THE FULLY NETWORKED CAR

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o **CVIS project**

- CVIS in brief

- Assumptions

- Objectives

o **EDA Overview**

- Objectives

- Cooperative concepts

- Technical approach

Outline

o **EDA services**

- Ghost driver

- Dynamic Speed Alert

o **Test Site Demonstrations**

- Sweden

- France

CVIS
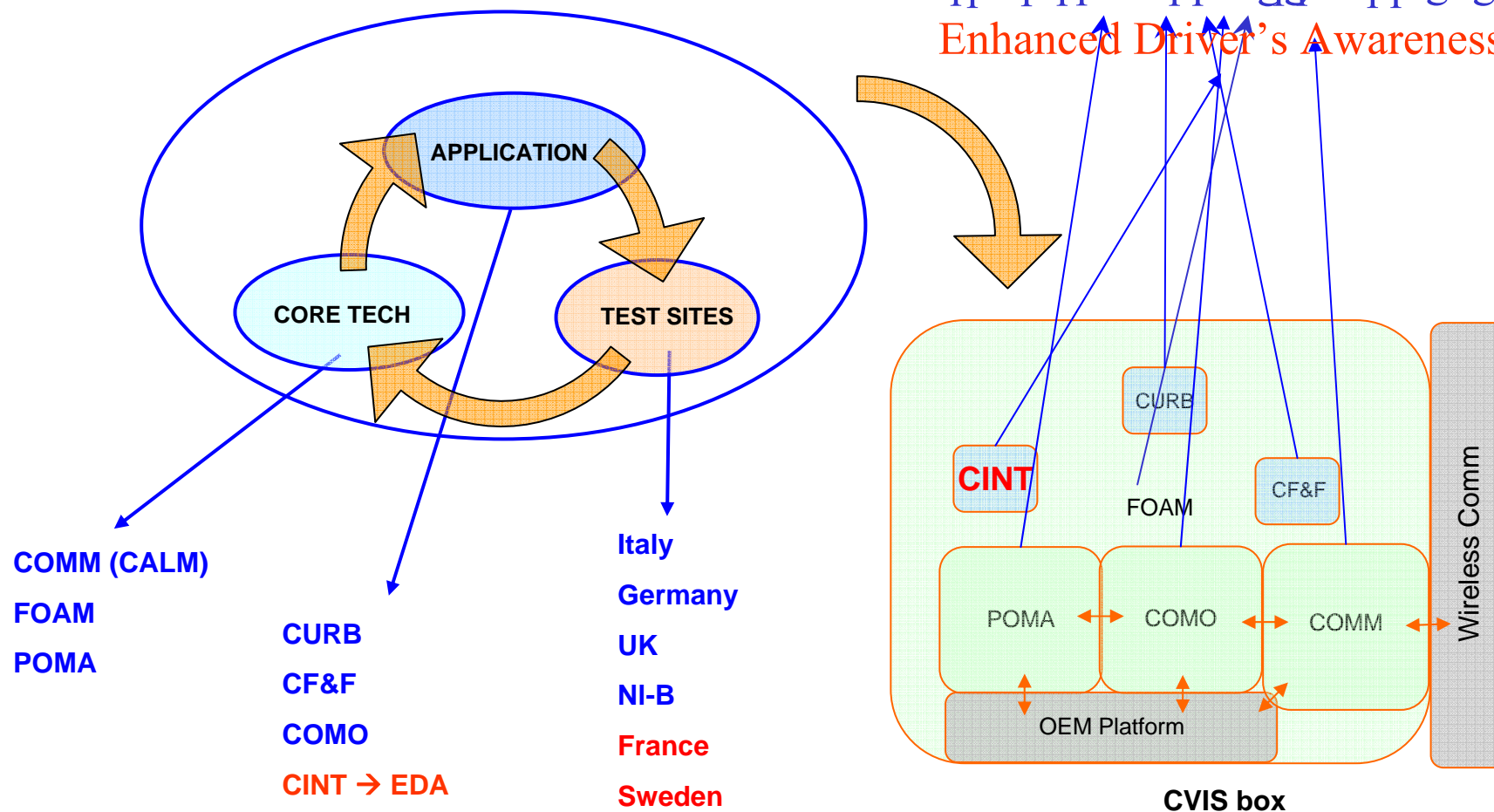## Cooperative Vehicle Infrastructure Systems

o   CVIS in brief

- Funding : M€ 20 funded by EC DG-ISM,

- Duration : 4 years – 2006 - 2010,

- Coordination : ERTICO - ITS Europe

- Consortium : 70 European public/private partners (Volvo, LCPC and many other relevant partners)

- Website : www.cvisproject.org → EDA

o **CVIS in brief**

Framework Cooperative Monitoring Application
Enhanced Driver's Awareness

APPLICATION

CORE TECH

TEST SITES

COMM (CALM)

FOAM

POMA

CURB

CF&F

COMO

CINT → EDA

Italy

Germany

UK

NI-B

France

Sweden

CURB

CINT

FOAM

CF&F

Wireless Comm

POMA ↔ COMO ↔ COMM

OEM Platform

CVIS box

ISO   IEC   ITU International Telecommunication Union

o **CVIS Assumptions**

- IPv6 : Internet Protocol Version 6

- OSGi : Open Service Gateway Initiative

- CALM : Continuous Air-interface, Long and Medium Range,

o **Other project**

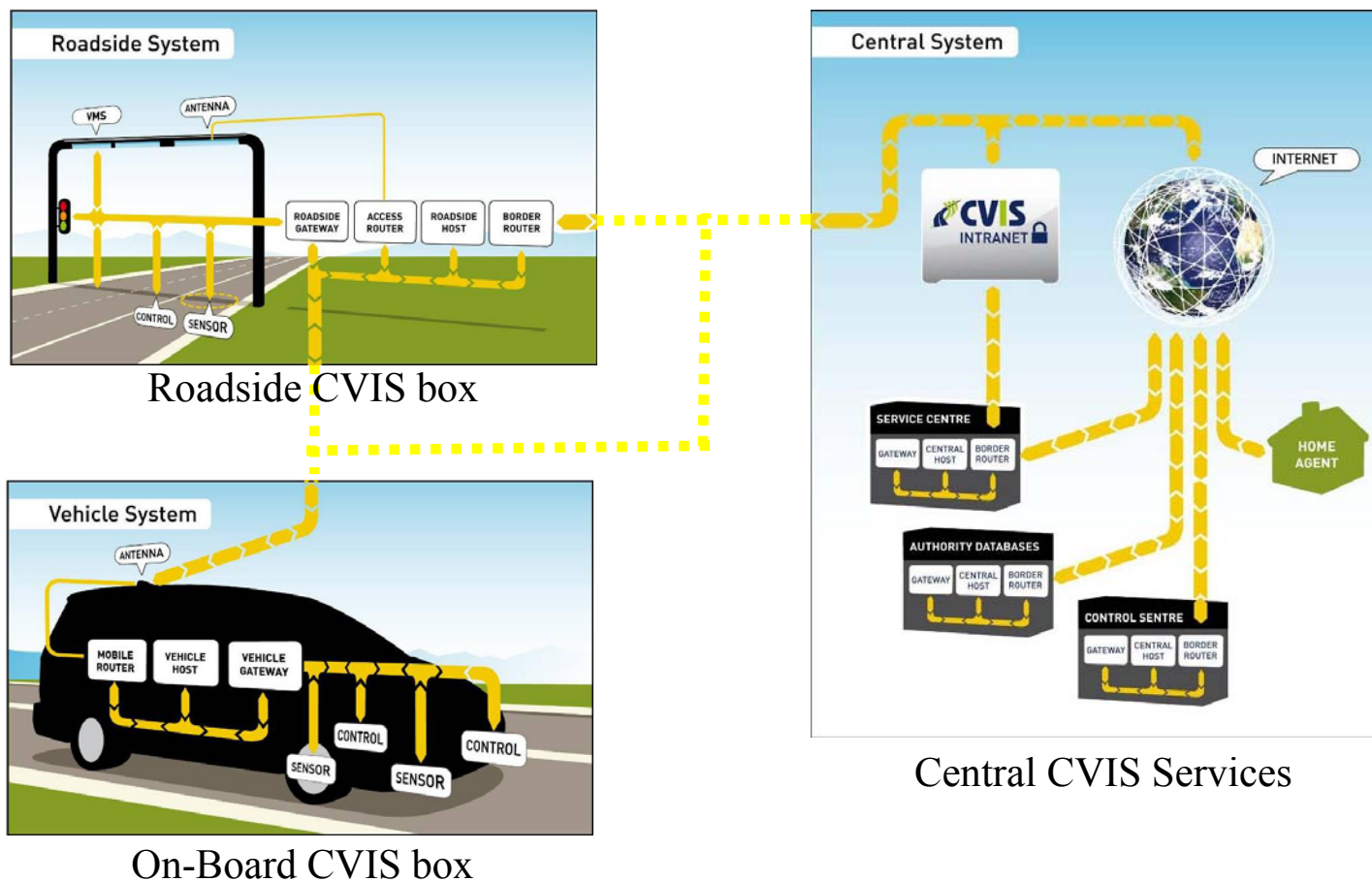- SafeSpot : European project – Local Dynamic Map

o **Main Objectives**

- Create a standardized in-vehicle and roadside module providing a continuous and seamless connectivity using a wide range of communication media, including mobile cellular (3G) and wireless local area networks (802.11p),

- Design innovative processes for enhanced vehicle positioning,

- Develop innovative cooperative applications,

- Create guidelines and tools addressing key non-technical challenges to cooperative systems deployment.

o **CVIS in brief**

Roadside CVIS box

On-Board CVIS box

Central CVIS Services

EDA
Enhanced Driver's Awareness

ENHANCED DRIVER AWARENESS
Vehicle to vehicle communication
Vehicle to Infrastructure communication and
Infrastructure to vehicle communication

TRAFFIC MANAGEMENT

ROADSIDE

o **EDA in brief**

 o EDA is a cooperative safety application:

  - Keeping the driver aware about his/her nearby environment,
  - Keeping the traffic manager informed about dynamic situation
   regarding roads network,
  - Detecting any kind of non regular event,
  - Managing non regular event notification to drivers and road
  operators,

In the scope of CVIS – application to :
  - Ghost Driver - Wrong way driver detection and management,
  - Dynamic Speed Limit – Static/Temporary/Dynamic
  - Traffic Flow Event – Hazards

Demonstrations:
  - France (Lyon and Versailles),
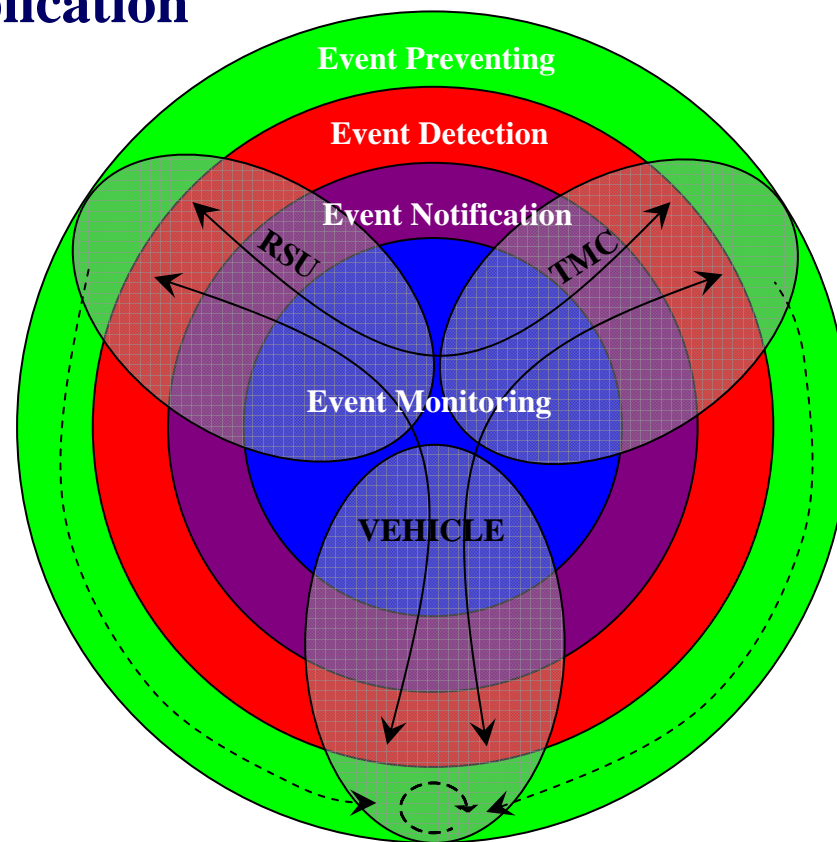 - Sweden (Götheberg),

o Cooperative concepts

EDA : **Safety cooperative application**
for non regular event:
- **preventing,**
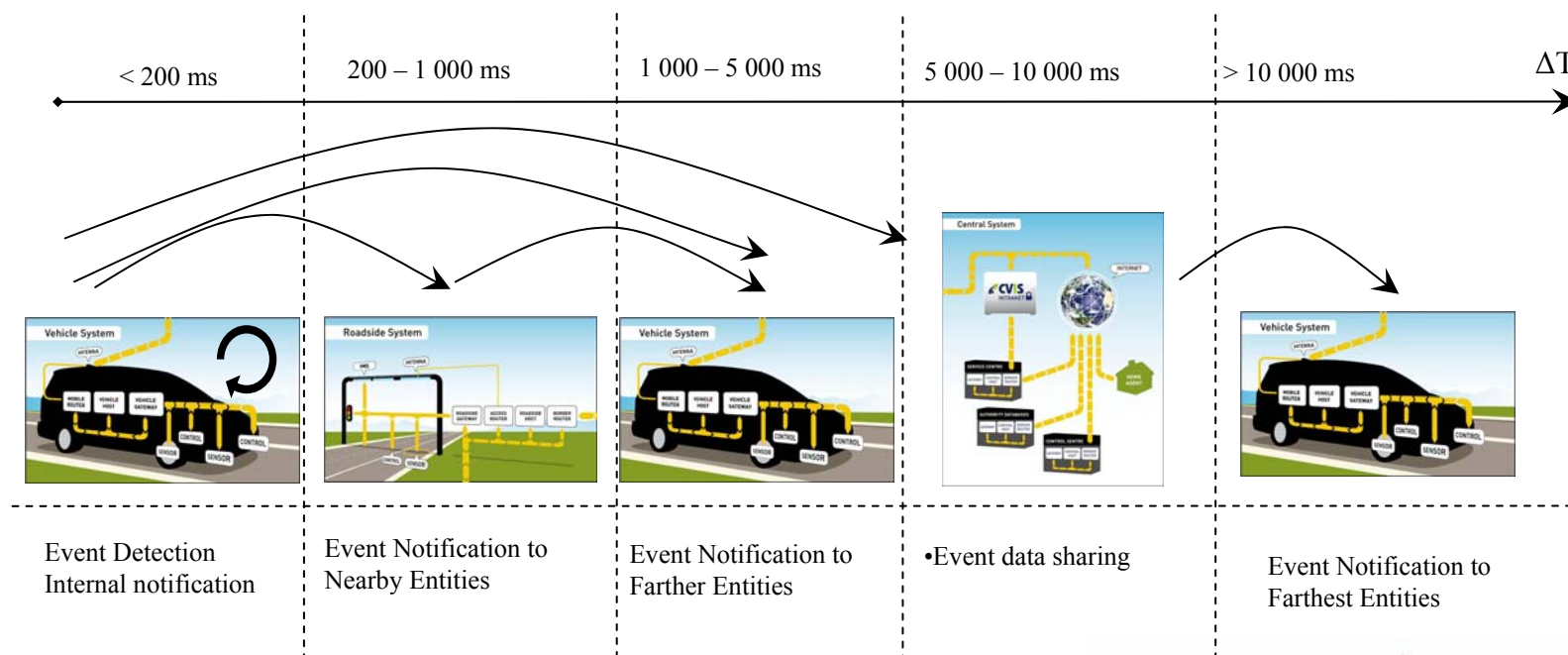- **detection,**
- **notification,**
- **monitoring.**

An application deployed into:
- **vehicle,**
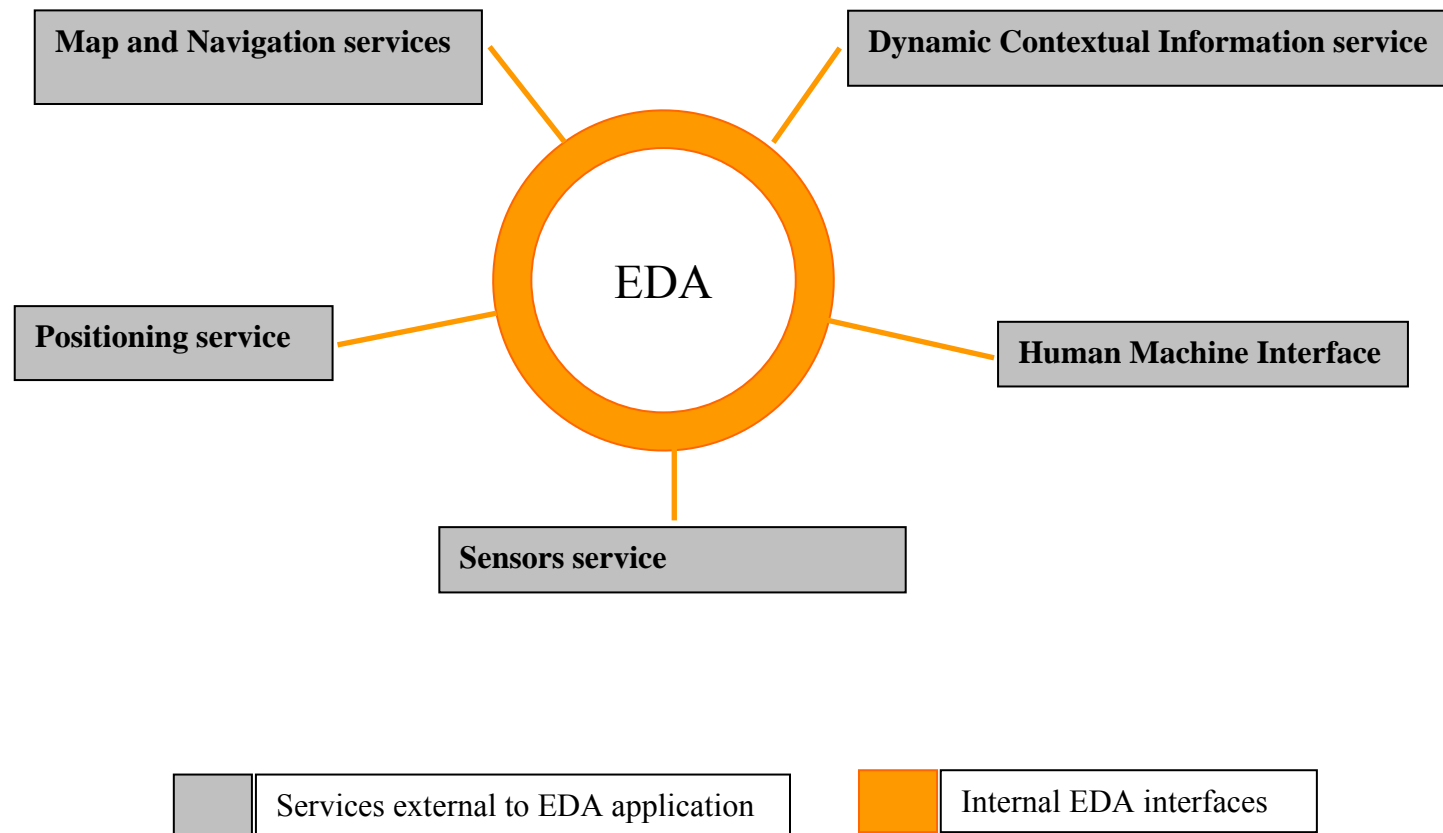- **roadside unit,**
- **traffic center.**

o   ## Cooperative concepts

Combination of an **event broadcasting based strategy (V2V)** and a **Central system based strategy (V2I)** for an efficient event notification

< 200 ms	200 – 1 000 ms	1 000 – 5 000 ms	5 000 – 10 000 ms	> 10 000 ms	ΔT
Event Detection Internal notification	Event Notification to Nearby Entities	Event Notification to Farther Entities	•Event data sharing	Event Notification to Farthest Entities	

o **Technical approach**

```
  Map and Navigation services          Dynamic Contextual Information service


                          EDA

  Positioning service                   Human Machine Interface


              Sensors service
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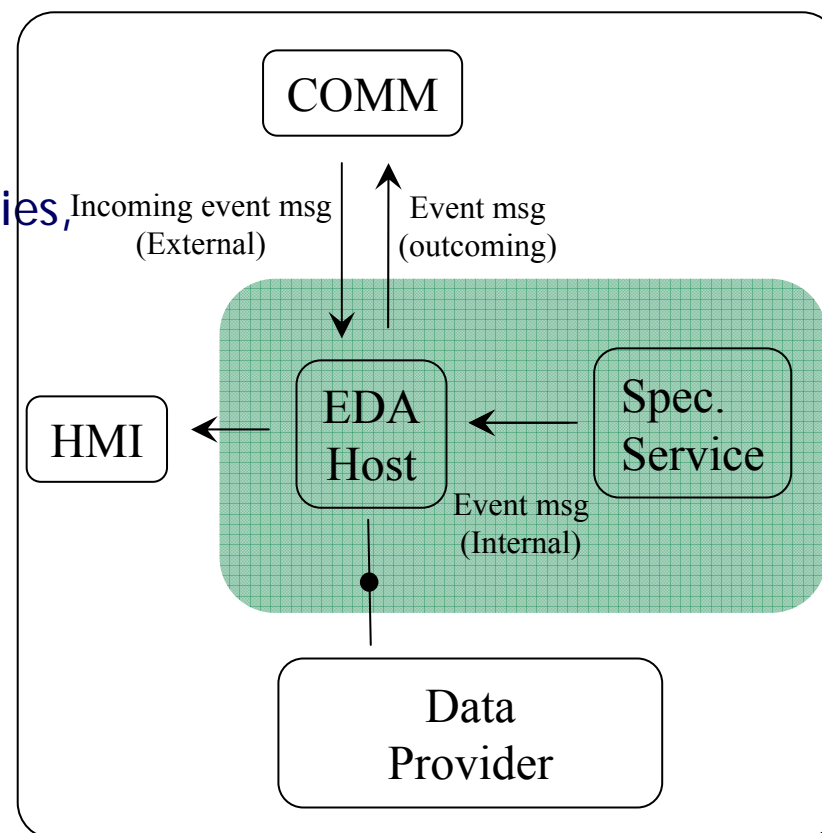Services external to EDA application   Internal EDA interfaces

o **Technical approach**

A Host application (open source/free)
- Open APIs to access to data/functionalities,
- Standard functionalities/mechanisms,

Specific services (Plug-in/Add-on)
- For a given non regular event,
- Using EDA host APIs,
- Providing specific methods/policies,
  - Event message validation,
  - Incoming/Outcoming event filtering,
  - Event state estimation,
  - Event notification,

COMM

Incoming event msg (External)

Event msg (outcoming)

HMI

EDA Host

Spec. Service

Event msg (Internal)

Data Provider

ISO   IEC   ITU International Telecommunication Union

EDA Services in the scope of CVIS

- Ghost Driver
- Dynamic Speed Limit

o **Ghost driver detection and management**

EDA Ghost Driver Services

RSU based Ghost Driver Detection/Notification

In-Vehicle Ghost Driving Detection/Notification

o Ghost driver detection and management

- **RSU based ghost driver detection**: Detection of ghost driver by a roadside unit and notification to both nearby entities (vehicles and roadside unit) and Traffic management center

Ghost Driver

Broadcast/Push
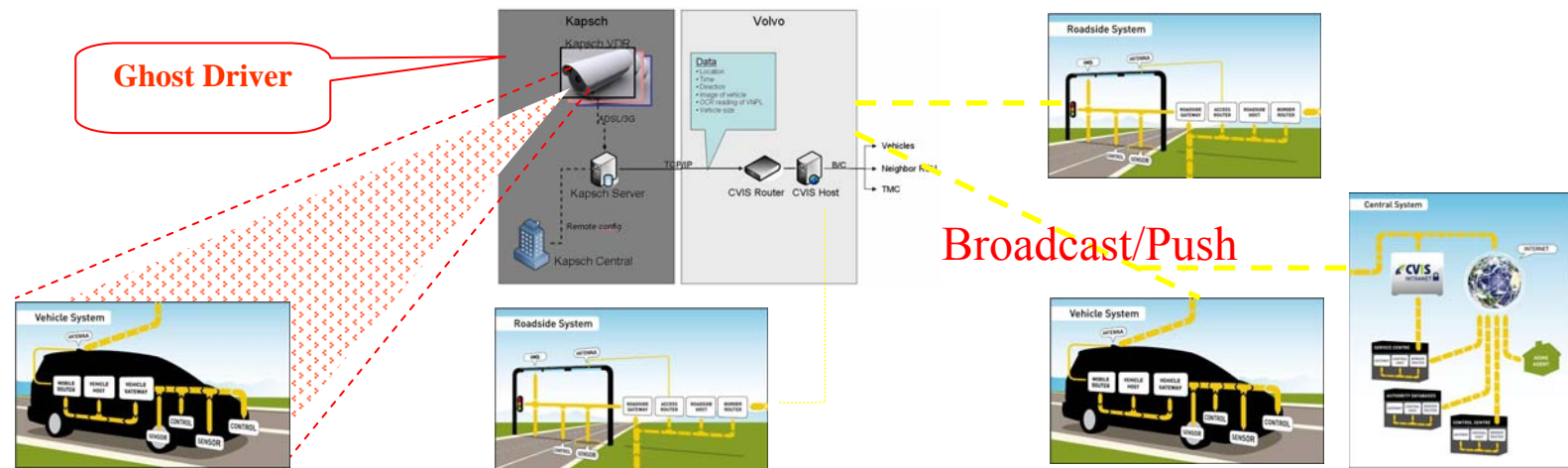
o Ghost driver detection and management

- **In-Vehicle based ghost driving detection**: Preventing and detection of ghost driving situation and notification to nearby entities (vehicles and roadside unit) and Traffic management center
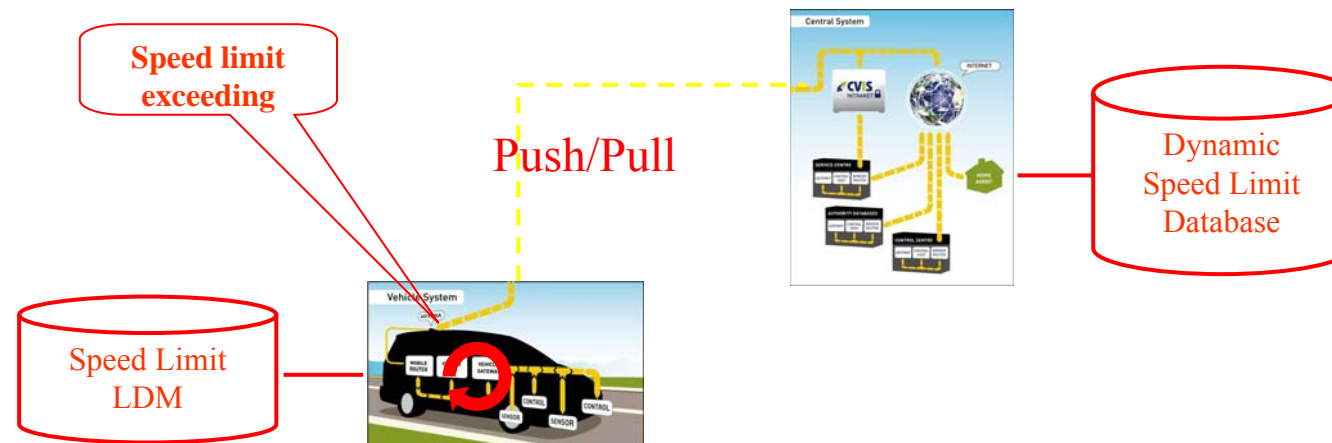

Ghost Driving

Push/Pull

Broadcast
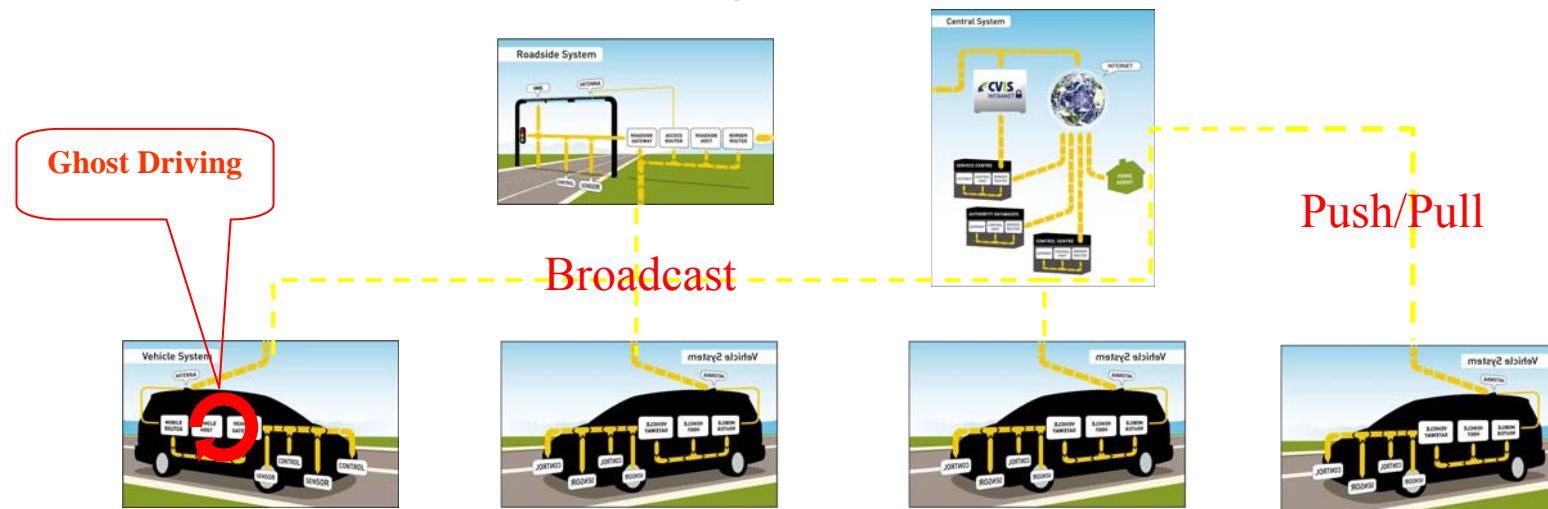
o **Dynamic Speed Limit**

EDA Dynamic Speed Limit Services

LDM based Speed Limit
notification

RSU based Speed Limit
notification

o Dynamic Speed Limit

- **LDM based speed limit notification**: online service to update the current mandatory speed limit and on-board service to assess whether the driver complies the speed limit or not

Speed limit exceeding
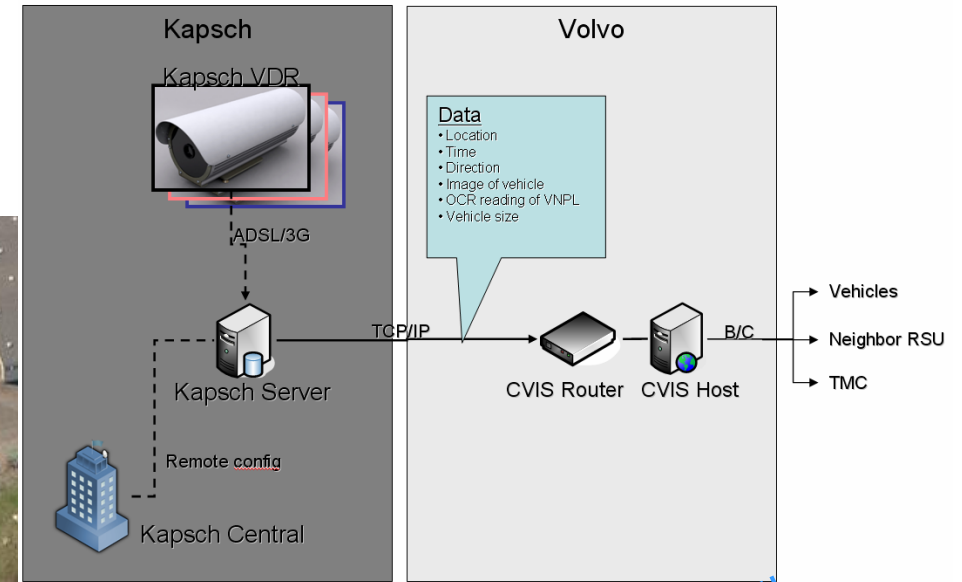
Push/Pull

Dynamic Speed Limit Database

Speed Limit LDM

o Dynamic Speed Limit

- **RSU based speed limit notification**: Roadside unit based speed limit updating and on-board assessment of speed limit compliance

Speed limit exceeding

Broadcast

Single Speed limit Local/Temporary Dynamic

Speed Limit LDM
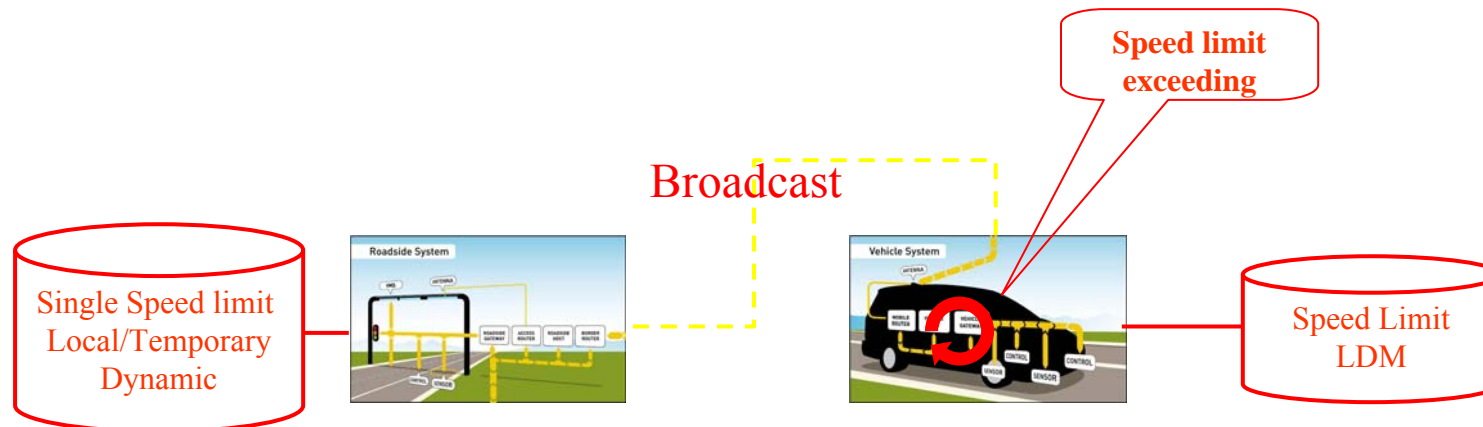
EDA Demonstration on Test Sites

- Sweden
- France
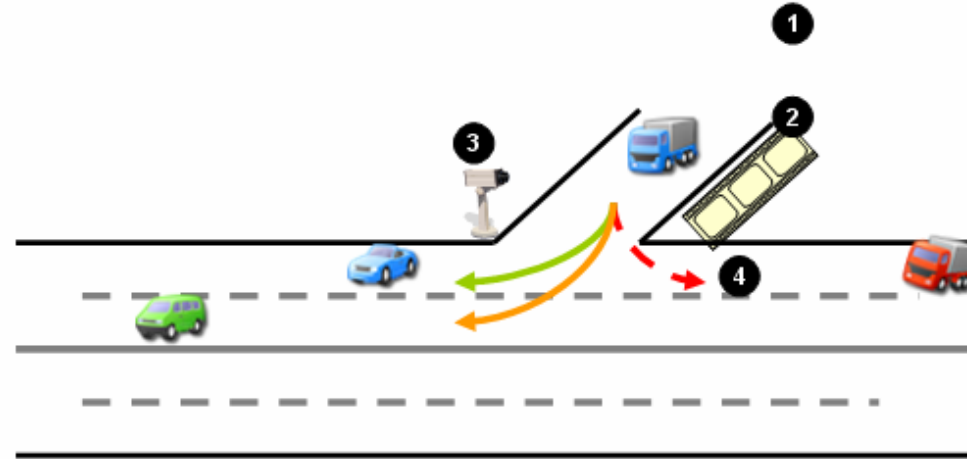
By vehicle & RSU

Inception phase

❶ Detection of highway ramps

By vehicle

❷ Cinematic position monitoring & map matching

By RSU

❸ Pattern recognition

Acting phase

❹ Sending warning/alert messages

o French Test Site

RSU based
Speed Limit
Notification
(2 vehicles + RSU)

In-Vehicle Ghost Driving
RSU based GhostDriver
Detection/Notification
(3 vehicles + 1 RSU)

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Thanks for your attention