TISA in the ITS-Landscape –
Competition or Complementation for V2V ?

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Current situation and systems under development

Current situation:
- Until recently, the primary interaction between vehicles and roadways has been the interface between the tire and road surface at the tire contact patch
- In addition, loop detectors, roadside closed-circuit cameras, microwave radar or roadway weather information services provide data about, and in some instances (e.g., variable message signs) to vehicles
- Most widely spread technology to deliver traffic and travel information to vehicles is the Traffic Message Channel (TMC), mainly transmitted via FM. When data is integrated directly into a navigation systems, this gives the driver the option to take alternative routes to avoid traffic incidents.

Systems under development include:
- Traffic control and management systems
- Intersection collision warning applications
- Weather and road condition warning systems
- Route guidance to avoid traffic congestion and, consequently, wasting fuel
- as well as information tools, e.g. advice on the location of nearby car parks with available parking spaces

VMS (Variable Message Sign)
European ITS Landscape

Key to the delivery of such systems under development are various communication technologies:

**Primary Communication**
- **Infrastructure centric**
  - Infrastructure-to-Infrastructure
  - Wired or wireless
- **Broadcasting centric**
  - (migrating to digital terrestrial and satellite radio, in future, cellular systems & web services)
- **Vehicle centric**
  - Vehicle-to-Vehicle (V2I, V2V, I2V via short range communication)

**Organization**
- EasyWay
- TISA
- CAR2CAR

**Communication Protocol**
- Datex II (Roadmanagement)
- TMC, TPEG
- Corporate Awareness Message (CAM)
- Decentralized Environmental Notification Message (DENM)
Easyway and Datex II

**EasyWay**
- is a project for Europe-wide ITS deployment on main TERN corridors driven by national or regional road authorities and road operators
- sets clear targets, identifies the set of necessary ITS European services to deploy (Traveller Information, Traffic Management and Freight and Logistic Services) and is a platform that allows the European mobility stakeholders to achieve a coordinated and combined deployment of these pan-European services.

**Datex II**
- Datex exchange standard, originally designed for only one user group: the TERN operators
  - coarse location referencing good for motorways, but not enough for urban environments
- Datex II is being promoted on the interface to other stakeholders (e.g. service providers)
  - Datex II is designed to be easier to use, has improved referencing (e.g. TPEGloc) and provides features that allow users to add missing elements (e.g. Agora-C extension for dynamic location referencing)

**Standardization, Co-Operative Systems and liaison**
- Easyway coordinates with standardisation in the V2X field (standardization mandate CEN / ETSI / Cenelec)
- Cooperative systems include vehicles, roadside and centres (connected to the TCC backbone using Datex)
- Easyway has set up active liaison with organisations like TISA („Datex-2-TPEG-conversion“)

TERN (Trans European Road Network), TCC (Traffic Control Centers)
Easyway, TISA and further organisational links

- Easyway and TISA have set up active liaison to foster interoperability of DATEX II with downstream standards (Alert C; TPEG) („Datex-2-TPEG-conversion“)
- TISA itself has also links with many other standards and technical organisations

... but what is TISA?
TISA
Traveller Information Services Association

- Not-for-profit organization
- Market-driven, coordinated, proactive implementation of TTI services
- Delivering Traffic Information to the end user
- Practical delivery of EU ITS Action Plan to Drivers
- Language independent → displayed in users language at receiver

Technologies:

- **RDS-TMC**
  - Immensely successful
  - Still expanding worldwide
  - Stable / Mature (ISO)

- **TPEG**
  - "Next Generation" Traffic Information
  - Fast Digital Bearers
  - Multiple Services
  - More Information
  - Adaptable/Extendable

TTI (Traffic and Traveller Information)
TPEG (Transport Protocol Expert Group)
The Vision

PrecisionTraffic

- Full network flow information
- Predictive/historic data
- "Confidence" information
- High-speed delivery channel
- Improved driver experience - additional services

Traffic 1.0

Incident information

Added value from traffic services focussed on the driver’s needs
TPEG – The Automotive TTI Toolkit

- Standardised method for delivery of all types of TTI content by digital bearer. (ISO standards)
- Language independent human and machine readable content.
- Extensible with multiple applications
- TPEG Applications already defined for several types of data.
- There are many in development.
- TPEG applications use a set of Location Referencing
- For the Automotive use in combination with navigation systems within the next 1-2 years the applications with most focus are TEC (Traffic Event Compact) and TFP (Traffic Flow and Prediction)

TTI (Traffic and Traveller Information)
Applications: TPEG-TEC (Traffic Event Compact)

- Similar application to TMC; incident / safety related information
- Provides machine and human readable incident information
- Specifically designed for use with Automotive Navigation systems with Dynamic Route Guidance
- Every TPEG message is constructed of three containers:
  - Message Management Container,
  - Application Event Container and
  - Location Reference Container
Applications: TPEG – TFP (Traffic Flow and Prediction)

- Efficient and detailed transmission of traffic speed & flow information with predictions.
- Navigation systems will use the information on live network speeds for improved dynamic routing choices and more accurate travel times and corresponding ETA (expected time of arrival) calculations.

Resolution not limited to TMC-Locations; distance offsets can be used

User is able to make a decision on real time- and even predicted information.
## TISA: Application Status & Summary

<table>
<thead>
<tr>
<th>TEC</th>
<th>Traffic Event Compact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Defined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TFP</th>
<th>Traffic Flow &amp; Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Defined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPI</th>
<th>SPee Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definition almost complete</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PKI</th>
<th>ParKing Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardised Application</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>RTM</th>
<th>Road Traffic Message</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardised Application</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PTI</th>
<th>Public Transport Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardised Application</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEA</th>
<th>WEAther Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Application being developed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FPI</th>
<th>Fuel Price Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Application being developed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RPI</th>
<th>Road Pricing Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Application just started</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCA</th>
<th>Safety/Speed CAmera Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use Case</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAI</th>
<th>Conditional Access Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ready for adoption</td>
</tr>
</tbody>
</table>

|       | what next ?                           |

### Summary

- now an enlarging set of Applications and supporting documents
- TPEG is becoming more and more an important additional tool set for the delivery of future TTI services...

... but what about material / content?
ITS Landscape → Easyway, TISA and C2C-CC

**Data Acquisition**
- Traffic data from road-side telematics system
- Traffic data from various "manual" sources
- Traffic data from co-operative (V2I) telematics system
- Traffic data from car-sensors

**Data processing and Service generation**
- Traffic Control Center
- Service Provider
- Traffic Control Center

**Service Provision Network**
- Datex
- TPEG
- CAM / DENM
- Roadside infrastructure e.g. VMS
- Digital Broadcast (e.g. DAB)
- Communication (e.g. UMTS, WLAN)
- Communication (e.g. 802.11p)

* due to latency

Safety applications

Efficiency

In-car

Navigation displays

Pre-trip planning

On-trip planning

* due to latency
Vision of Co-operative Systems and Services

**Data Acquisition**
- Better informed road operator
- Integration of additional sources of data
- Available information on vehicle side due to various car sensors

**Data processing and Service generation**
- Traffic Data Marketplace
  - generating and validating high-quality traffic information
  - static & dynamic data
  - historic data
  - flow data
  - flow prediction

**Service Provision Network**
- Better informed road user
- New services based on more "confidence" information even in urban areas
- Safety applications enriched with efficiency and other applications

Content co-operation

Service differentiation

- in-car navigation displays
- pre-trip planning
- on-trip planning
- safety applications

* due to latency
Summary

- Co-operative Systems offer the potential for increased information about vehicles and road conditions.
- This information can be shared between vehicles and road infrastructure operators, and can provide the basis for decision making that will improve the use of available road capacity, and enable better responses to incidents and hazards.
- The amount of quality information provided to the traveller needs to be expanded beyond “variable message signs” and must deliver “confidence” information.
- Vehicles should act as important mobile collectors of information.
- Much of the most relevant information will come from nearby vehicles, which underlines the need for V2V communication.
- The challenge is to develop a system that intelligently and efficiently handles the large amount of relevant information that can be collected from these vehicles.

Strengths of V2V:
- high quantity of high quality (location, time) raw data
- communication device with lowest possible latency to cover highly time critical (pre-crash) safety apps.

Strengths of „server-based-communication“:
- coverage of wide areas with reasonable cost associated for transmission to a large usergroup
- dataformat is already deployed successfully for traffic efficiency functions like dynamic route calculation within navigation devices.

Let’s strive for a European harmonized, interoperable Intelligent Transportation System.
Every TPEG message is constructed of three containers:
- Message Management Container,
- Application Event Container and
- Location Reference Container

Within the Event component one or more Cause components shall come first, followed by one or more Advice components, and so on.

**TEC Tables:**

<table>
<thead>
<tr>
<th>TEC Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tec001:EffectCode</td>
<td>Describes the effect to the traffic flow.</td>
</tr>
<tr>
<td>tec002:CauseCode</td>
<td>Defines various reasons why this message was sent out.</td>
</tr>
<tr>
<td>tec003:WarningLevel</td>
<td>Defines different levels of danger.</td>
</tr>
<tr>
<td>tec004:LaneRestriction</td>
<td>Defines lanes being restricted with this message</td>
</tr>
<tr>
<td>tec005:AdviceCode</td>
<td>A recommendation or instruction for the driver to do something</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
### Applications: TPEG-TEC (Traffic Event Compact): Cause Code

#### TPEG Automotive Profile (TAP)
- Application TPEC-TEC
- TEC-Tables: Cause Code

#### Application Class: Co-operative road safety
- Applications: Driving Assistance – Road Hazard Warning
- Use cases

<table>
<thead>
<tr>
<th>Code</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>014</td>
<td>vehicle on wrong carriageway</td>
</tr>
<tr>
<td>002</td>
<td>accident</td>
</tr>
<tr>
<td>013</td>
<td>broken down vehicles</td>
</tr>
<tr>
<td>001</td>
<td>traffic congestion</td>
</tr>
<tr>
<td>003</td>
<td>roadworks</td>
</tr>
<tr>
<td>010</td>
<td>objects on the road</td>
</tr>
<tr>
<td>009</td>
<td>hazardous driving conditions</td>
</tr>
<tr>
<td>019</td>
<td>Precipitations (heavy rain, - snowfall, hail)</td>
</tr>
<tr>
<td>006</td>
<td>slippery road</td>
</tr>
<tr>
<td>018</td>
<td>visibility reduced</td>
</tr>
<tr>
<td>017</td>
<td>extreme weather conditions (117: winds)</td>
</tr>
</tbody>
</table>

#### Use cases
- (Source: BSA from ETSI TC ITS)

<table>
<thead>
<tr>
<th>Use case</th>
<th>Use case</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC005</td>
<td>Emergency brake lights</td>
</tr>
<tr>
<td>UC006</td>
<td>Wrong way driving</td>
</tr>
<tr>
<td>UC007</td>
<td>Stationary vehicle – accident</td>
</tr>
<tr>
<td>UC008</td>
<td>Stationary vehicle – vehicle problem</td>
</tr>
<tr>
<td>UC009</td>
<td>Traffic condition warning</td>
</tr>
<tr>
<td>UC010</td>
<td>Signal violation warning</td>
</tr>
<tr>
<td>UC011</td>
<td>Roadwork warning</td>
</tr>
<tr>
<td>UC012</td>
<td>Collision risk warning</td>
</tr>
<tr>
<td>UC013</td>
<td>Decentralized floating car data – Hazardous location</td>
</tr>
<tr>
<td>UC014</td>
<td>Decentralized floating car data – Precipitations</td>
</tr>
<tr>
<td>UC015</td>
<td>Decentralized floating car data – Road adhesion</td>
</tr>
<tr>
<td>UC016</td>
<td>Decentralized floating car data – Visibility</td>
</tr>
<tr>
<td>UC017</td>
<td>Decentralized floating car data – Wind</td>
</tr>
</tbody>
</table>
“TISA - bringing traffic information technologies to fruition”

Thank you

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