Networking & Transport Protocols for Release One and Future Directions

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Outline

Release 1

Release 2
### Published WG3 base & test standards for Release 1

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GeoNetworking key features

- Network beacons
- Location table
- Basic & extended header
- Geo-addressing
- Location service
- Store-carry & forward
- Packet repetition
- Security support
- Privacy support
- Dup-packet detection
GeoNetworking performance (1)

Smart forwarding algorithms in EN 302 636-4-1

- **Scenario**
  - Circular bidirectional freeway with three lanes per direction
  - Car Following-Krauss model
  - CAM rate 2Hz
  - DENM rate 1Hz
  - GeoArea size 100x500m
  - 500 vehicles uniformly distr.

- **Metrics**
  - Node Coverage Ratio (NCR)
  - End-to-End Delay (E2ED)
  - Data Traffic Overhead (DTO)

GeoNetworking performance (2)

Node coverage ratio (NCR) over vehicle density

- CBF and GFC – perfect NCR up to 30 veh/km/lane
- For higher density, NCR degrades → Congestion control
End-to-end delay (E2ED) over vehicle density

- CBF and GFC – Delay below 100 ms
  30 veh/km/lane
- For higher density, E2ED grows due to MAC queues
  → Congestion control
CBF and GFC – DTO shows reasonable increase

Beyond 30 veh/km/lane CBF DTO grows
GeoNetworking key facts

GeoNetworking related standards

- published as European norm
- test specifications developed
- all specifications publically available
- platform for conformance tests in place
- implementations from different vendors exist
- plugtests well-established
- part of C2C-CC profile for deployment
- validated in field trials & good performance

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Key question

- To what extend can we reuse existing protocols from Release 1 for Release 2 use cases?
GeoNetworking with modified forwarding algorithms

- Designed for information exchange in groups of autonomous vehicles
- Main features: low latency and high reliability
- Minimal changes in protocol specification

Example scenario

See R&D project „AutoNet 2030  Co-operative Systems in Support of Networked Automated Driving by 2030”
URL: http://www.autonet2030.eu/
Node coverage ratio and end-to-end delay over number of vehicles

Summary

WG3 Release 1 completed

Maintenance of release 1 standards

• Corrections
• Alignment with updates from DCC and security
• No new protocol features

Release 2 standards

• No open work item yet
• Follow closely WG1 pre-standardization activities to derive requirements for networking and transport
• Initial studies in R&D projects, such as AutoNet 2030, propose to enhance release 1 protocols for release 2 use cases
Fires destroy 3G infrastructure and V2X communication takes over for Emergency Calls and "Dad, I am OK!"

V2X interfaces to the User Calendar + Navigation so SmartGrid + Billing function at Office, Shops, Home, everywhere ...

V2X comm. of passing cars collect data and send later to M2M application.

Wind/Solar + E-Cars need SmartCharging

Agriculture Sensors need uplink

V2x is ubiquitous, robust, cheap ... what next !?

Taken from : L. Frost, A. Festag: "ETSI ITS Standardization: Focused or Visionary?", ETSI ITS Workshop, Venice, Italy, 2011