



# Communication platform and ecoMessages

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Cooperative Mobility Systems and  
Services for Energy Efficiency

# Content

- eCoMessage specification process
- eCoMessages Requirements and Design Choice
- eCoMessage description
- Concluding Remarks

# eCoMessage Process

- Requirements collected from applications
  - ecoApproachAdvice
  - ecoRouteAdvice
  - ecoParkAdvice
  - ecoDrivingSupport
  - ecoDriverCoaching
  - ecoTolling
- eCoMessages grouped in two categories
  - V2V or V2I short range communication
  - Long range single vehicle communication

# Basic Requirements

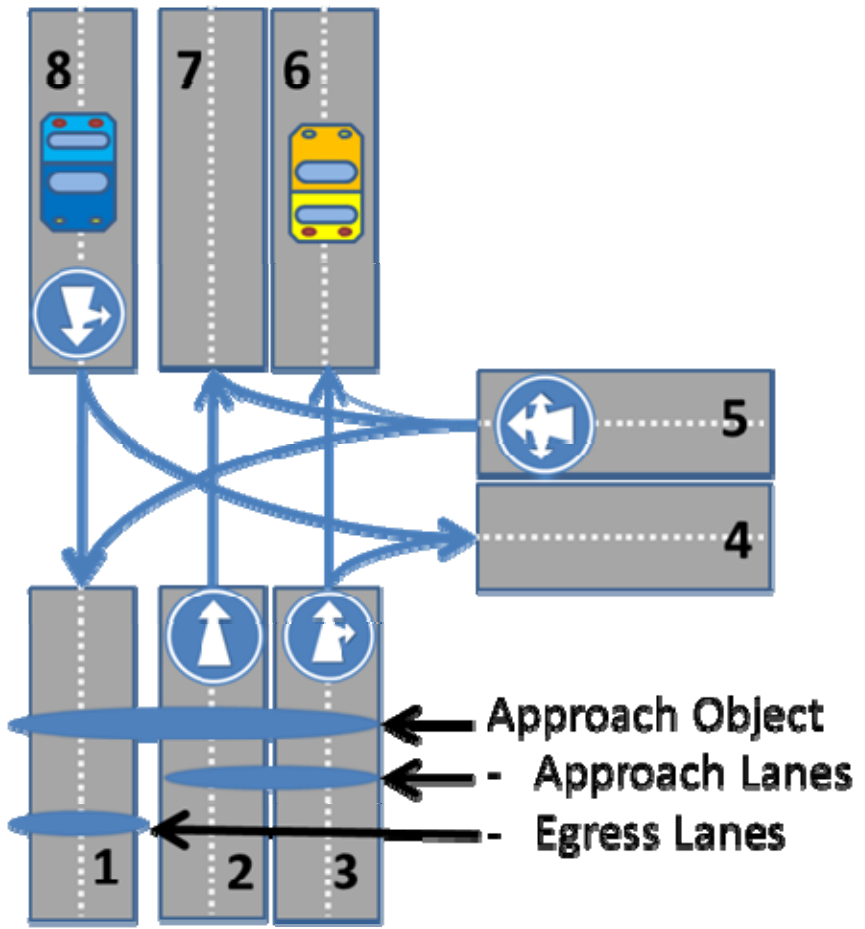
- Exchange energy related messages among vehicles and infrastructure
- Correctly represent the road topology to associate traffic related messages
- information from infrastructure:
  - traffic signal phase, speed recommendation
- information from vehicle:
  - current position, emission class, Floating Car Data (FCD), future and past position

# eCoMessage design choice

- Design
  - Common header
  - Header based on ETSI TC ITS CAM/ DENM specification
  - ASN.1 for interoperable communication
  - Functional interoperability with SAE J2735
  - Java / OSGI based API specification (Java Interface for interoperability)
- Location Reference in eCoMove
  - Geographical Coordinate Location reference,
  - Agora-C and OpenLR have been considered

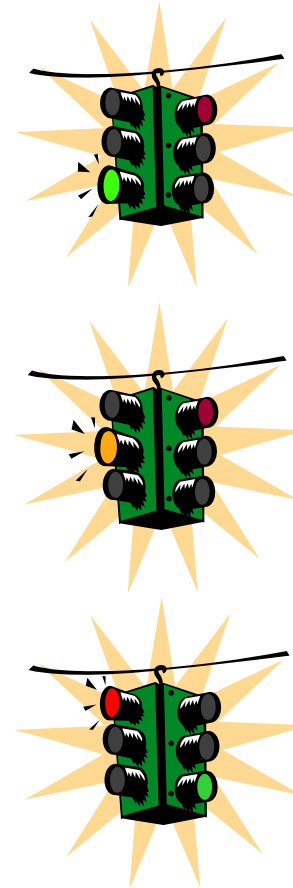
# Intersection Topology Message (ITM)

- Detailed map of intersection
- Topological view
  - connection among lanes, turns, restrictions
- Geographical coordinates
  - mark the centerline of lanes and other physical features
- Based on SAE J2735 MAP message



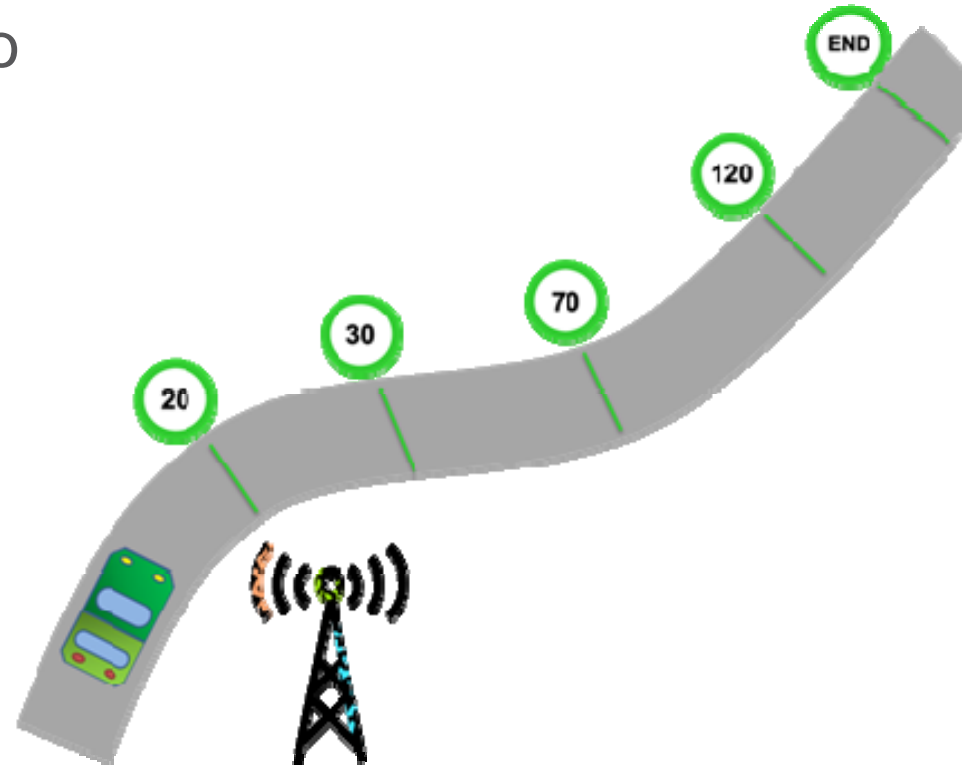
# Traffic Signal Phase Data Message (TSPDM)

- Traffic Signal Phase Data
- Based on SAE J2735 SPAT
- Information organized by traffic movements
- Multiple traffic state changes per movement
- No geographical information, must relate to ITM.



# Speed Lane Advice Message (SLAM)

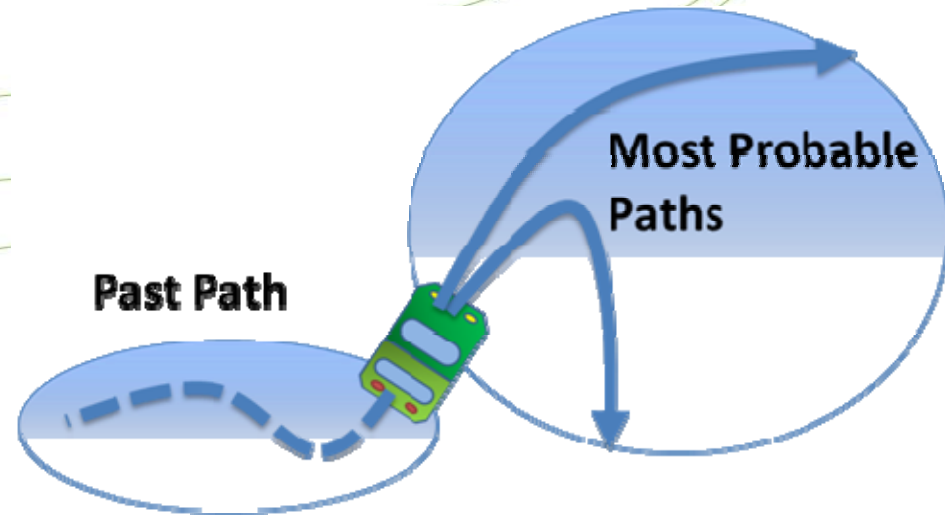
- Driving behavior advice to the drivers
- Broadcast or unicast communication
- Advice to driver for
  - Target speed
  - Meeting time instant
  - Lane preference
  - Combination of the three
- Speed/time profile over distance
  - Splitting the advice in multiple sections of the same path





# Vehicle Path Message (VPM)

- Past path and most probable near-term future paths
- Next destination is an intermediate step of the full trip
- Used by the cooperative horizon application
- Other vehicles and infrastructure may take future path into consideration
- Alignment CAM and SAE J2735 BSM
  - Past Path is now part of CAM
  - Already part of BSM



# ecoCAM

- CAM message is designed to convey information related to safety, in particular for collision avoidance
- ecoCAM conveys emission and consumption model of the vehicle
  - vehicle physical characteristics
  - vehicular emission class
  - fuel type
  - loading status
  - vehicular energy efficiency

# eCoMessage Protocol Consideration

- eCoMessages are layer 7 (application layer) protocols of OSI model
- eCoMessages are at the facility layer of ISO and ETSI communications architecture
- serve multiple applications
- eCoMessage protocols are independent of the transport, network and access layers
- Long-range using 3G/4G cellular networks
  - IPv6 with TCP or UDP as the transport protocol
  - IPv6 datagrams are transmitted via VPN tunnels over IPv4 Internet, if IPv6 is not natively supported by the 3G networks
  - VPN server hosted by a back-end service in the cloud
- Medium range using ETSI ITS-G5, IEEE 802.11p
  - GeoNetworking Network and Transport layer protocols.
  - BTP port numbers assigned in the project

# eCoMessage General Consideration

- Interoperability of eCoMessage with ETSI was demonstrated at ETSI Plugtests™
- ETSI TC ITS and CEN/ISO TC 278 are now specifying set of messages
- ecoCAM is not yet included into the road map, some input for standardization from eCoMove are encouraged
- Acknowledge to eCoMove partners in particular to Robert Bosch GmbH, PTV AG, Peek Traffic

# Thank you

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