



Location is the heart of a cooperative
system

Rob van Essen
Tele Atlas/TomTom

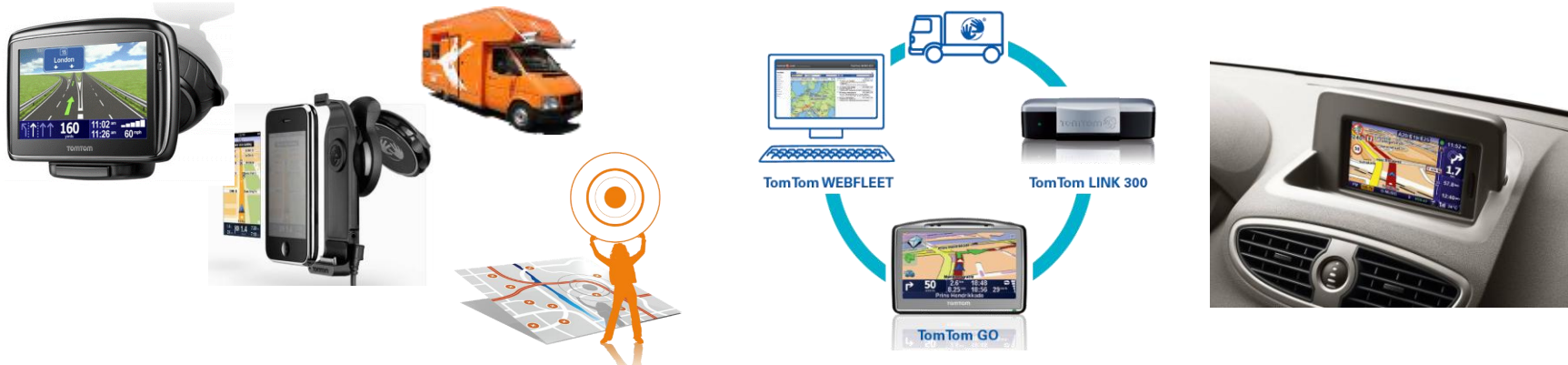


Overview

1. TomTom / Tele Atlas and Mapping in the Era of Community Input
2. Applications driving digital maps
 - Consumer Navigation
 - Advanced Driver Assistance Systems for safety and eco-driving
 - Location Based Services
 - Traffic Management
 - Cooperative Systems
3. Location in Cooperative Systems
 - Results from major projects
 - Local Dynamic Map
 - Location Referencing
 - Further building of Cooperative Systems:
4. Implementation of Cooperative Systems



Introduction to the TomTom Group



TomTom PND

B2C →

Retail

- Consumers
- Mobile Phone suppliers

Tele Atlas

B2B →

- PND
- Automotive
- Mobile
- Internet
- GIS

WORK

B2B →

- Commercial fleets

Automotive

B2B →

- Car industry
- Car industry suppliers

Dynamic Content & Publishing

Shared Technologies

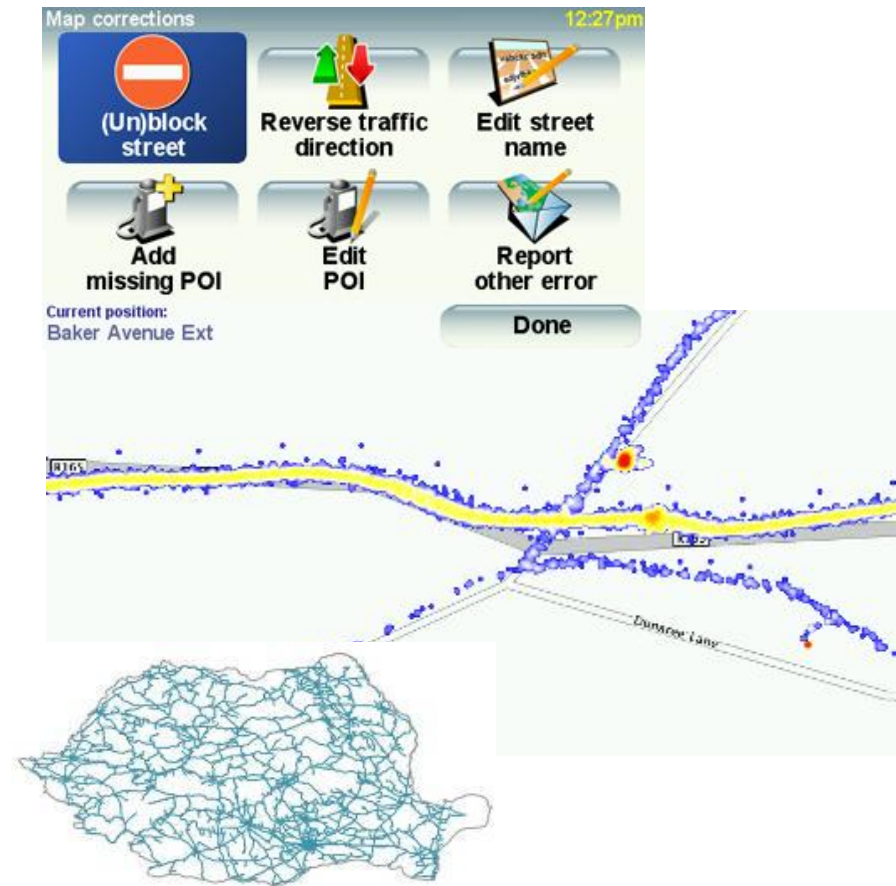
Tele Atlas map making

A variety of sources

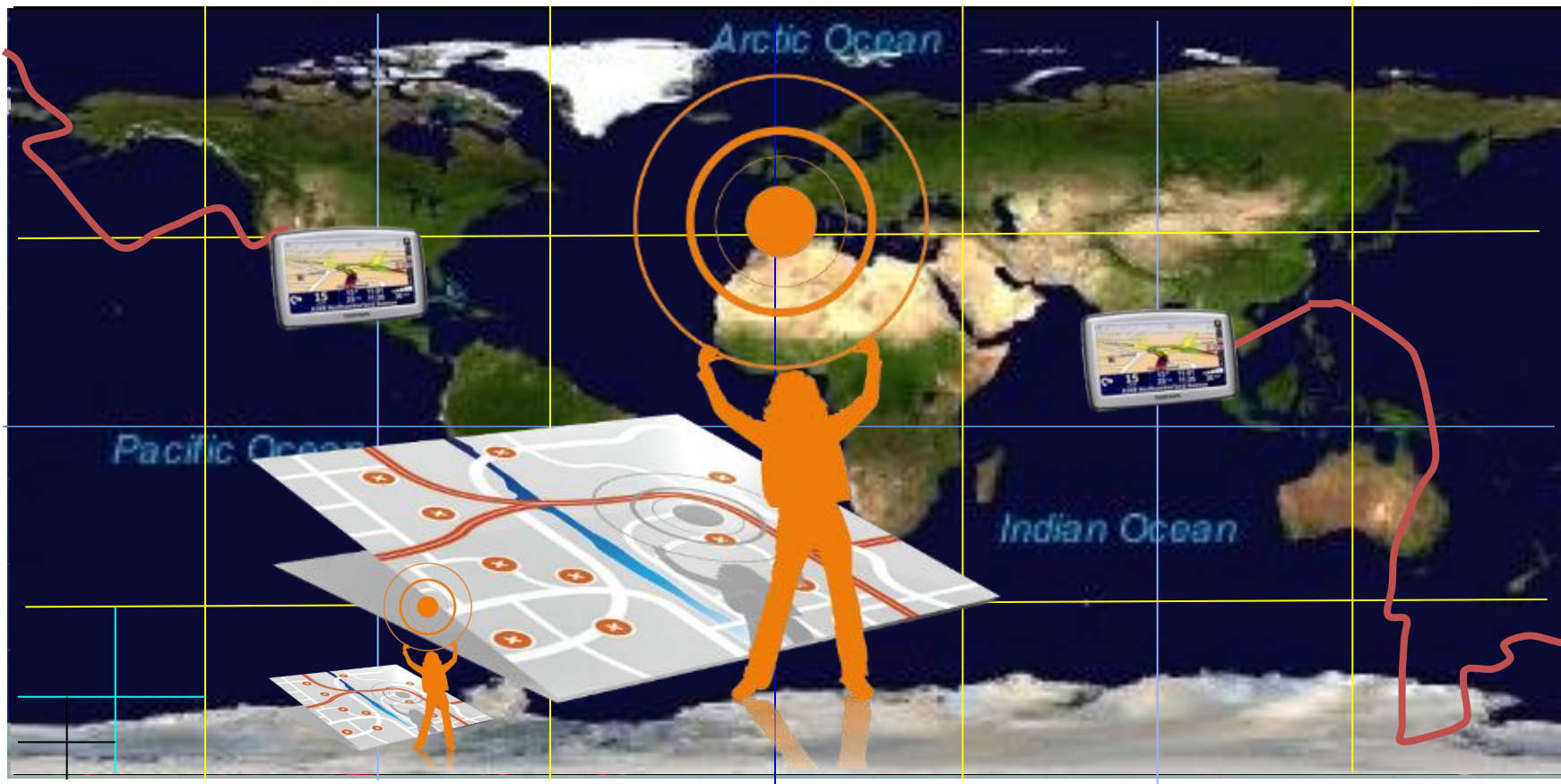


Community Input

- Today's application requirements for maps are: fresh, accurate and complete
- Map creation and updating with community input is fast, efficient and quality controlled
 - Active Community Input (user correction): MapShare
 - Passive Community Input (probe data)
- High quality: Fulfilling high map requirements from ADAS systems
- Also a source for dynamic and real-time content



A new era of mapping



Applications driving Digital Maps

- Consumer Navigation
Basic network + dynamic traffic information
- Advanced Driver Assistance Systems for safety and eco-driving
+ Accurate Geometry + extra content + high quality
- Location Based Services (LBS)
+ POIs
- Traffic Management
+ Speed Profiles + O-D information + Real-Time flow information
- Cooperative Systems
Connected vehicles generating and using spatial information

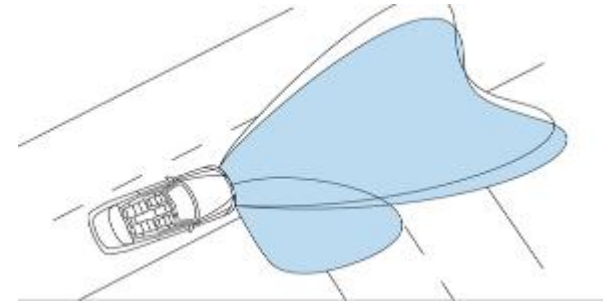
Consumer navigation

- Navigation is becoming commodity feature in a car with 27% in 2010 (incl PNDs)
- Dynamic navigation has become a key feature
- Personal Navigation Devices will coexist with built-in systems
- Navigation Data Standard (NDS) will make navigation ubiquitous

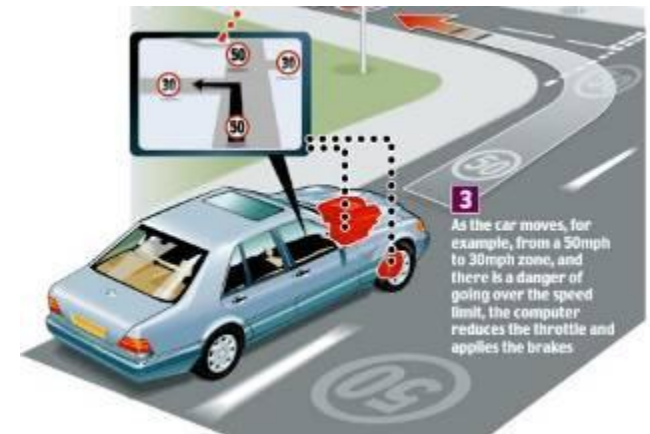


ADAS and Eco-driving

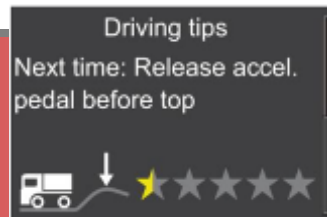
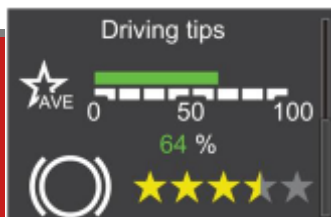
- For safer roads and more efficient vehicles
- Strict Map Accuracy and Quality requirements: Fulfilled with Community Input
- Extra Content: Legal Speed, Road Curvature, Gradient
- Green maps will enable 'green' routing and smooth driving, preventing unnecessary acceleration and braking



Adaptive Headlights and cornering lights



3
As the car moves, for example, from a 50mph to 30mph zone, and there is a danger of going over the speed limit, the computer reduces the throttle and applies the brakes

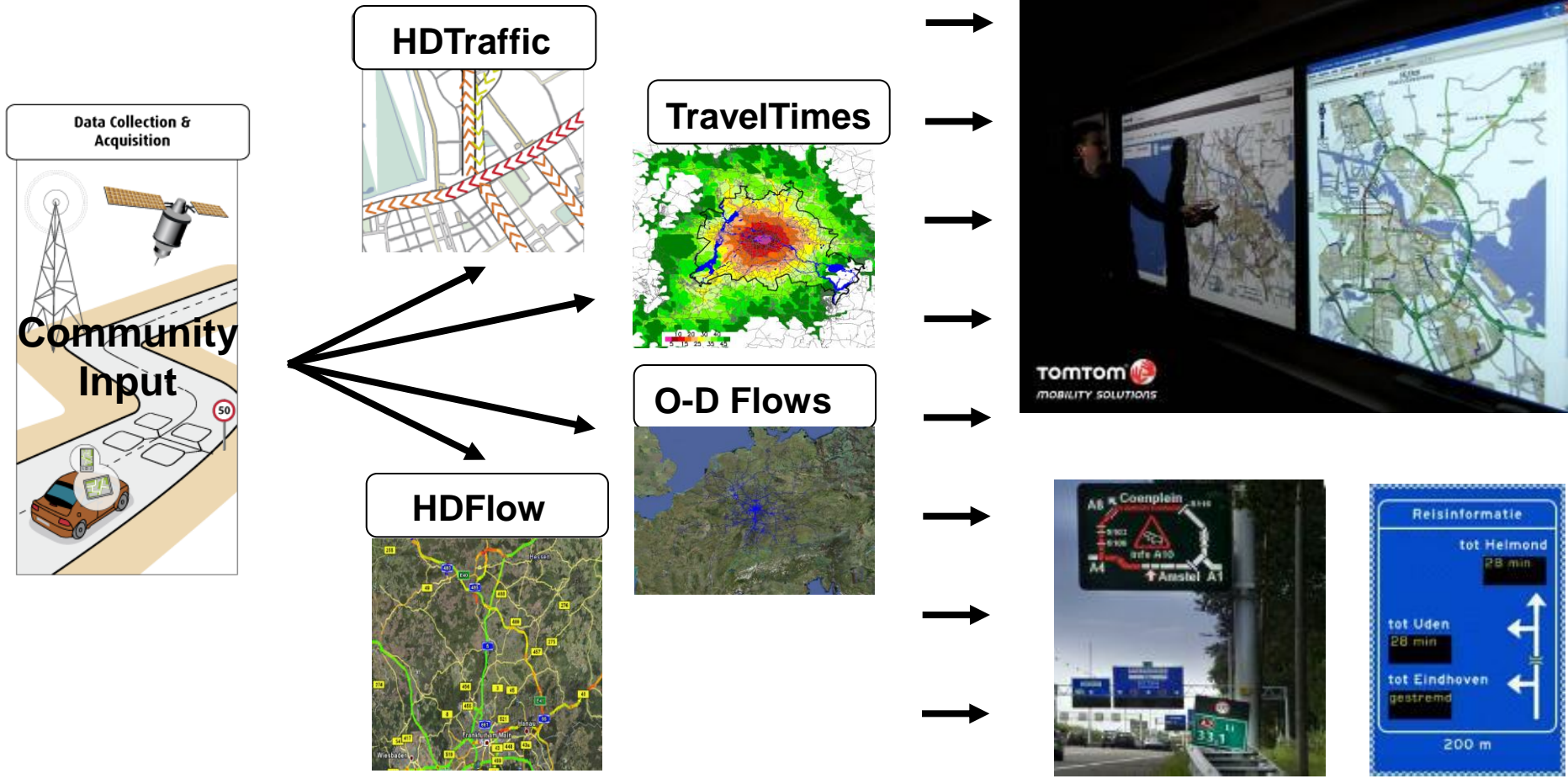


"First generation" Eco-ADAS
on the market
www.scania.com

Location Based Services

- Access to Business Listings and POI's
 - Location enabled, integration in the map
 - Via on-line or off-line media
- Static and dynamic content
 - Editorial
 - Dynamic: E.g. restaurant menus, parking occupancy rates.
- Advertising content

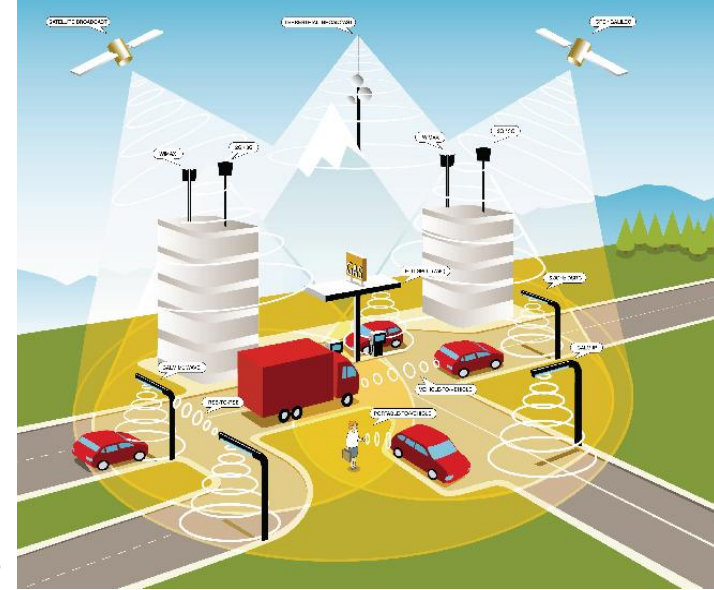
Traffic Management



TomTom HD Flow: Nominated for the Intertraffic Innovation Award 2010: See our stand 09.212

Cooperative Systems

- Connected vehicles generating and using spatial information
- Next generation in-car safety and eco systems
- Next step towards European traffic safety targets
- Connected devices to service centre, infrastructure and other devices (cars) for e.g.
 - Green wave and Stop and Go information from traffic lights
 - Road condition status
 - Parking information
- Maps are a core component to enable position interpretation
- Developed in European and National research initiatives



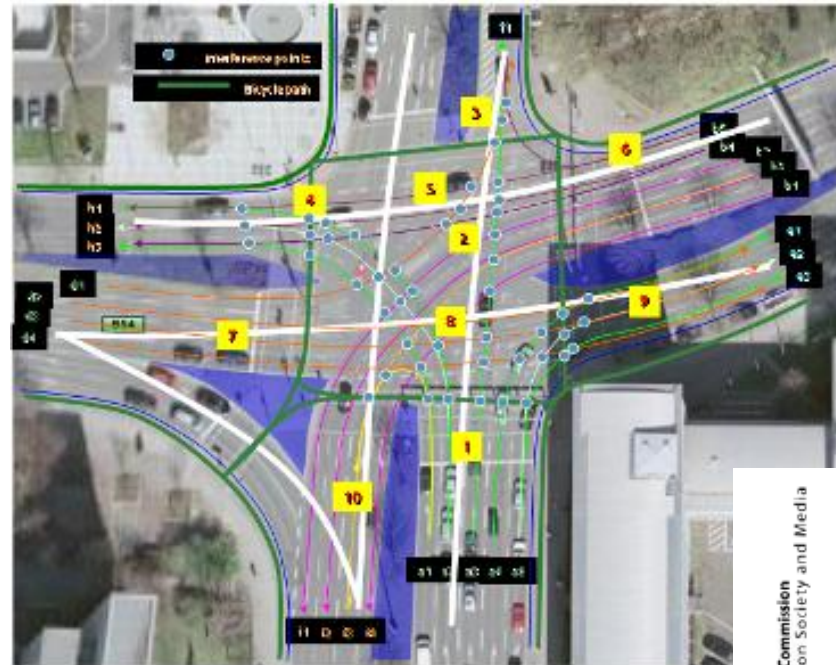
European Commission
Information Society and Media



Project Results

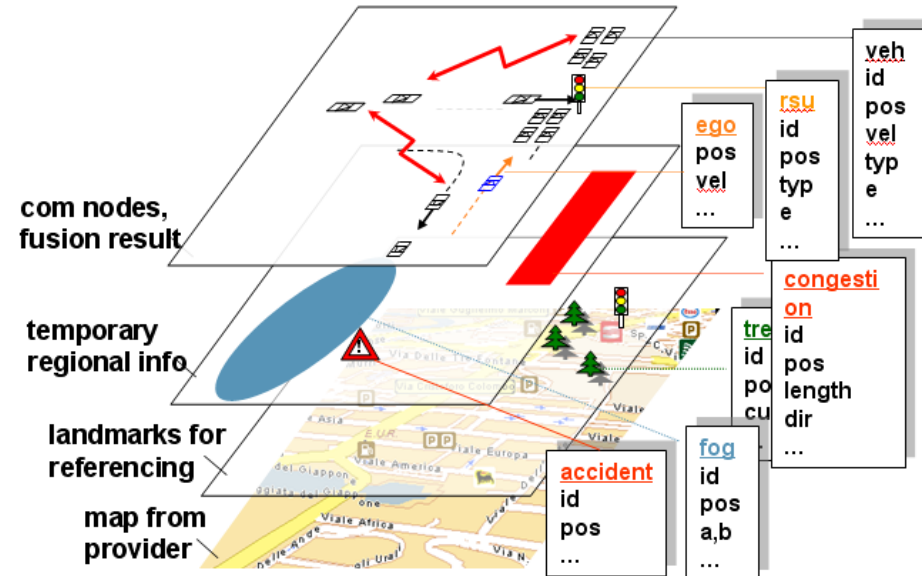


- Proven technical feasibility
- Hardware and software architecture
 - Message protocol,
 - Communication layer,
 - Positioning techniques,
 - Local Dynamic Map concept,
 - Location Referencing,
 - API's,
 - ...
- CVIS Box as a reference implementation



The Local Dynamic Map

- Standard interface to combined enhanced static map with temporary and dynamic information
- Layered Data structure to model the surrounding of vehicles and road side units
- To analyze the perception vicinity of the car or the infrastructure to detect potential dangerous situations
- Enables storage and updating of objects including type, position and other characteristics
- Modeled as a relational database with spatial functionality
- Dedicated APIs provide easy access to the LDM



Our first experiences with LDM

- We delivered prototype static LDMs for 22 test sites
- New content features for intersection static maps:
 - Reference tracks, which define the possible legal paths of vehicles on an intersection
 - Line and point landmarks for relative positioning (curb lines, building outlines, lane markings, etc)
 - Intersection stop lines for red light violation
 - Lane information for interpreting traffic light information and advanced positioning
- Technical feasibility of LDM is proven
- Potential of Community Input for economic LDM data sourcing.

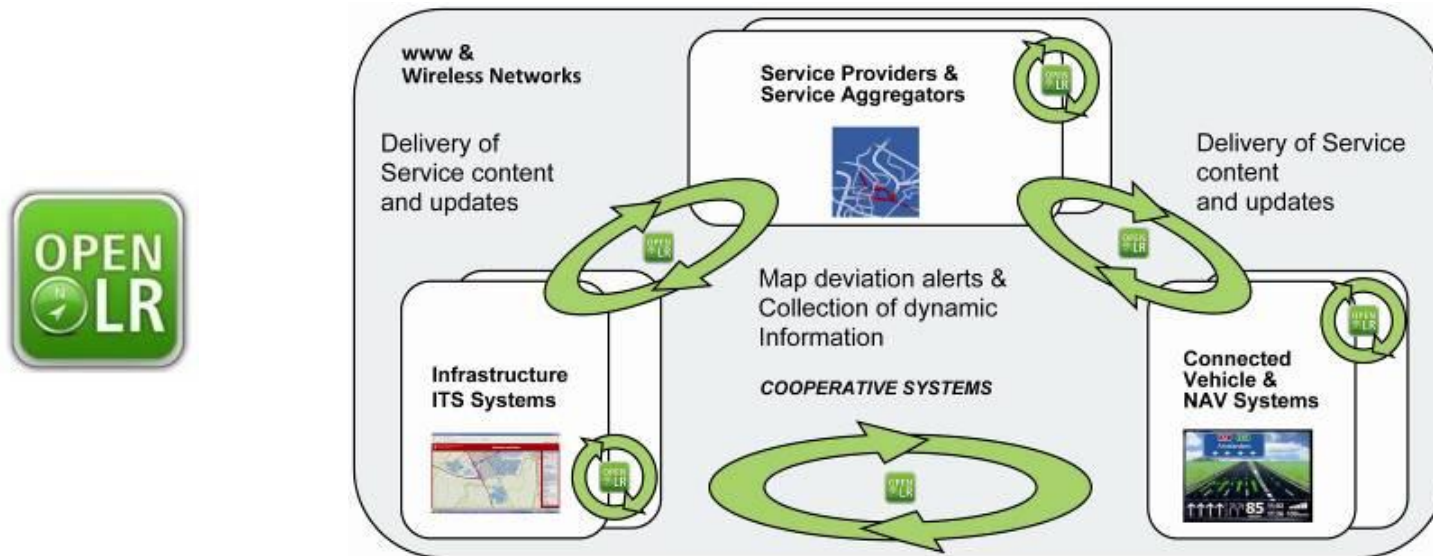
	Project	Partner
Amsterdam	CVIS/Safespot	Intertraffic
Stockholm	Safespot/CVIS	ITS
Torino-Caselle	Safespot	CRF/Mizar
Ulm	Safespot	Daimler

Location information exchange

- Exchange of position information is key for cooperative systems
- If maps in the systems are different, matching of coordinates may be inaccurate, ambiguous or impossible.
- Key Location Referencing Technologies
 - AGORA-C Standard for location referencing
 - License available via Patent Pool
 - http://www.vialicensing.com/licensing/AgoraC_index.cfm
 - OpenLR industry standard in open source
 - Developed by TomTom
 - www.openlr.org

OpenLR Location Referencing

- Proven Industry standard
- GPL Open Source
- Royalty free for commercial implementations
- Join at www.openlr.org



Cooperative Systems: Challenges and solutions

- Business case details to be fixed
 - Gap between government and industry perspectives
 - Vehicle and Infrastructure equipment chicken and egg
 - How to reach required penetration for car-to-car functionality
- Availability of Advanced LDM content?
- Technology
 - Short range communication technology requires lots of investments
 - Moving from research platform into cost-effective implementation
 - Architecture defined in EU projects results from a green field situation
- Focus on Business Case with clear added value for the end user (e.g. green wave entry)
- First focus on near term use cases
 - Non-safety critical;
 - Use existing communication infrastructure;
 - Use existing static map
- Solve the volume bottleneck by adding PNDs as connected sensors and adopt Open Platform Concept
- Continued development and testing

Next steps towards deployment

- EU-ERTICO led project EcoMove:
 - Developing the Eco-use cases for cooperative systems
 - Improving individual eco-behavior and collective behavior via eco-traffic management with advanced real-time eco data modelling and eco-static map content
- NL-project SPITS: (Strategic Platform for Intelligent Traffic Systems)
 - Demonstrate pragmatic implementations of cooperative systems to advance the deployment
 - Open platform approach
 - First results demonstrated at Intertraffic



Conclusion

- Cooperative Systems have huge potential
- Location and maps are a key component
- EU projects demonstrated long term vision and technical feasibility
- Stepwise deployment starting with near term use cases and existing technology and maps
- Further development and testing support is essential: SPITS, EcoMove,
- Special thanks to the European Commission; Bundesministerium für Wirtschaft und Technologie; Ministerie van Economische Zaken

The logo for 'cooperative' features the word in a bold, lowercase sans-serif font. The 'oo' is highlighted in red, with a red arch above it. The rest of the word is in black.

cooperative

A graphic consisting of two thick, horizontal arrows pointing in opposite directions. The top arrow points right and the bottom arrow points left. They are colored in a gradient from red to dark red. The text 'Conference 2010' is centered between them in a light gray, italicized sans-serif font.

Conference 2010

mobility

Thank you for your Attention

Rob van Essen

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