s  |
|   introduced by security            |                     |
|   mechanisms (including             |                     |
|   certificates); certificates       |                     |
|   with each message                 |                     |
+-------------------------------------+---------------------+
```

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?