



# Cooperative Vehicle Infrastructure Systems

European Intelligent Vehicle Safety Summit  
Frankfurt, 11-12 March 2008



# Outline

- Introduction to CVIS
- CVIS reference execution platform
- CVIS applications
- Deployment of V2X

# CVIS in Brief

- Coordinator:  
ERTICO
- Duration:  
to 31 Jan 10
- Total budget:  
€ 41 Million
- EC contribution:  
€ 22 Million
- Consortium:  
61 partners  
12 countries



# CVIS Vision

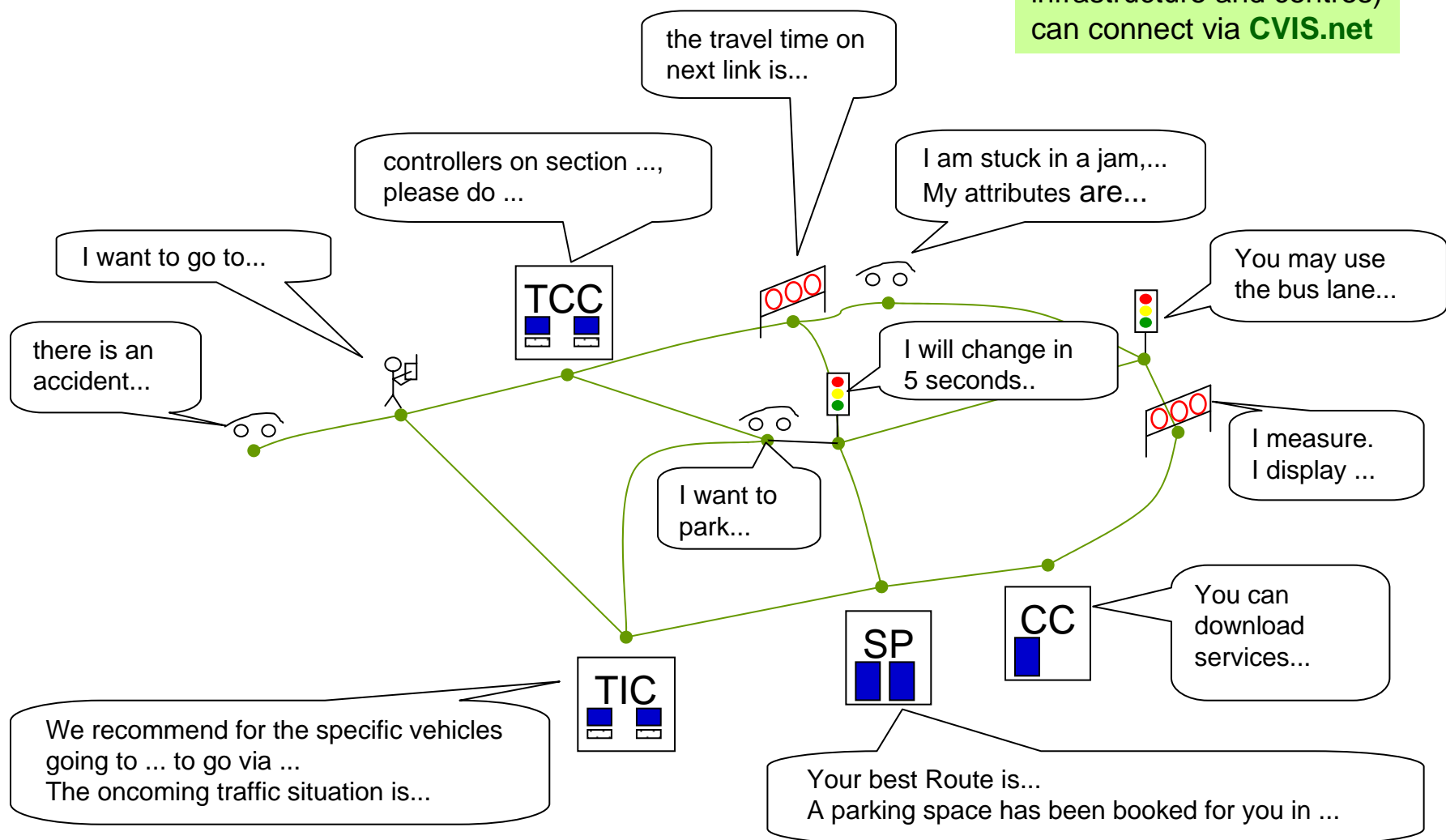
“Create a **wireless network** between vehicles & infrastructure”

“Increase efficiency & safety through **vehicle-infrastructure cooperation**”



# CVIS concept

Any clients (e.g. vehicles, infrastructure and centres) can connect via **CVIS.net** ZJ1



**Slide 6**

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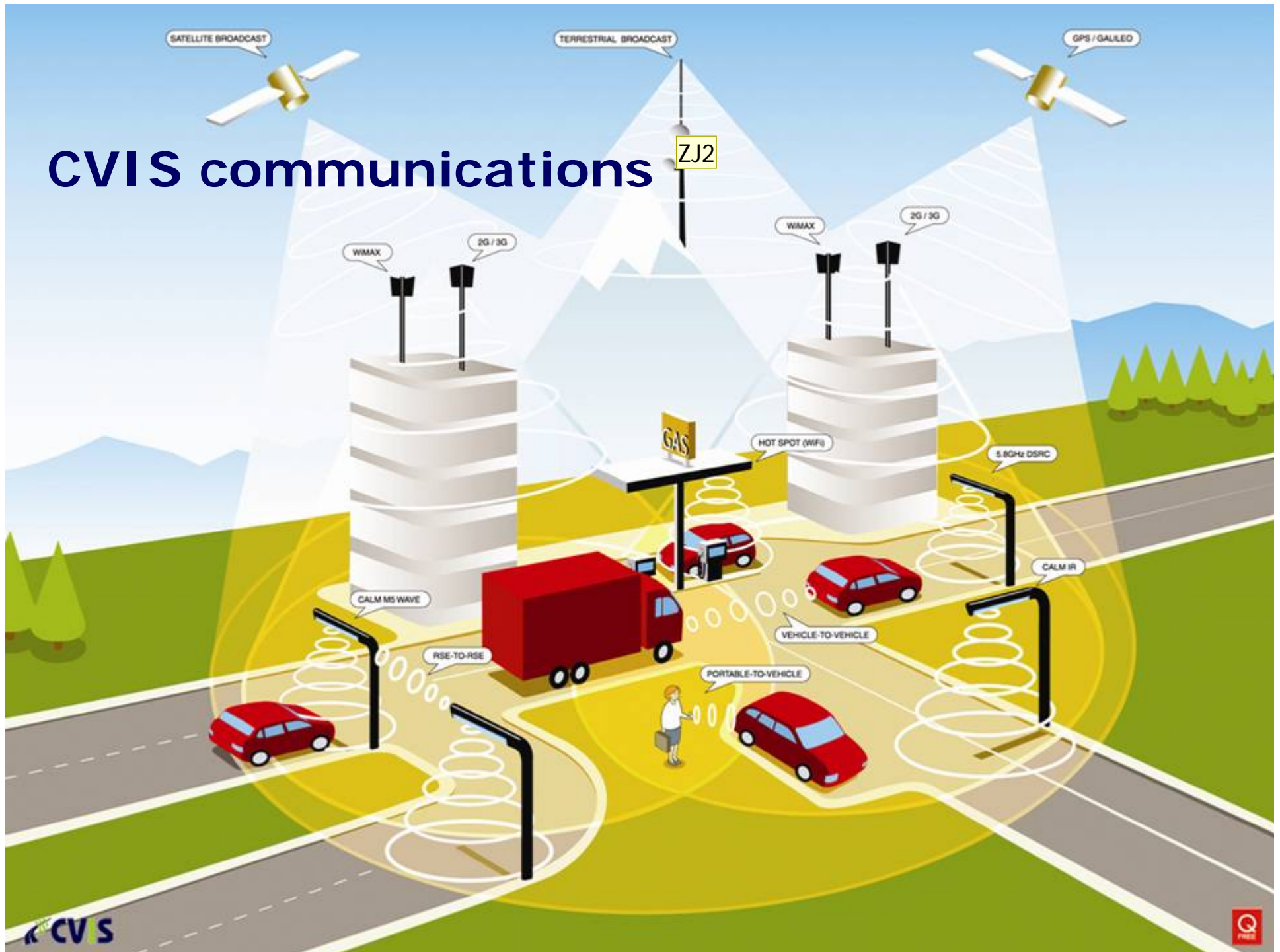
**ZJ1**

I would call it "node" in order to be consistent with our achitecture and terminology

Zeljko Jeftic; 05/03/2008

# **CVIS Reference Execution Platform**

# CVIS communications



**Slide 8**

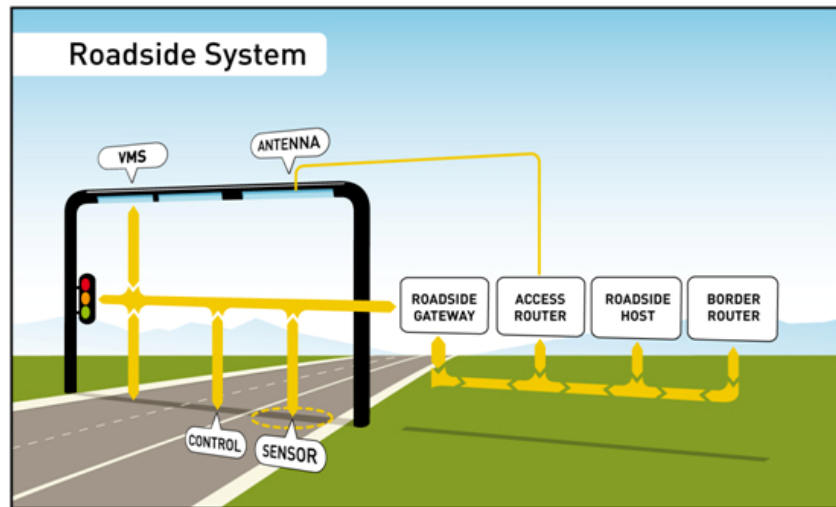
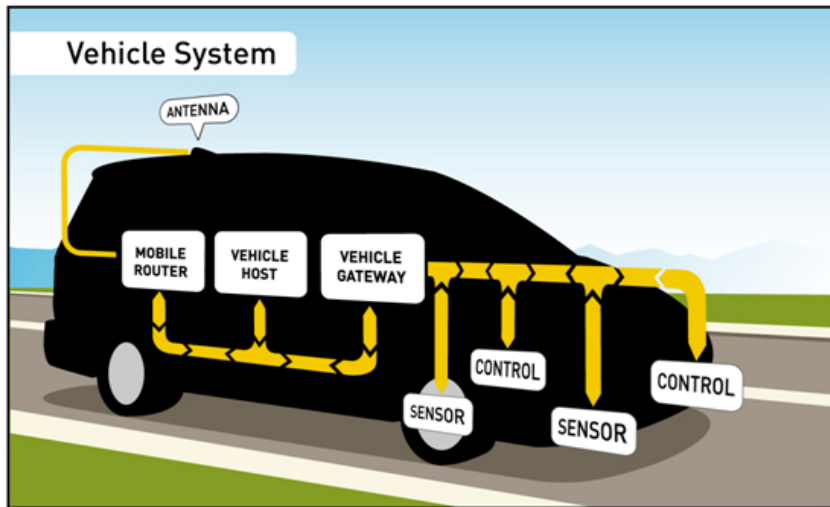
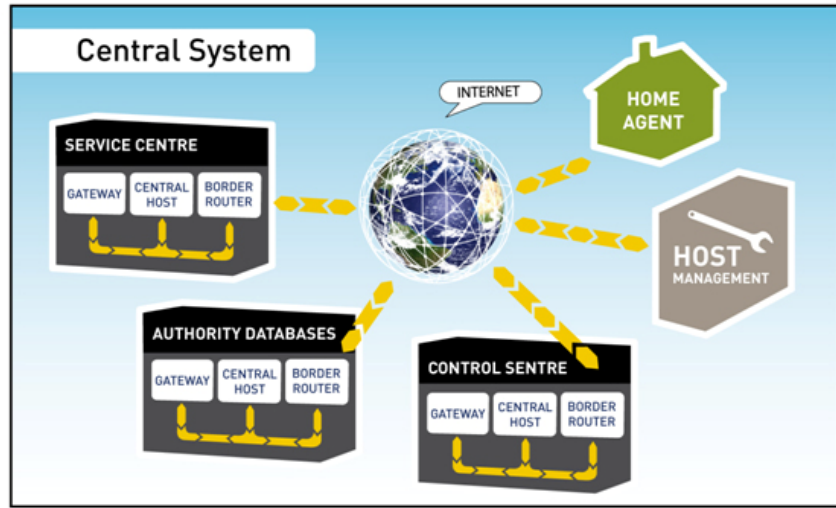
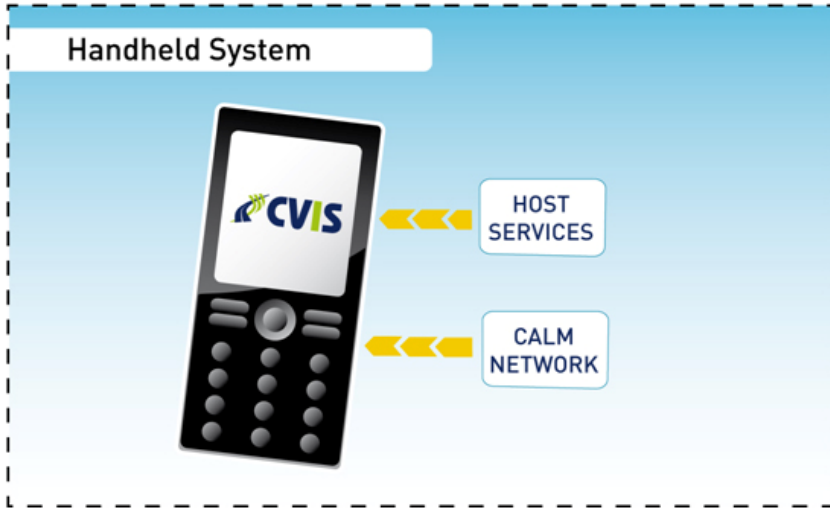
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**ZJ2**

I would call it "CVIS communicaitons vision" as we do not implement all of these in CVIS project

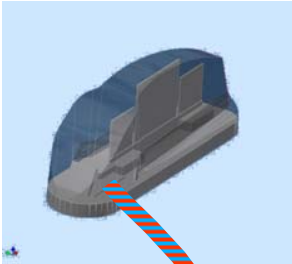
Zeljko Jeftic; 05/03/2008

# CVIS elements



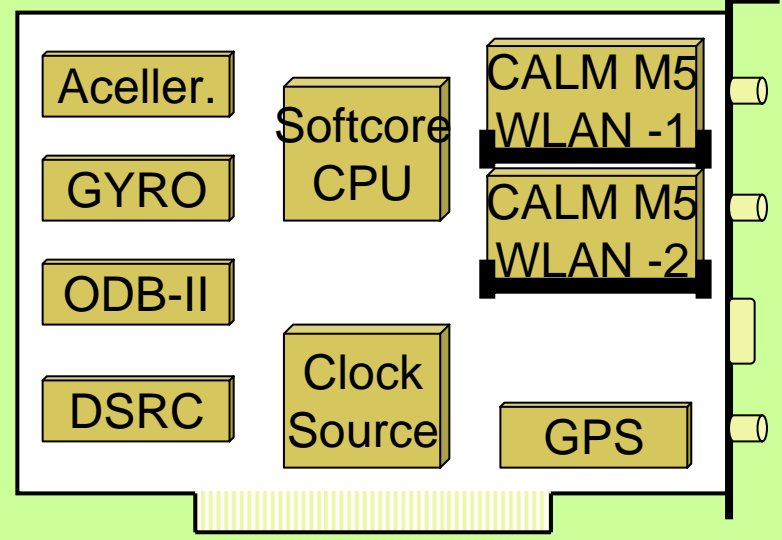
# Reference execution platform

CVIS Antenna



CVIS Router

POMA/CALM M5/ CEN DSRC



Small-size PIC-card

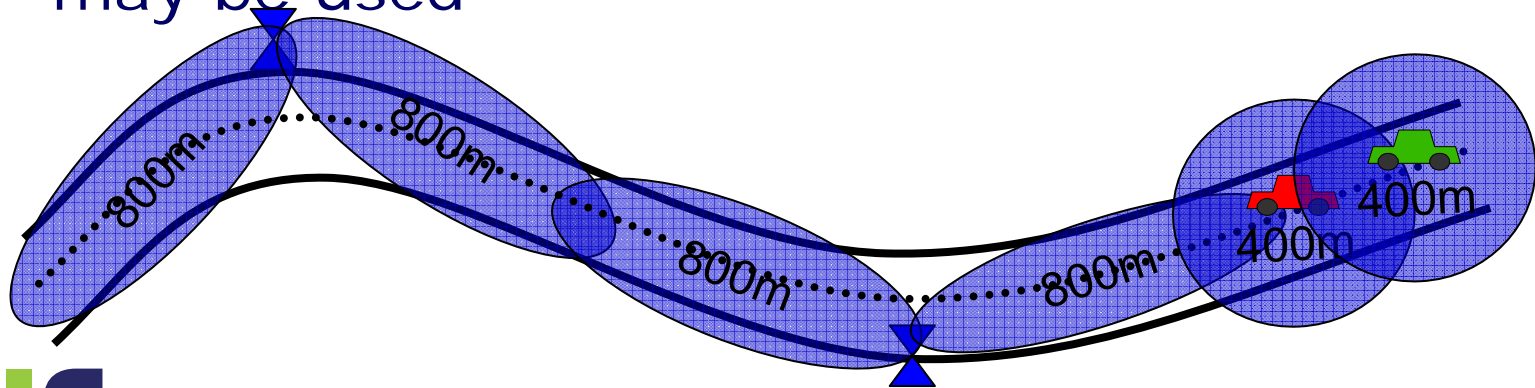


CVIS Host

# Performance of M5 / 802.11p

- First measurement results:
  - Nominal range between vehicles is less than 400 meters
  - Nominal range from roadside to vehicle is less than 800 meters
  - Note line-of-sight limitation
  - Special repeat-stations to extend range may be used

ZJ3



Slide 11

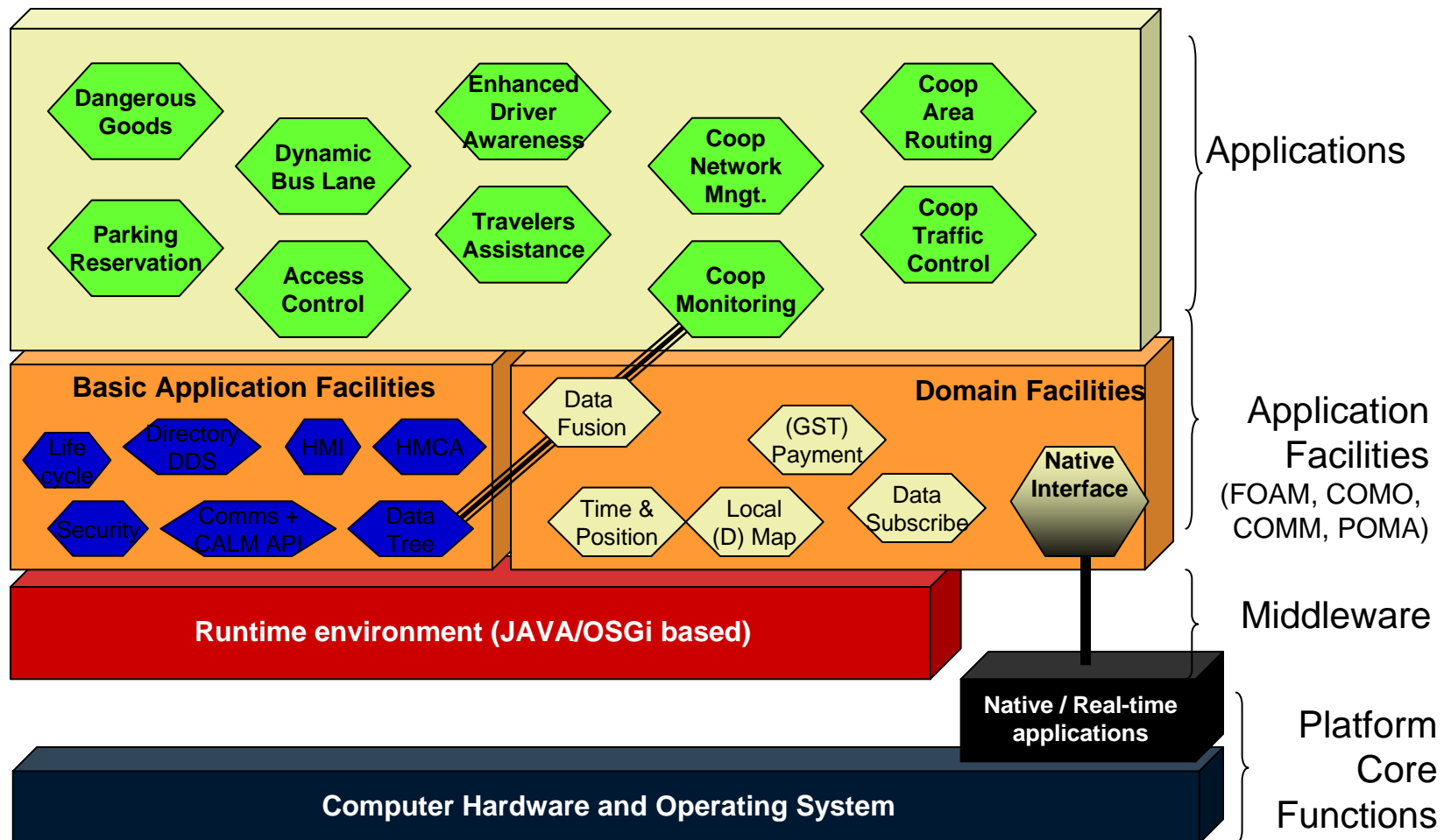
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ZJ3

Where do these results come from?

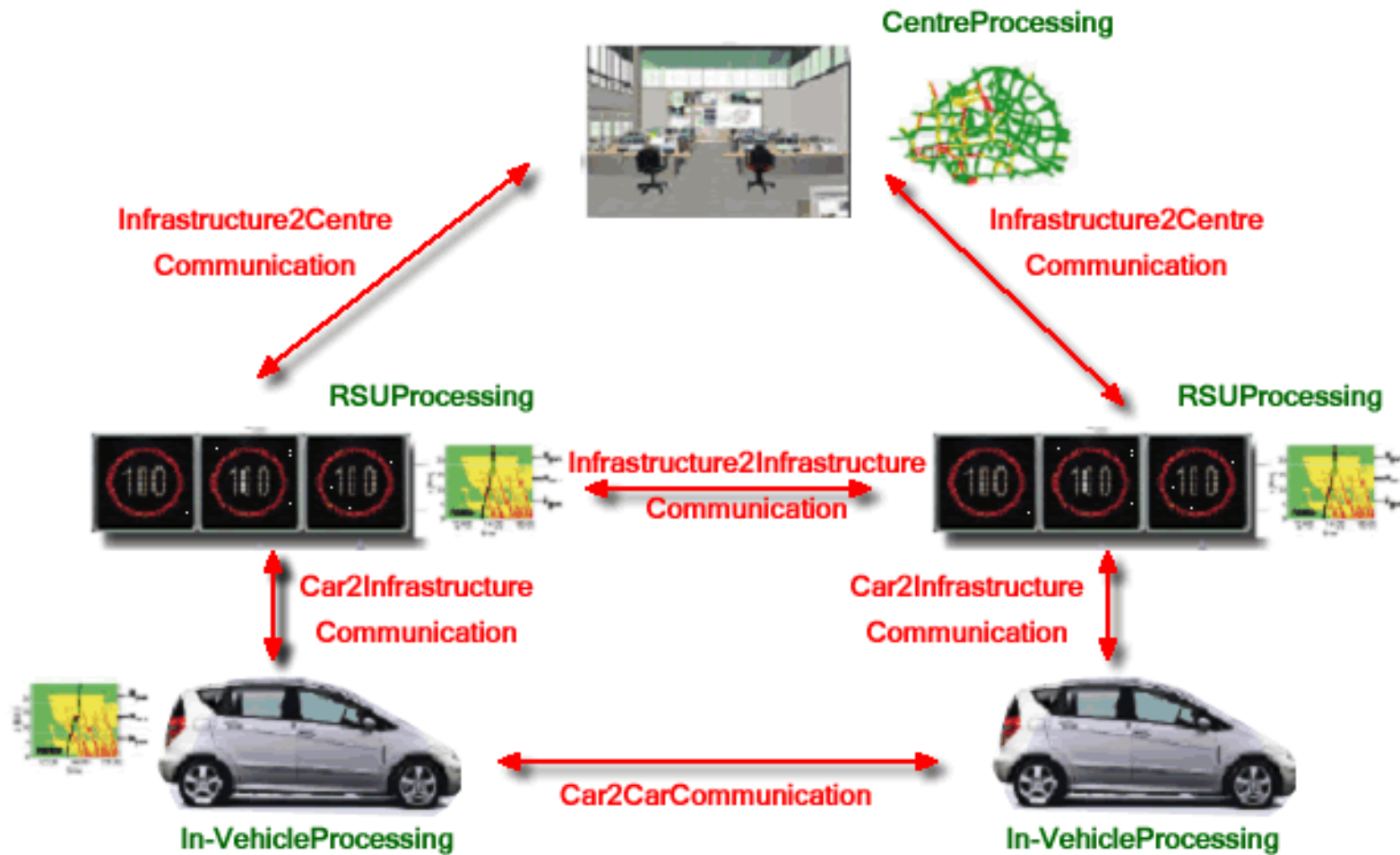
Zeljko Jeftic; 05/03/2008

# Software architecture (CVIS)

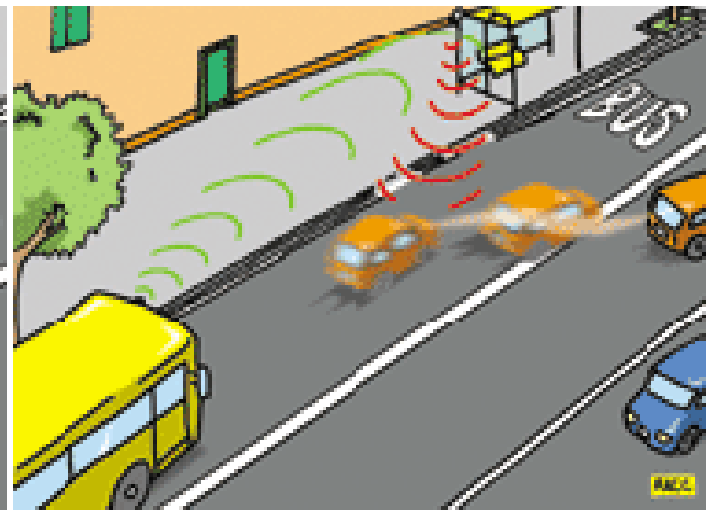
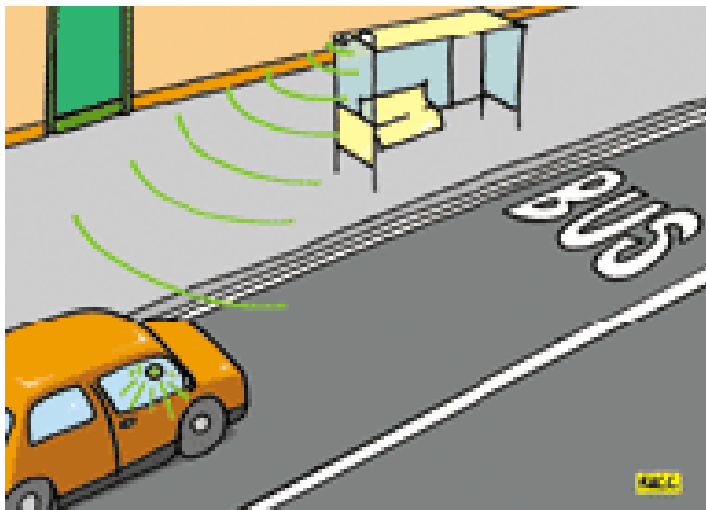
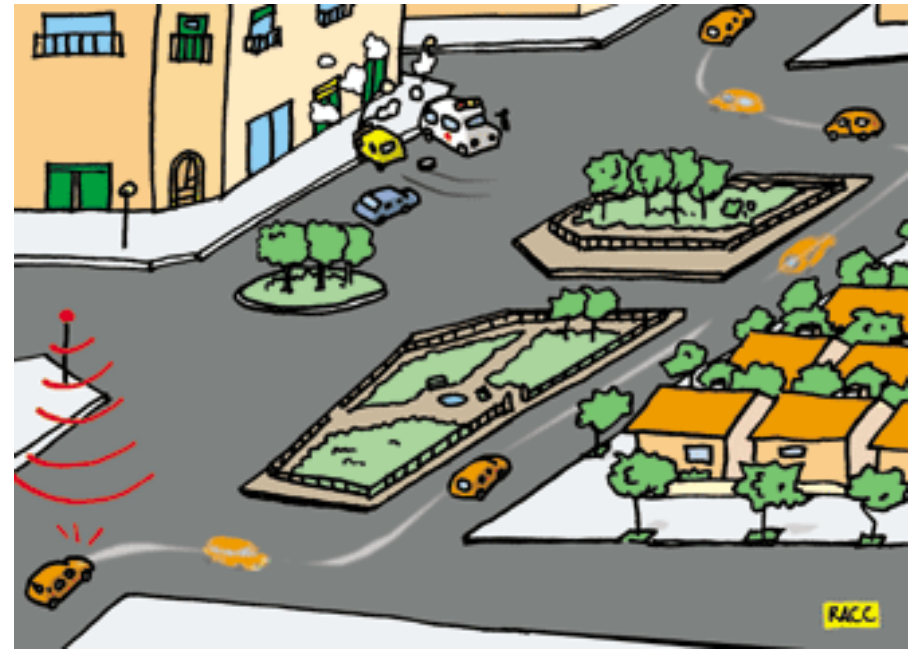


# **CVIS Applications**

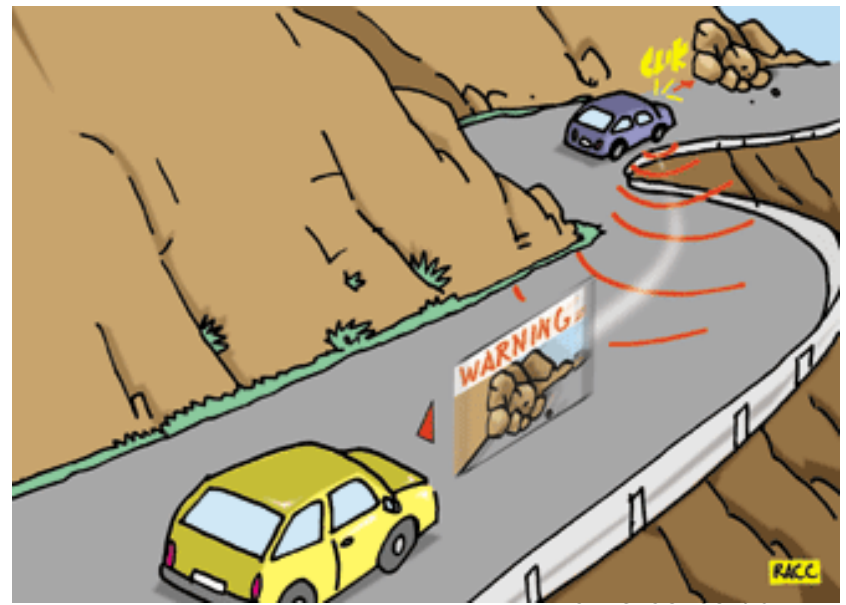
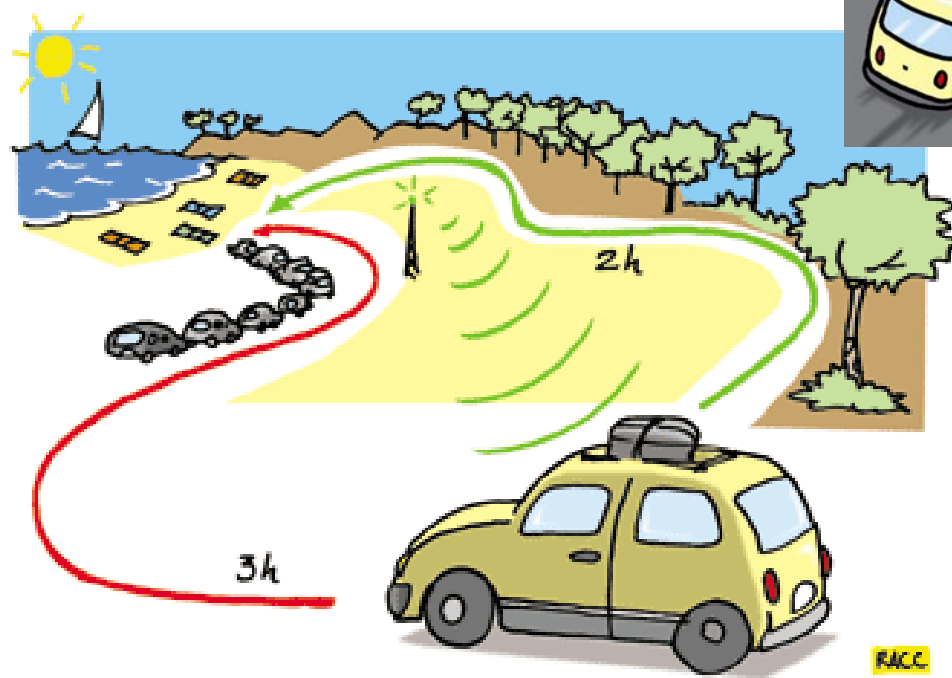
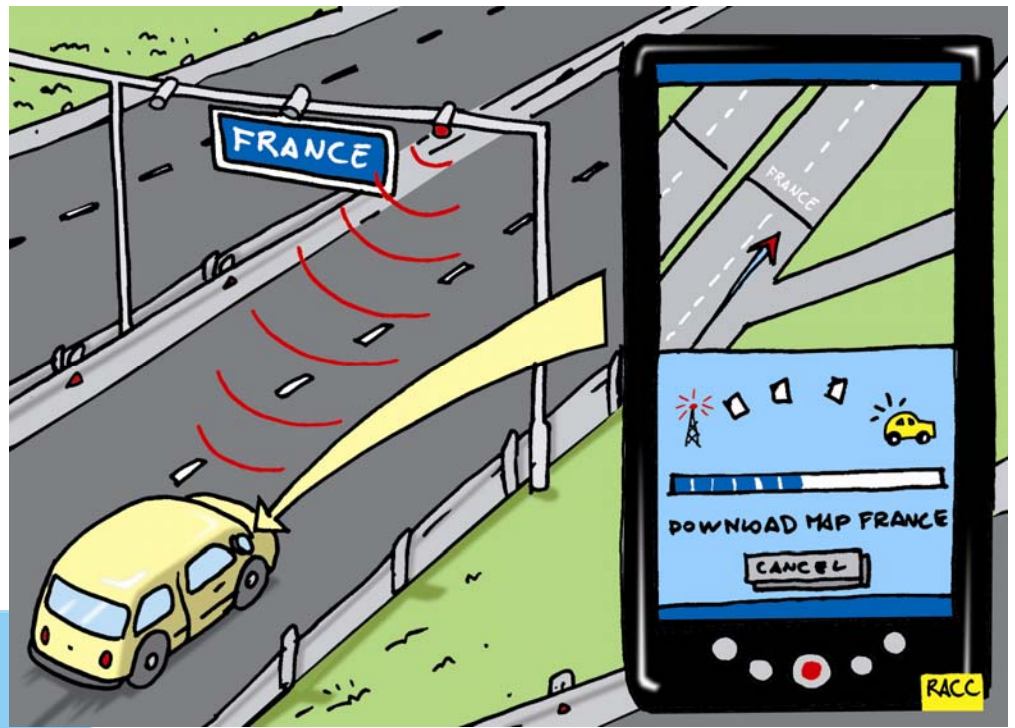
# Cooperative monitoring



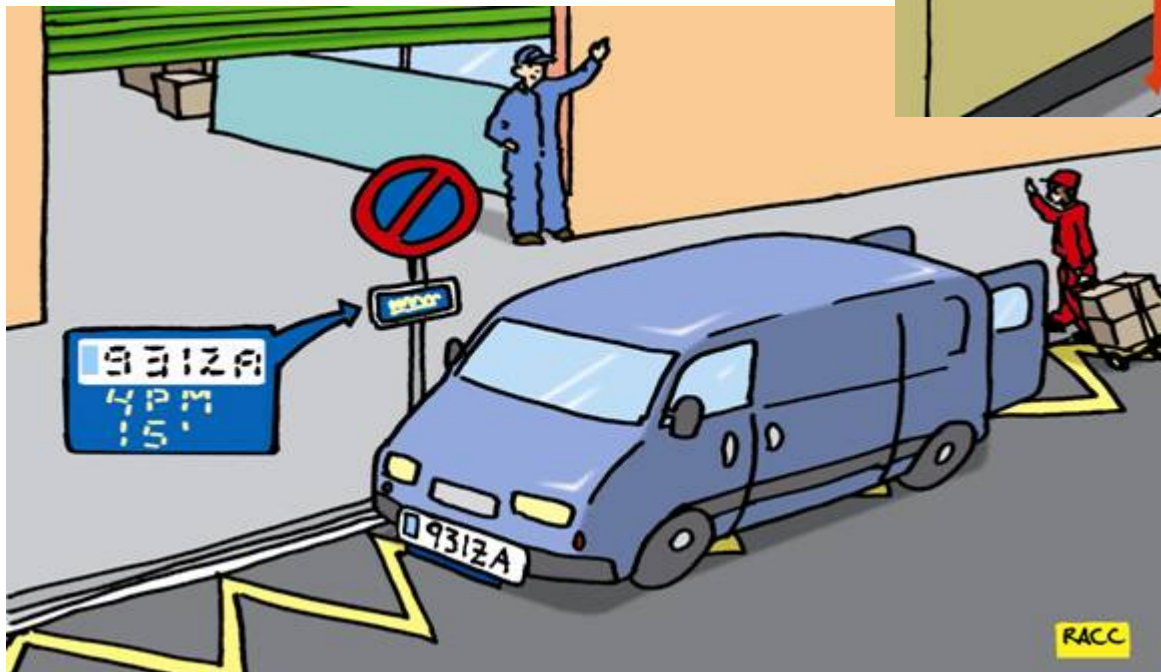
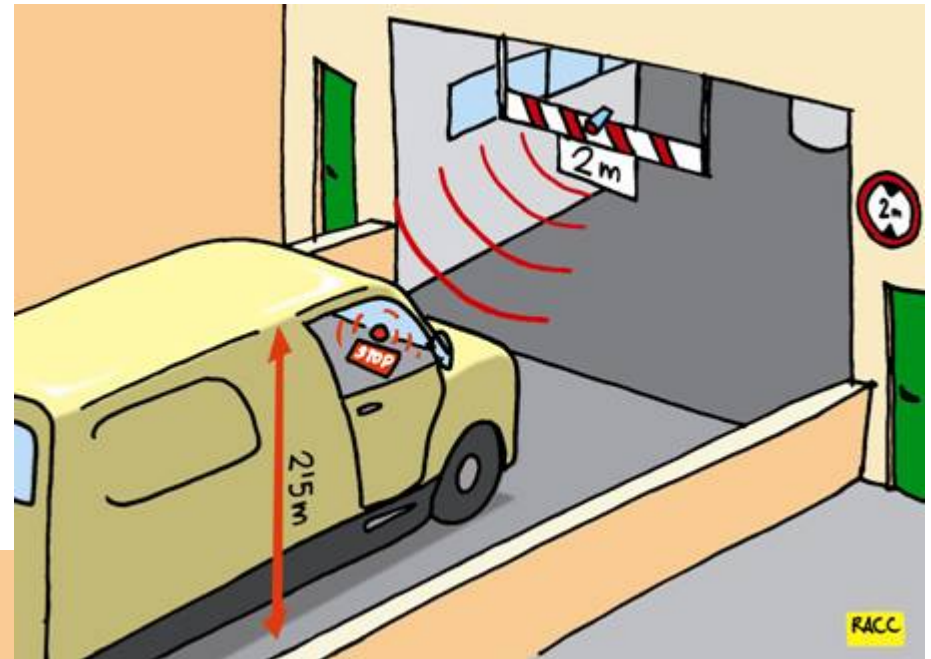
# Cooperative urban applications



# Cooperative Interurban applications



# Cooperative Fleet & freight



# Deployment of V2X

# Deployment phases

## 2008-2009 Proof of Concept

- Laboratory integration and testing (Beta stage)
- Test site integration (Gamma stage)
- Field tests in 6 countries and 10 test sites
- Standardisation at ETSI, ISO/TC2004, etc.

## 2010-2011 Large Scale Field Trials

- Field operational tests (N x 100 vehicles and RSUs)
- First commercial implementations (e.g. Freight and Fleet)

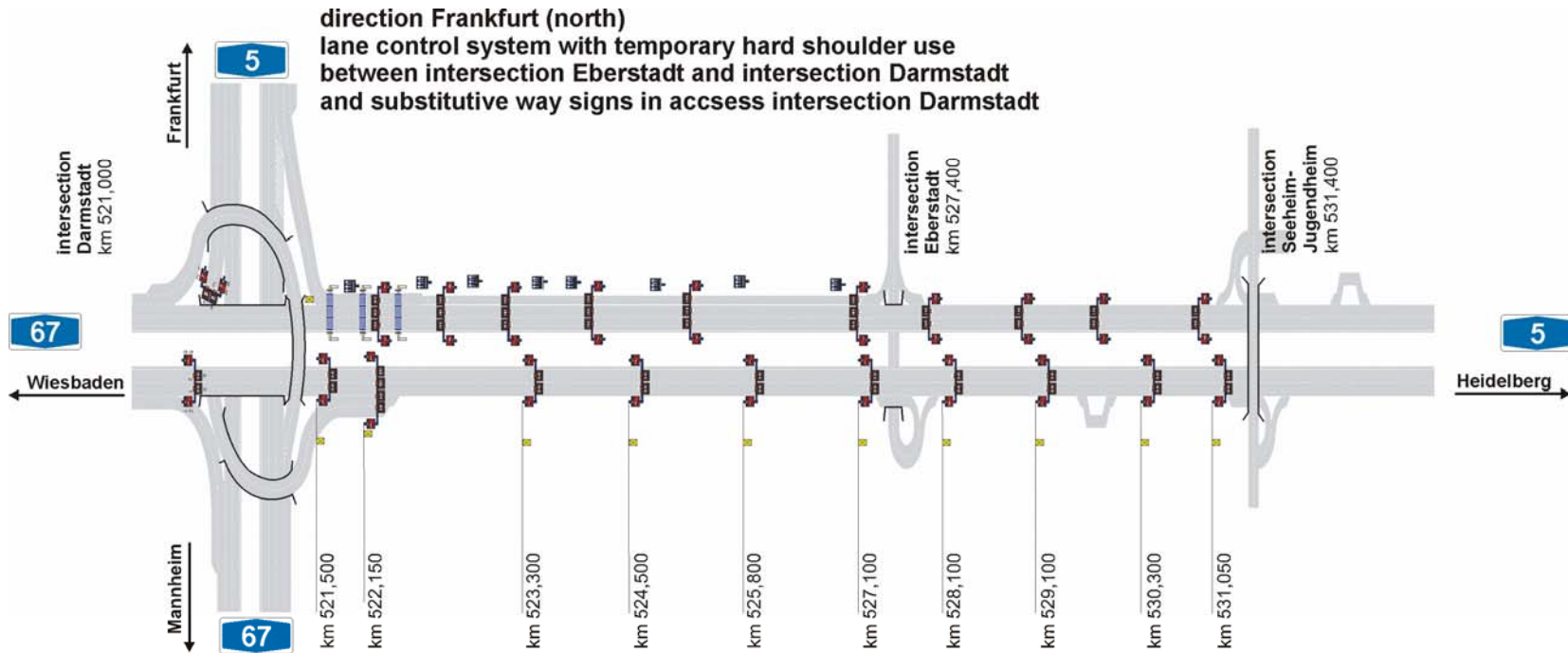
# Integration and Testing Gothenburg

- Located at Lidholmen in Central Gothenburg (old shipyard area, now a high-tech cluster) [Map](#) , [Web site](#)
- February 2008: Installation of equipment
- March 2008: Test of communication components
- April – June 2008: Test of middleware software and applications
- July – December 2008: Field Tests in CVIS and SAFESPOT
- Ideal for near-by road tests
  - The road outside the Beta test Site will be equipped with road side units from the CVIS and Safespot test site budgets
  - Urban roads, Inter-urban roads and tunnels in the direct vicinity (3 km radius)
  - Lot's of parking space, in-house garage available
  - Test vehicles (trucks) will be provided by Volvo



# Field Tests Hessen

## Test track with lane control system



direction Frankfurt (north)  
 lane control system with temporary hard shoulder use  
 between intersection Eberstadt and intersection Darmstadt  
 and substitutive way signs in access intersection Darmstadt

These 10 gantries of the lane control system in direction Heidelberg (south) were equipped to integrate RSU (connected to the traffic center with fibre optic cable). The average distance of the gantries is 1.000 m. 5 gantries in a row should be equipped with CVIS RSU.

direction Heidelberg (south)  
 lane control system between  
 intersection Darmstadt and intersection Eberstadt

both directions  
 lane control system between  
 intersection Eberstadt and intersection Seeheim-Jugendheim

# Field Tests Hessen

## Lane control system

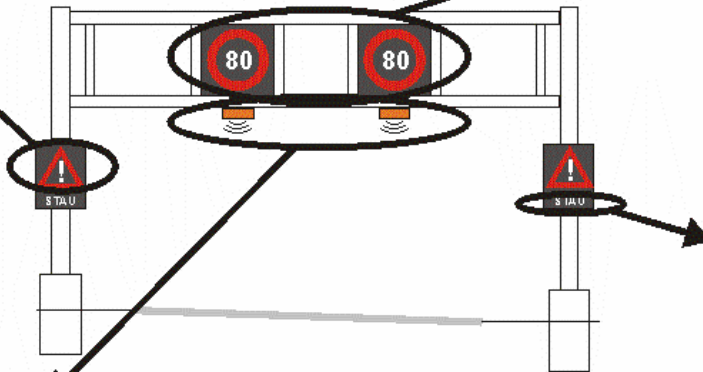
warning signs



Lane specific speed limits and lane closures



Lane specific traffic detectors



additional Information

STAU	600 m	2 km	↑1000 m ↑
NEBEL	800 m	↑ 400 m ↑	↑1500 m ↑
UNFALL	1000 m	↑ 600 m ↑	↑ 2 km ↑
400 m	1500 m	↑ 800 m ↑	7,5 t

# Deployment of Cooperative Systems in Europe: The Three Generations



**Autonomous**

**Connected**

**Cooperative**

1995

2005

2015

2025

# Deployment Enablers

- Openness and interoperability
- Safe, secure and fault-tolerant design
- Utility, usability and user acceptance
- Costs, benefits and business models
- Risks and liability
- Cooperative systems as policy tool
- Deployment road-maps

...Thank you for your attention

