



European Research in Cooperative Vehicle- Highway Systems

AAET 2007 , Braunschweig
26-28 February 2007



Outline

- “Cooperative systems”
- Vehicle-to-x communications
- Research projects
 - CVIS
 - SAFESPOT
- Towards deployment

Non-cooperative systems

- “Ignorant drivers & infrastructure...”
- One-way information flow: signs & signals → driver
- Static, or slow to respond
- Poor knowledge → no choice
- Uncertainty, high costs
- Downward spiral...

Cooperative systems

- Listen to what cars say about the road & traffic
- Tell what you see & where you want to go
- Synoptic vision - see whole network at once
- More accurate forecasts
- “Best” guidance to each driver
- Positive incentives...

Cooperation: closing the loop

Better data

Instant,
integrated total
coverage



Less delay,
smoother
driving, best
route

Better journeys

Lower costs

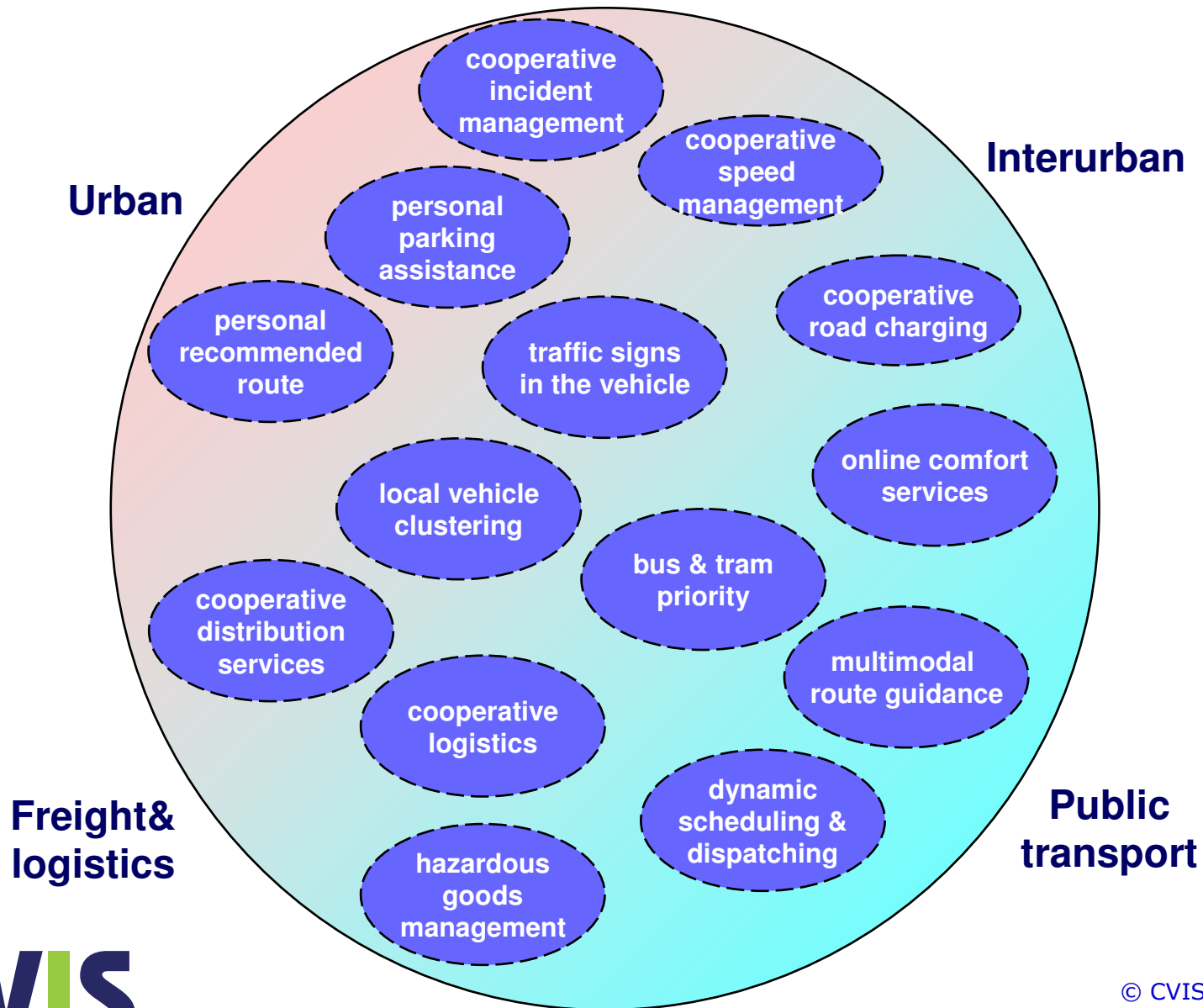
Reduced
detection
infrastructure



Full coverage &
instantaneous

Better info service

Cooperative system applications



Requirements for this vision?

- Standard network & communications platform -
EQUIP EVERY VEHICLE
- Standard network router -
EQUIP ALL ROADSIDE UNITS
- Low-cost in-car terminal & low wireless access charges
- Inexpensive roadside interface equipment
- Sufficient radio spectrum (reserved?)
- Positive private & public business case
- Compelling services - acceptable to users (privacy...)
- No deployment “show-stoppers”

Vehicle-to-X communications

- Always connected
- High bandwidth → streaming content
- Low latency, real-time response
- Standardised interface, protocols
- Priority for safety messages
- Simple beacon, broadcast, one-to-one
- Complex ad-hoc, mesh networks
- Coverage → use “best” available bearer
- Roaming across networks

Vehicle-to-X communications

- Reserved / protected spectrum?
- Demand vs. channel capacity?
- Whose standards? which “language”?
- Support for which applications?
- Service pricing models?
- Who should build network? operate?

→ CALM - ISO 121XX !

CALM: Continuous Air interface for Long & Medium distance comm.

- continuous communications
- client/server and peer-to-peer modes
- user-transparent networking
- many (any?) communications medium through network layer
- handover spanning multiple media, media providers and beacons

CVIS in Brief

Integrated Project - eSafety Priority
“Cooperative Systems for Road Transport”

- Coordinator: ERTICO
- Duration: 4 years from 1 Feb 06
- Total budget: € 41 Million
- EC contribution: € 22 Million
- Consortium: 61 partners - 12 countries

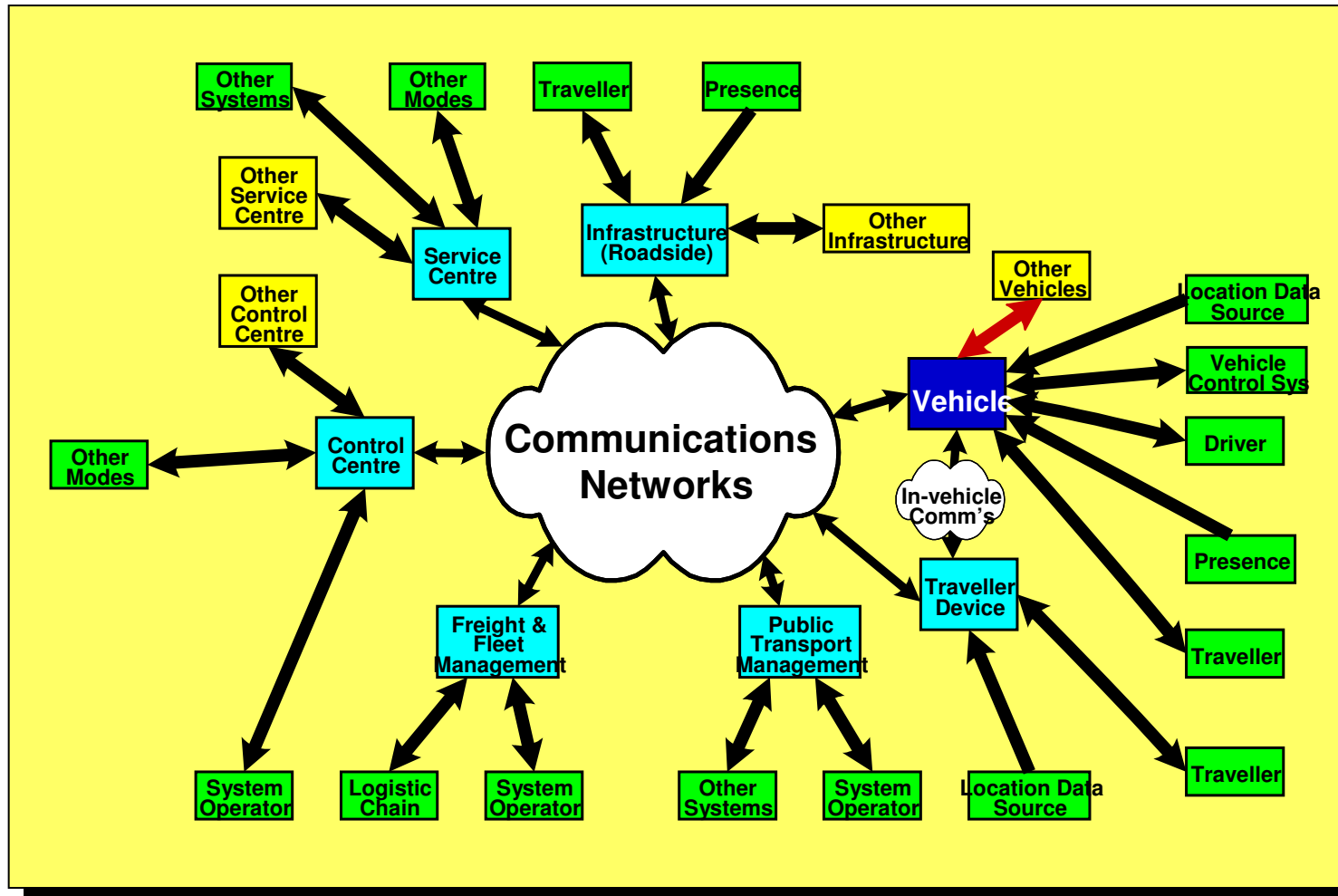


CVIS Vision

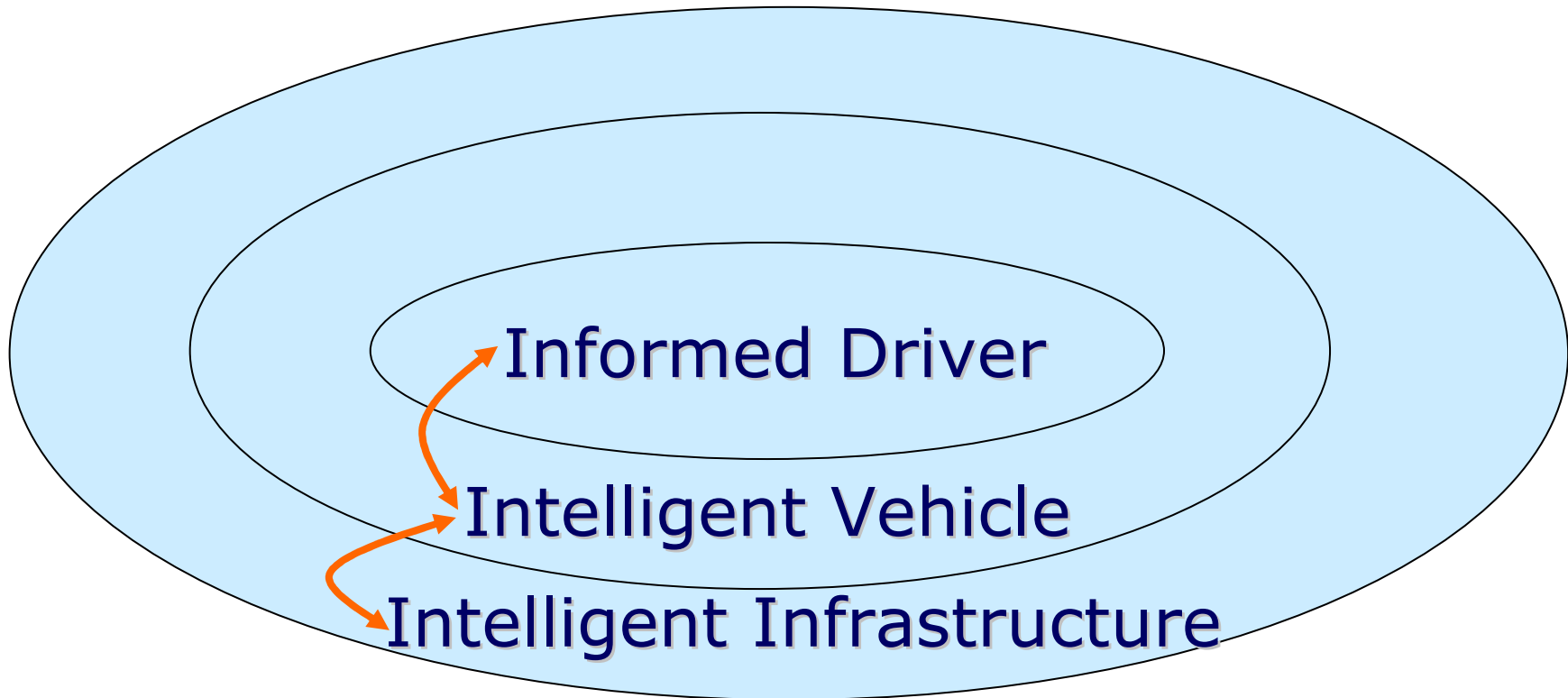
“Create a wireless network between vehicles & infrastructure”

“Increase efficiency & safety through vehicle-infrastructure cooperation”

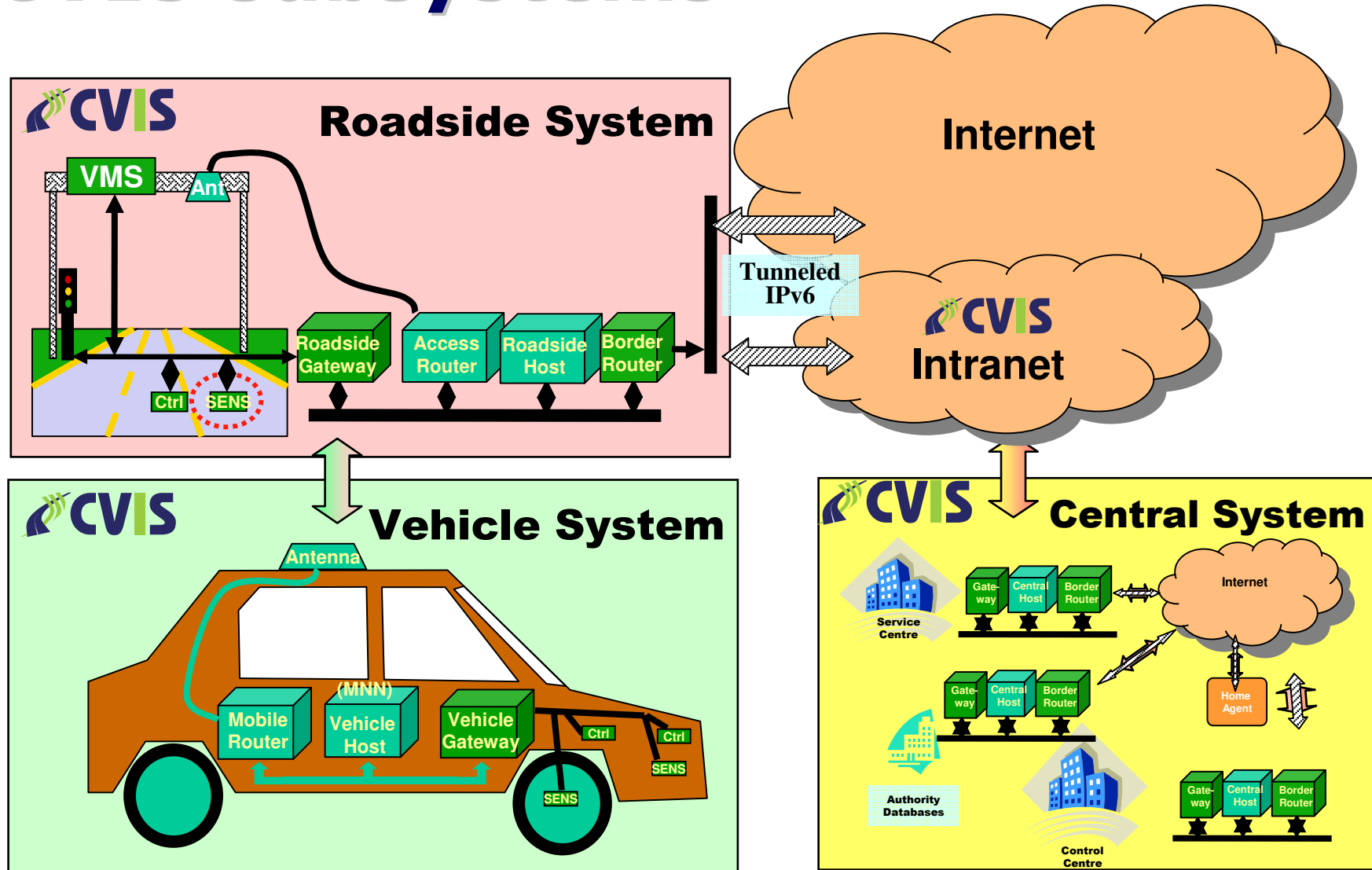
Connected to everything...



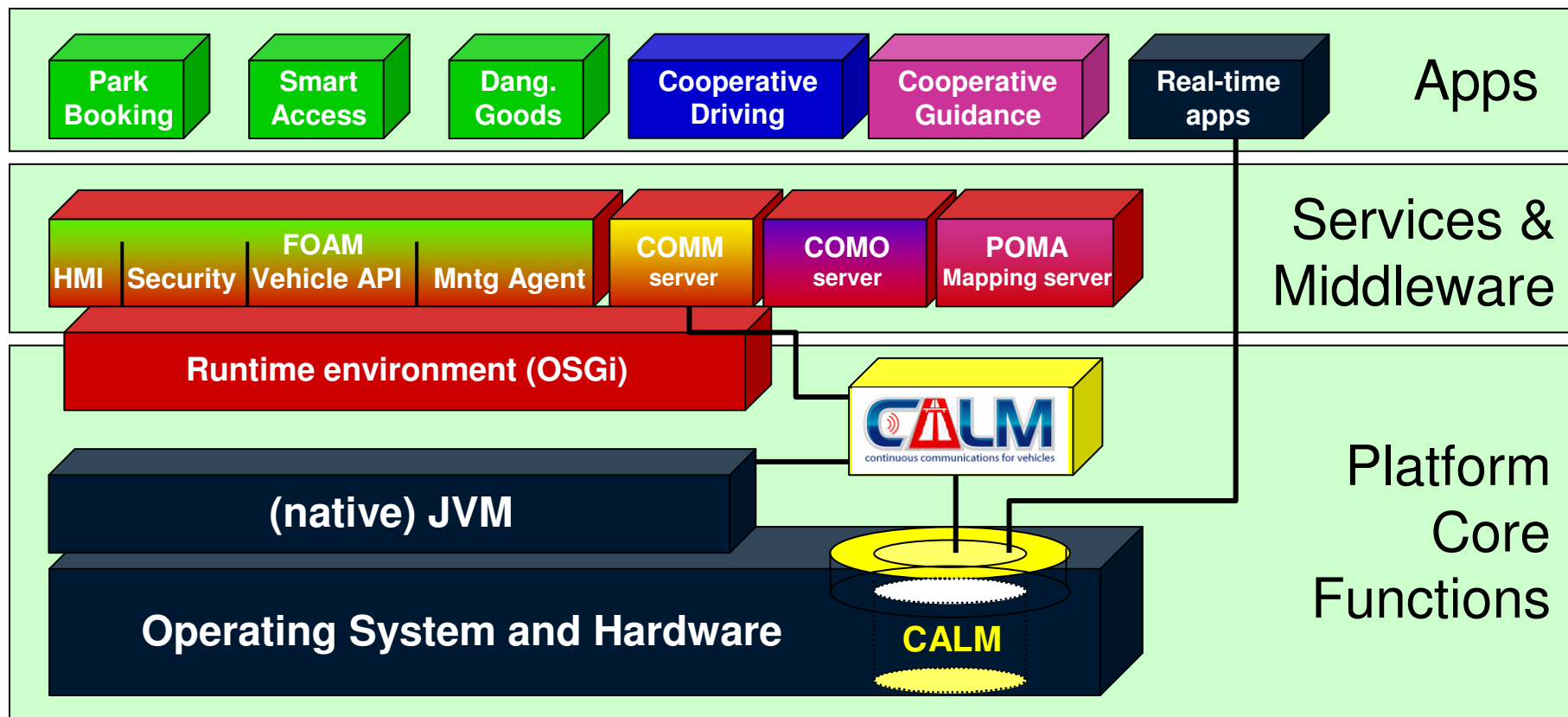
The CVIS Vision



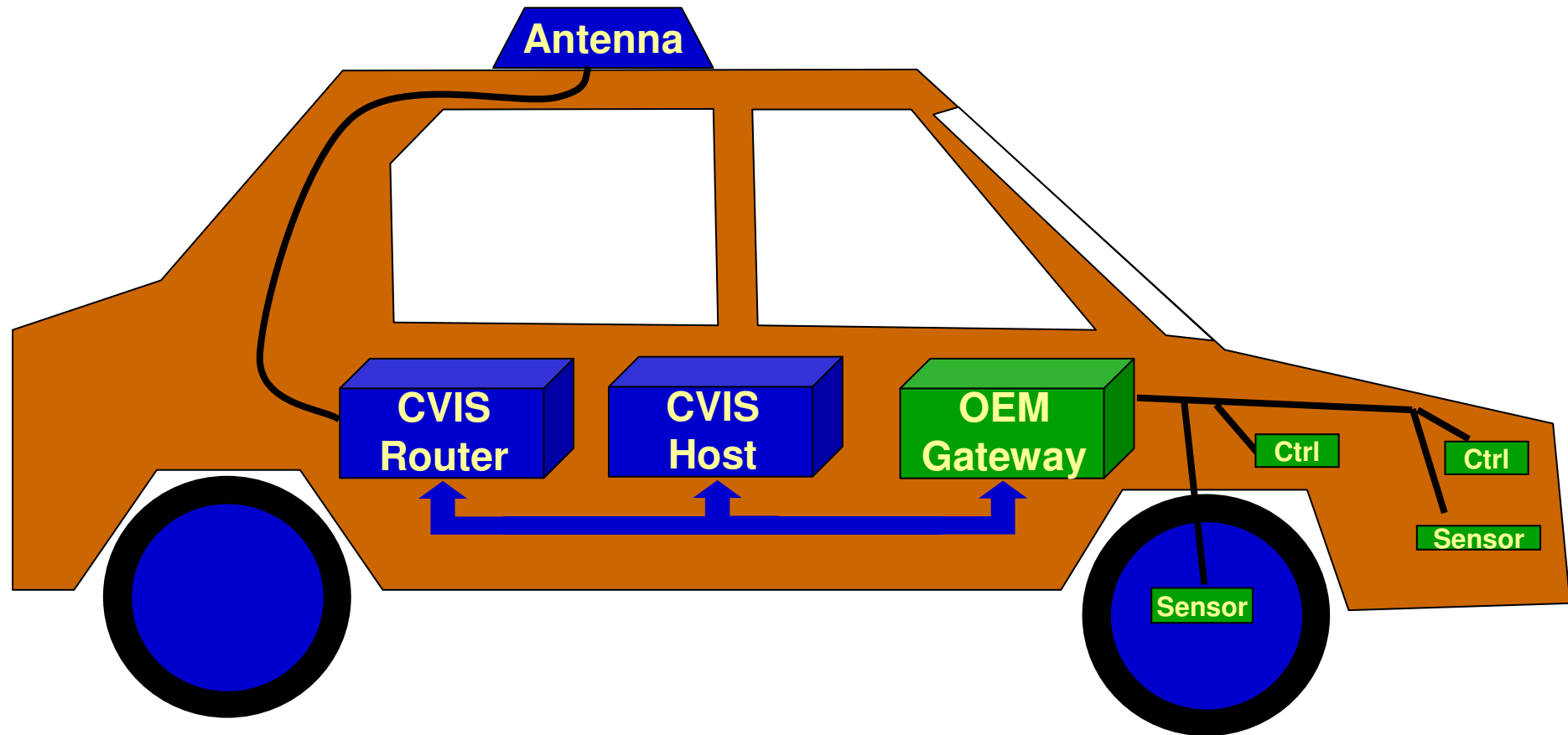
CVIS subsystems



CVIS Network Platform



CVIS Vehicle Architecture



CVIS Applications

Cooperative Monitoring

- XFGD, fusion with infrastructure sensors

Urban

- Cooperative network management
- Cooperative area destination-based control
- Cooperative acceleration/deceleration
- Dynamic bus lanes

Interurban

- Enhanced driver awareness
- Cooperative travellers' assistance

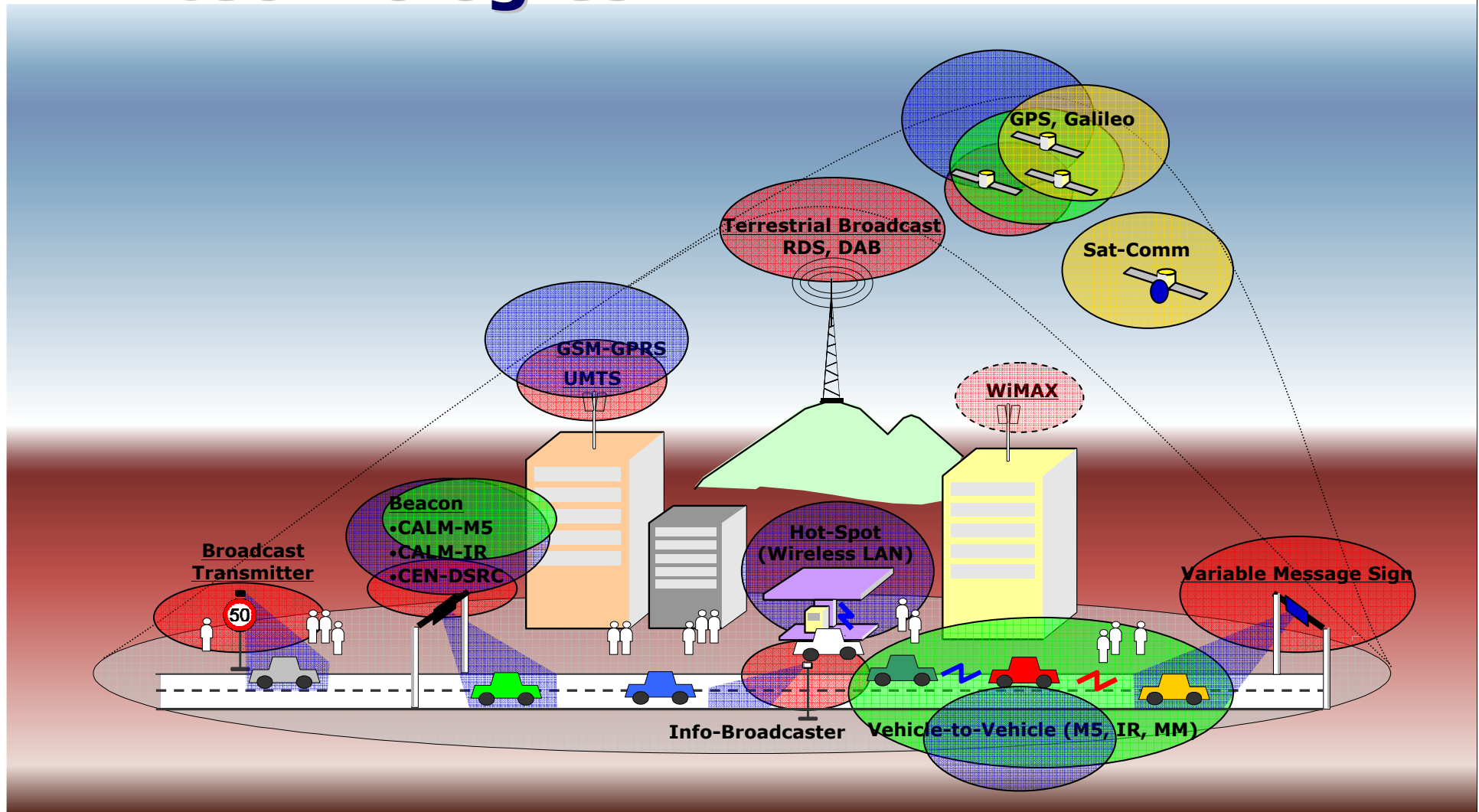
Freight and Fleet

- Access control
- Dangerous goods
- Parking booking

Enabling CVIS Deployment

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

EC-Projects communication technologies



Cooperative Systems Development



Coordinator: **ERTICO**

Total budget: € 41 Million

EC contribution: € 22 Million

Consortium: 61 partners - 12 countries

Core Technologies



Coordinator: **Fiat Research Centre**

Total budget: € 38 Million

EC contribution: € 20,5 Million

Consortium: 51 partners - 12 countries

Car-Makers View



Coordinator: **AustriaTech**

Total budget: € 16,8 Million

EC contribution: € 9,6 Million

Consortium: 37 partners - 14 countries

Road-Operators View

Cooperation links to: **SISTER, SEVECOM, COMeSafety, Car-2-Car Communications Consortium (C2C-CC), Network on Wheels (NoW), INVENT, ACTIV (Germany), CVHS (UK), IVSS (Sweden)**



SAFESPOT

