

# DAIMLER

## Automotive Communications: An Introduction

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June 16, 2009



# Motivation

Communication to help with two problems:

## Mobility



Congestion generates  
annual economic cost of  
17,4 bn. €

(Estimate EU commission)

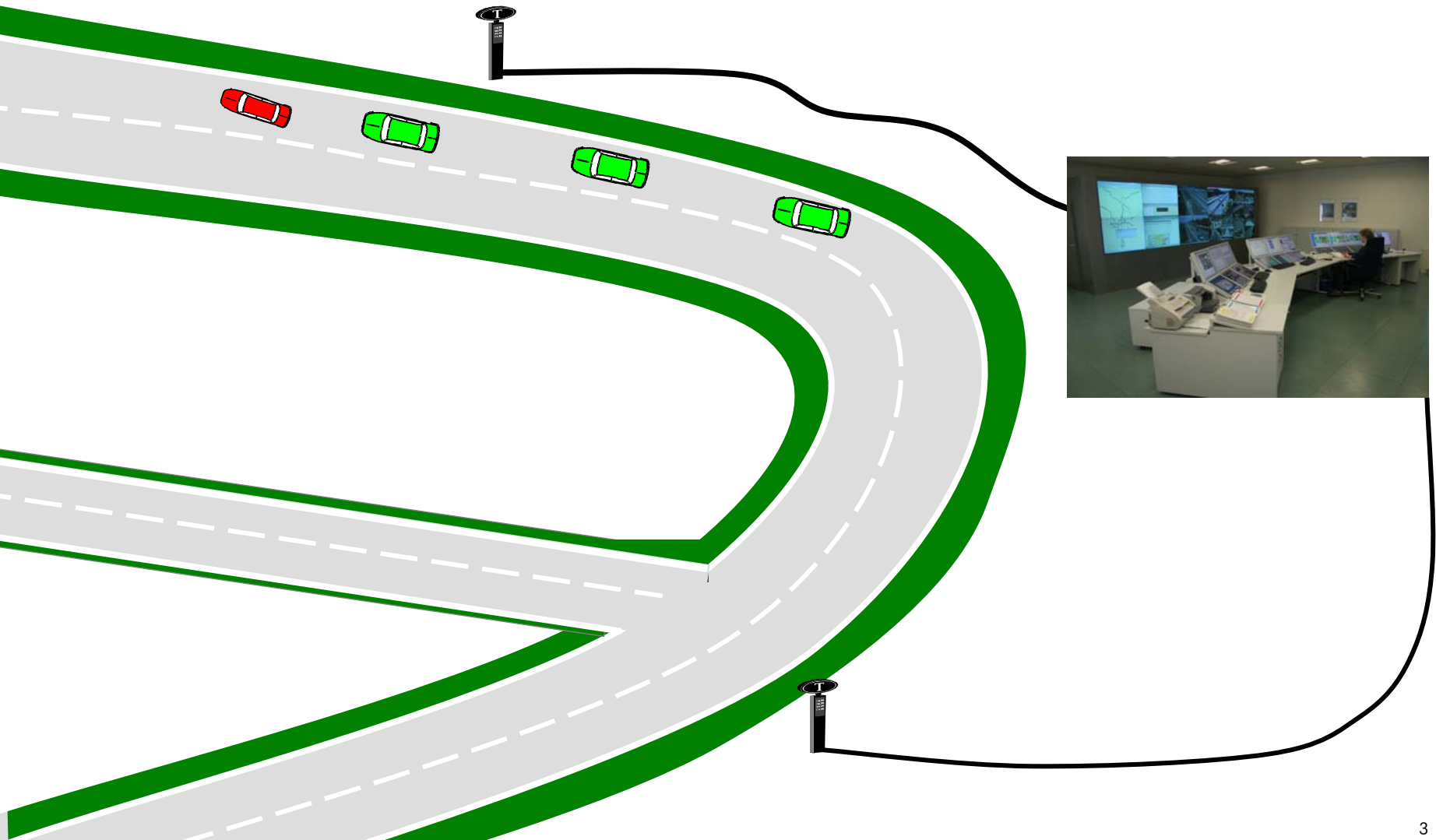
## Traffic Safety



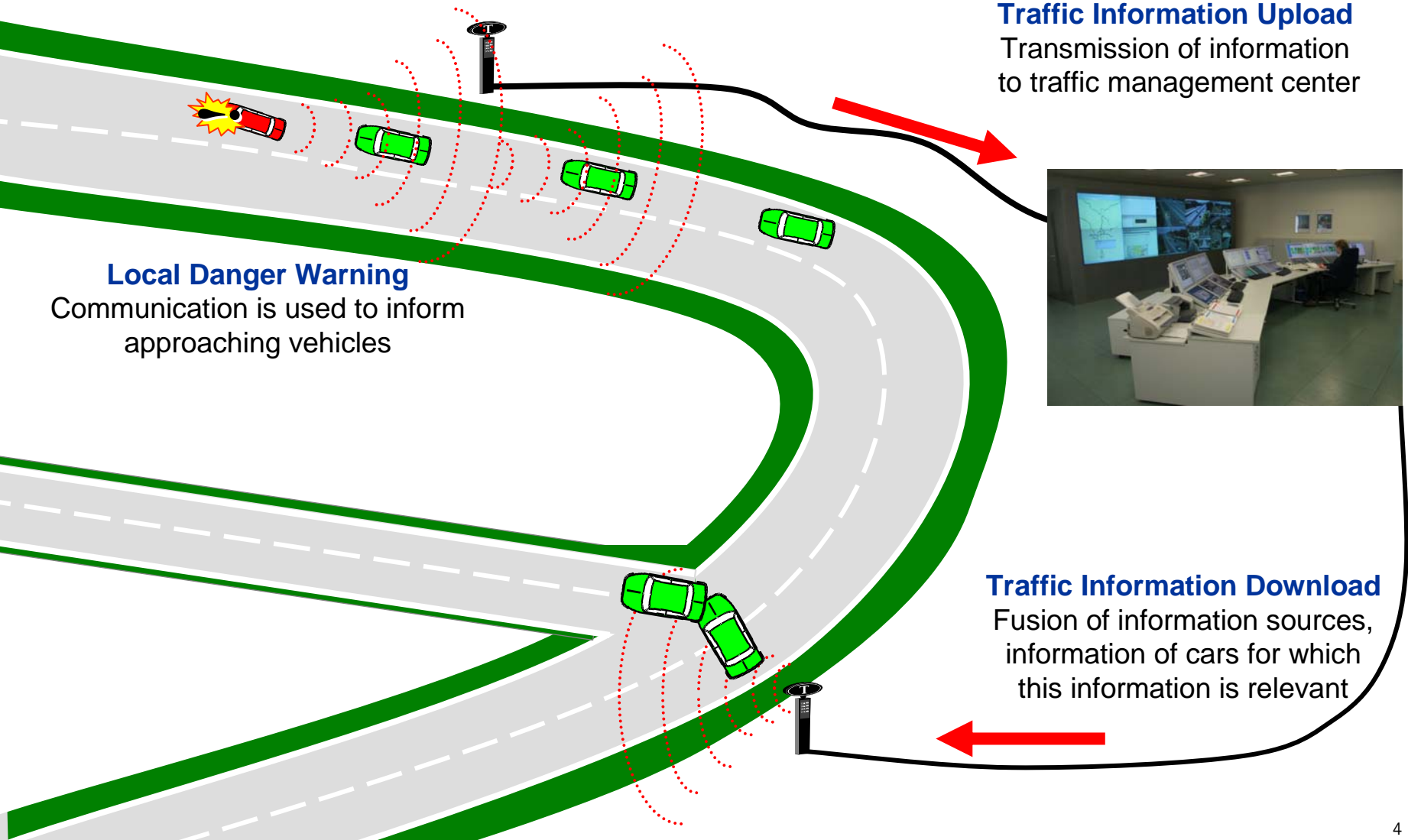
Accident statistics 2006:  
appr. 420.000 injuries  
appr. 5000 fatalities  
in Germany

(Source Statistisches Bundesamt)

# How Can Communication Help – An Example



# How Can Communication Help – An Example Improved Local Traffic Information





# Potential Communication Applications

## Safety Warning

Construction Zone



Stopped Traffic



Weather



Emergency Vehicle



Red Light



## Mobility

Traffic Information



Traffic Smoothing



Dynamic Route Guidance



## Commercial / Internal OEM Use

WWW.



Connectivity



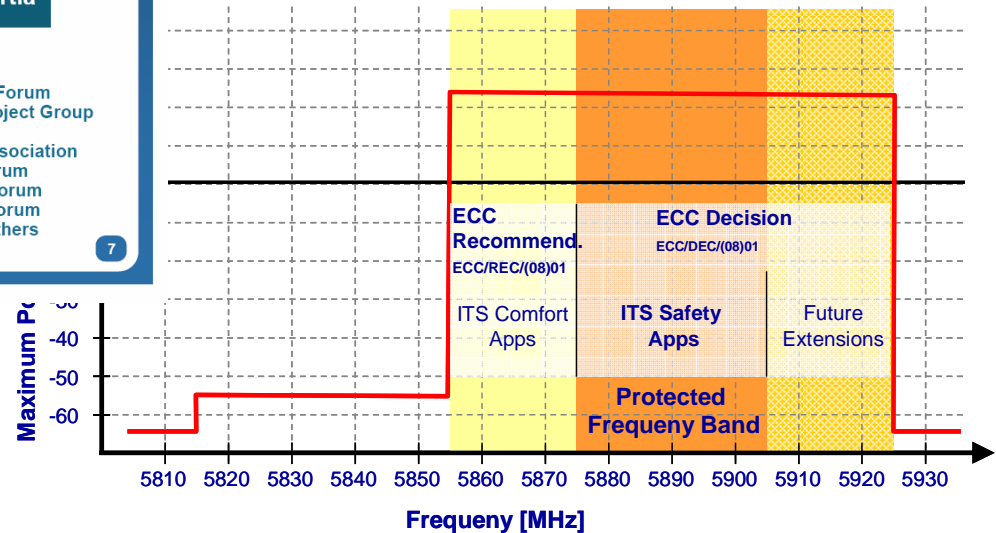
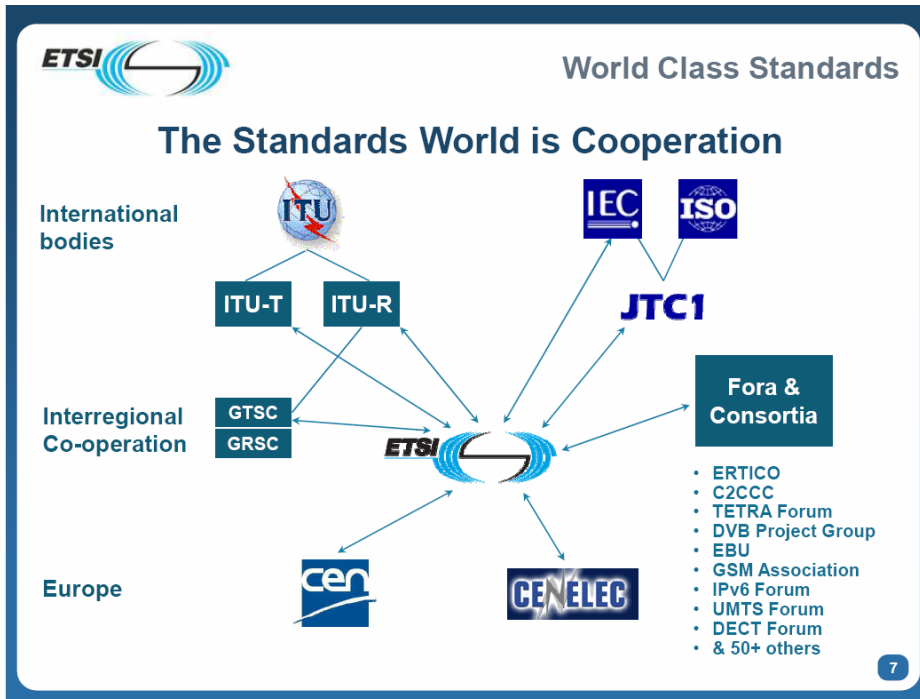
E-Payment



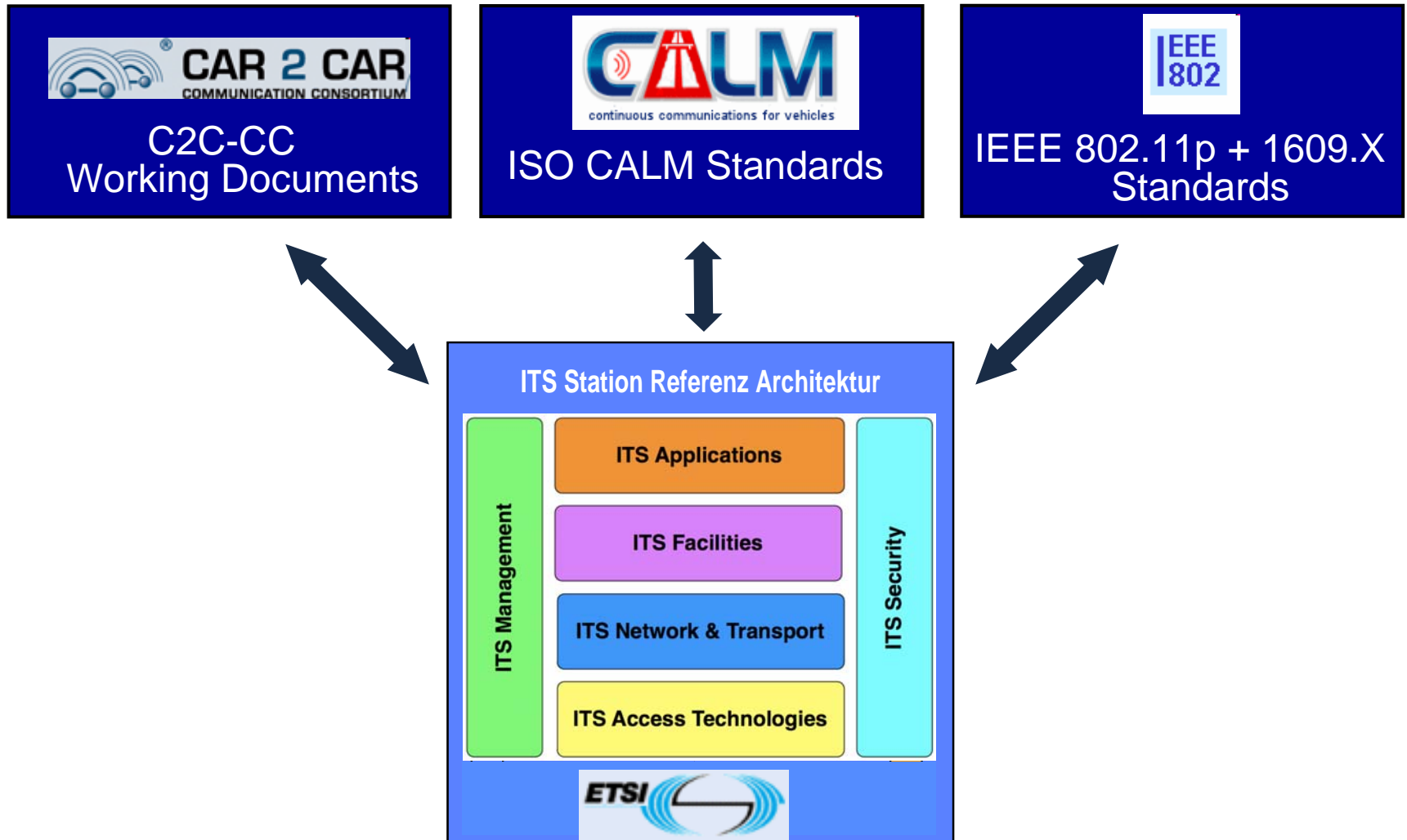
Telediagnosis



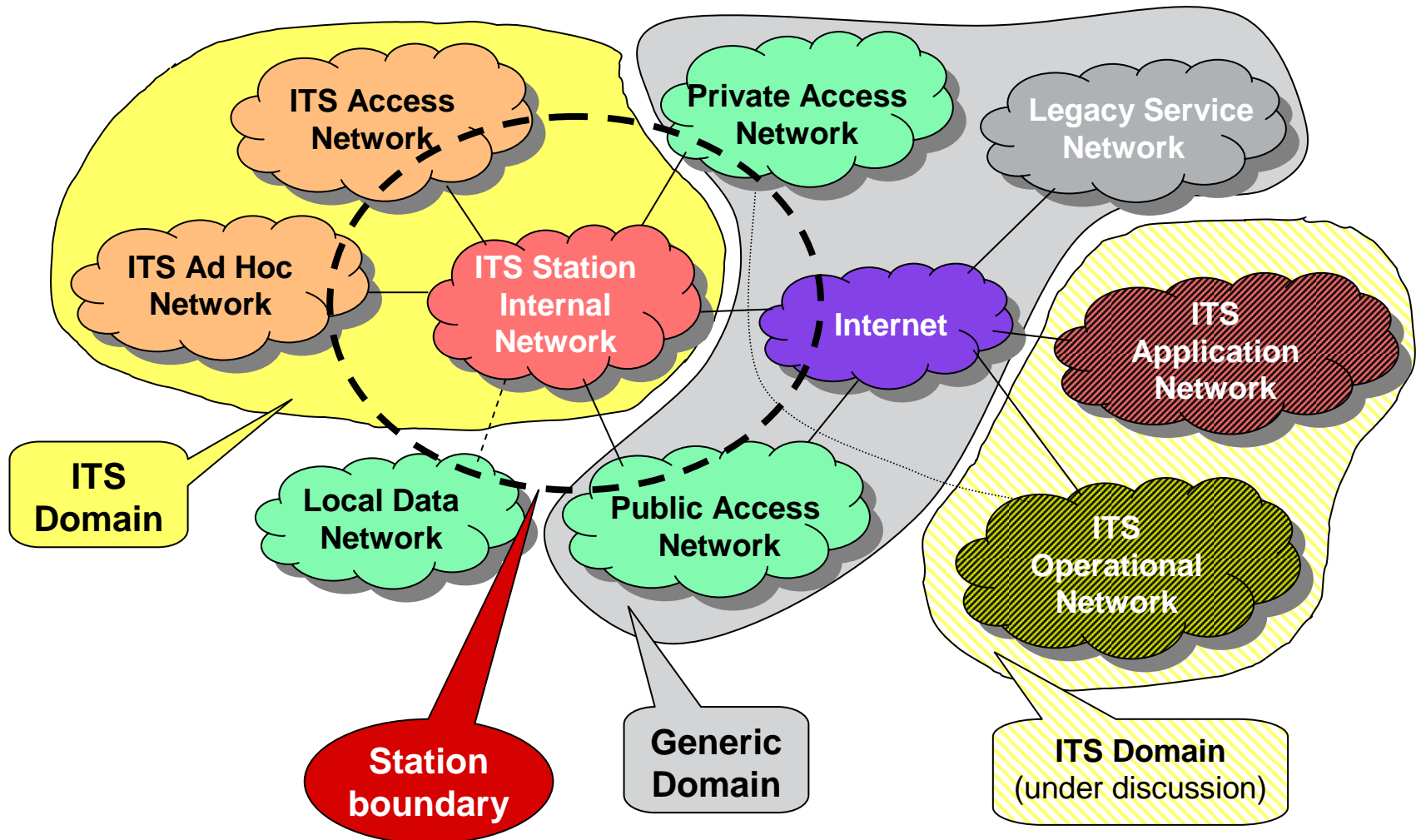
# Communication Technologies and Standardization



# Beginning Harmonization of Standards



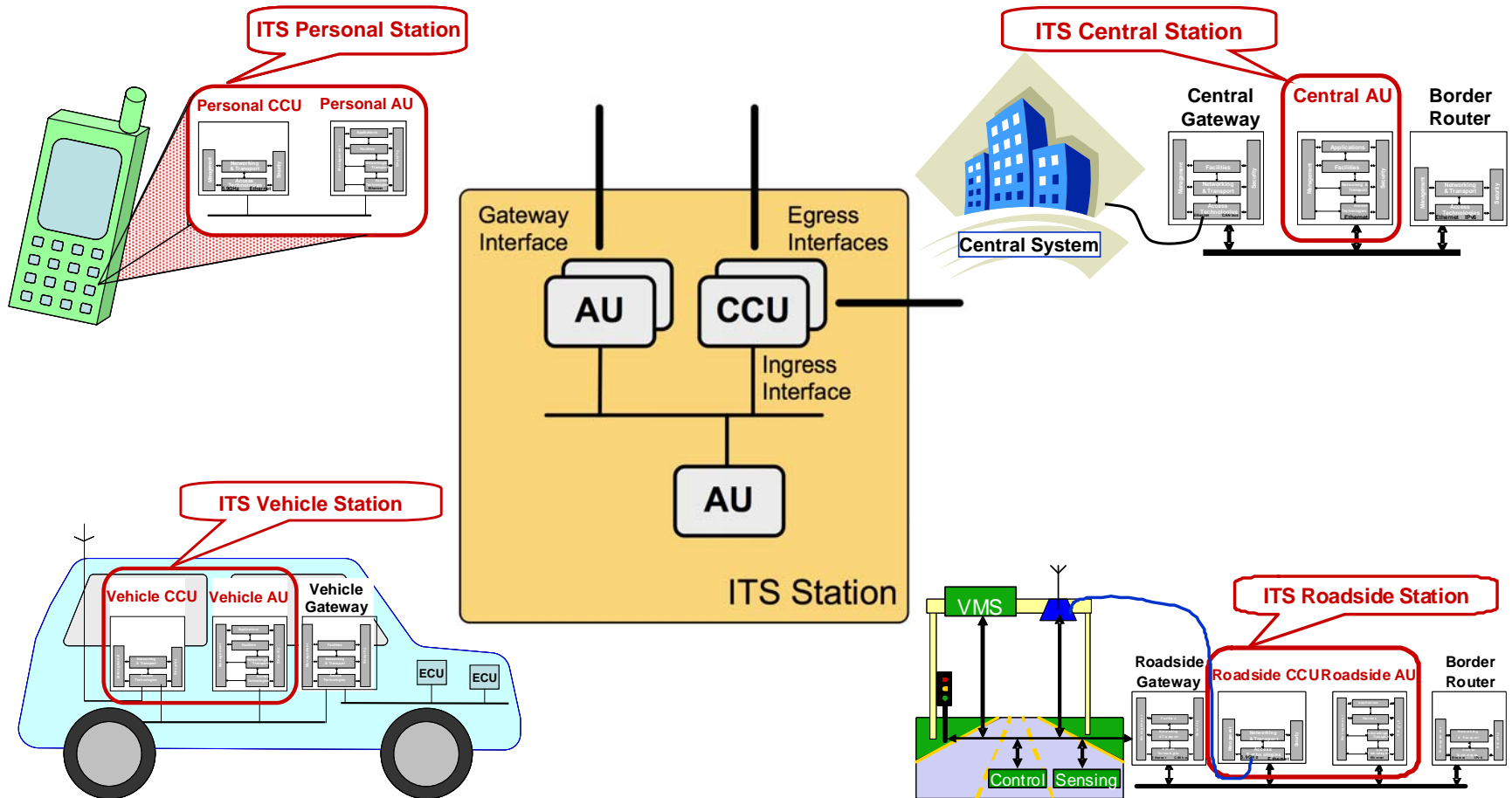
# ITS Communication Architecture Network View





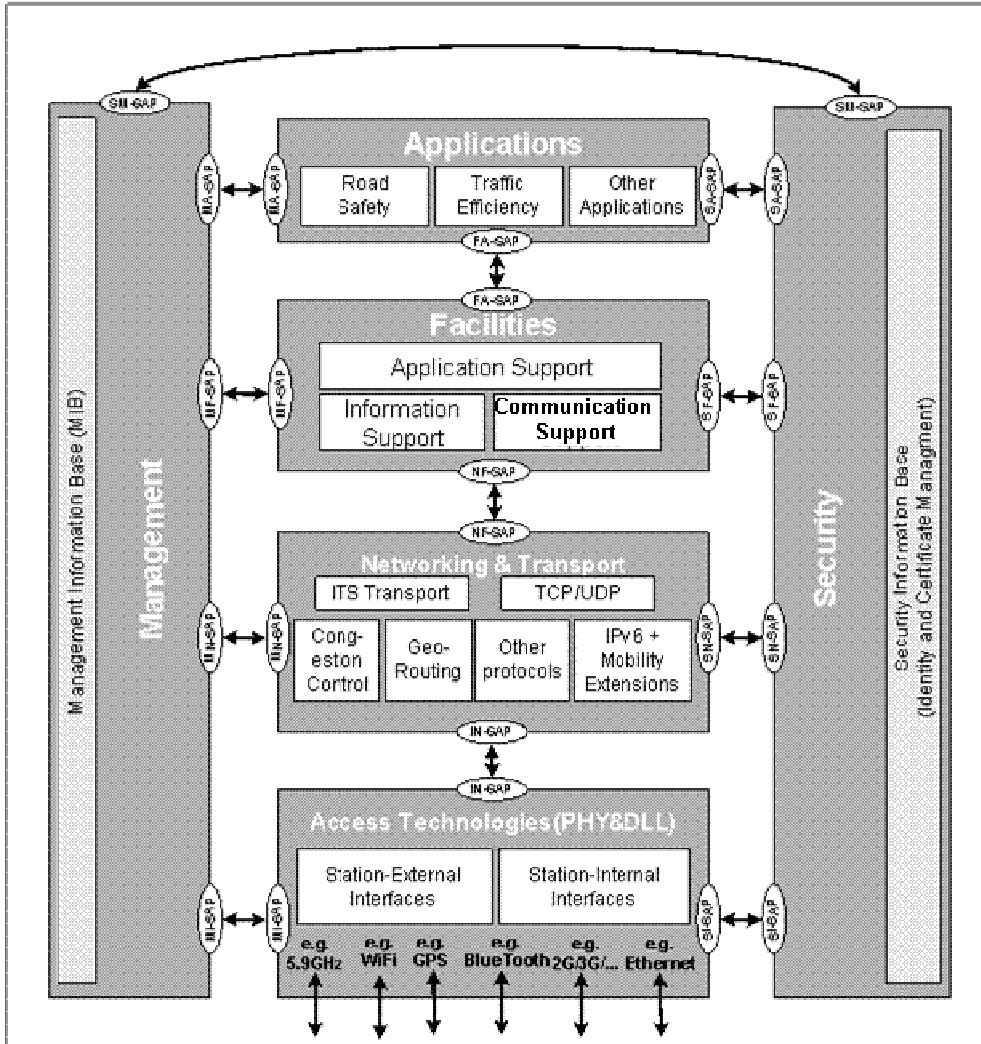


# ETSI ITS Station Concept





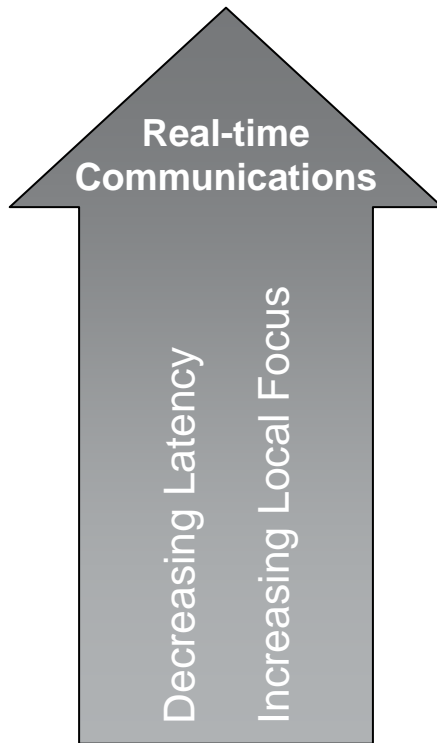
# ETSI ITS Working Groups



- WG APP: Applications / Facilities
- WG NET: Networking & Transport
- WG PHY: Access Technologies
- WG SEC: Security
- WG ARCH: Overall Architecture



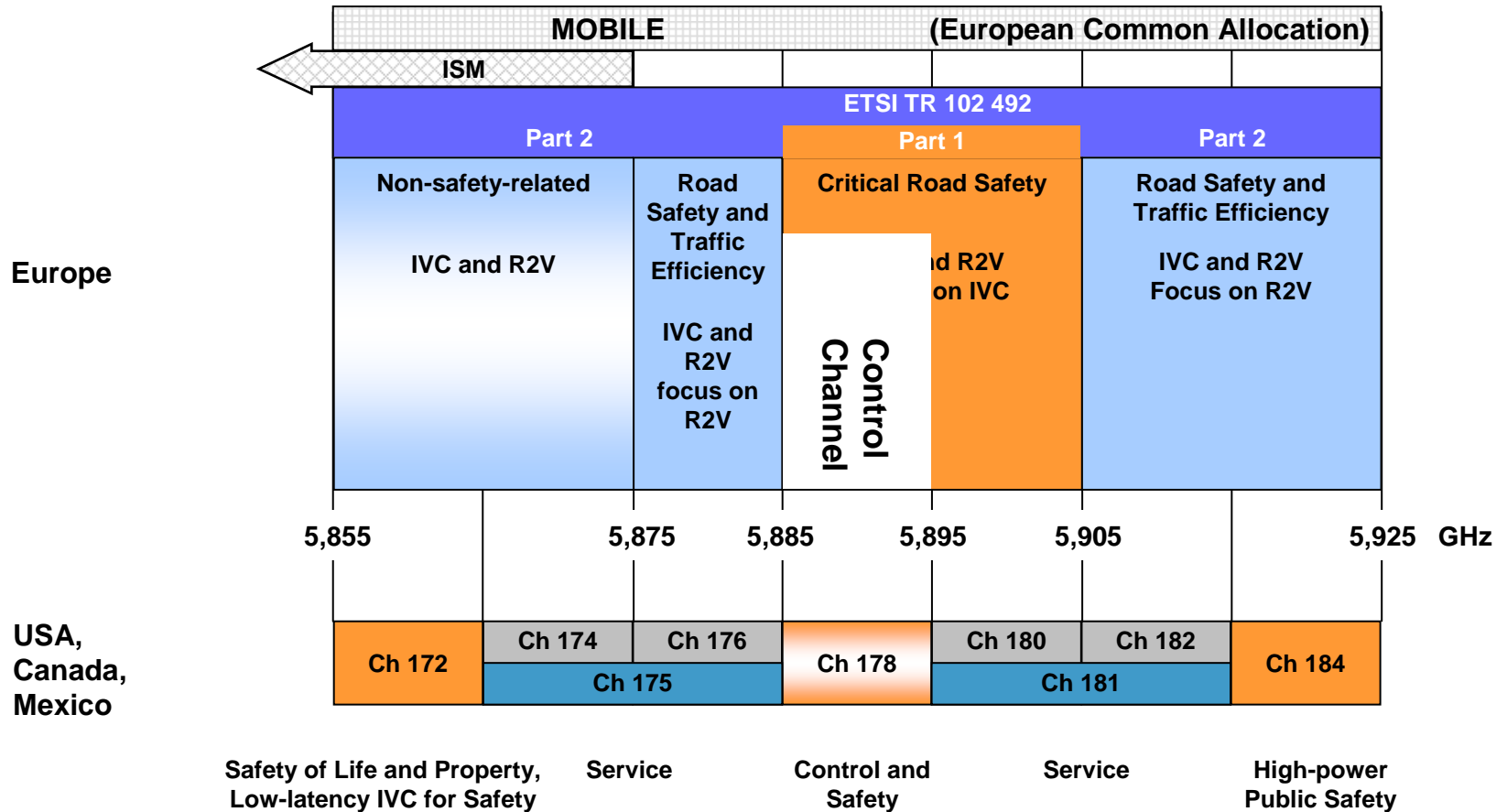
# Potential Access Technologies



<p><b>DSRC</b></p>	<p>Specially designed for C2X applications</p> <p>Supports the most stringent safety applications</p> <p>Dedicated spectrum</p>	<p>Penetration challenge for C2C approach</p> <p>Infrastructure will concentrate on traffic hotspots (introduction cost)</p>
<p><b>Cellular</b></p>	<p>Early support for C2X applications</p> <p>Infrastructure available</p> <p>Reuse of in-car equipment</p>	<p>Variety of providers</p> <p>Backend needed (as deflector)</p> <p>All safety apps possible?</p>



## DSRC





## Status of DSRC Standards

### IEEE 802.11p

- DSRC physical layer & lower MAC sublayer
- Passed 2nd recirculation ballot with 89% approval rate in 2009 (draft standard)

### IEEE 1609.4

- DSRC upper MAC sublayer (multi-channel coordination)
- Approved as “trial use standard” in 2006

### IEEE 1609.3

- WAVE Short Message Protocol (WSMP)
- Approved as “trial use standard” in 2007

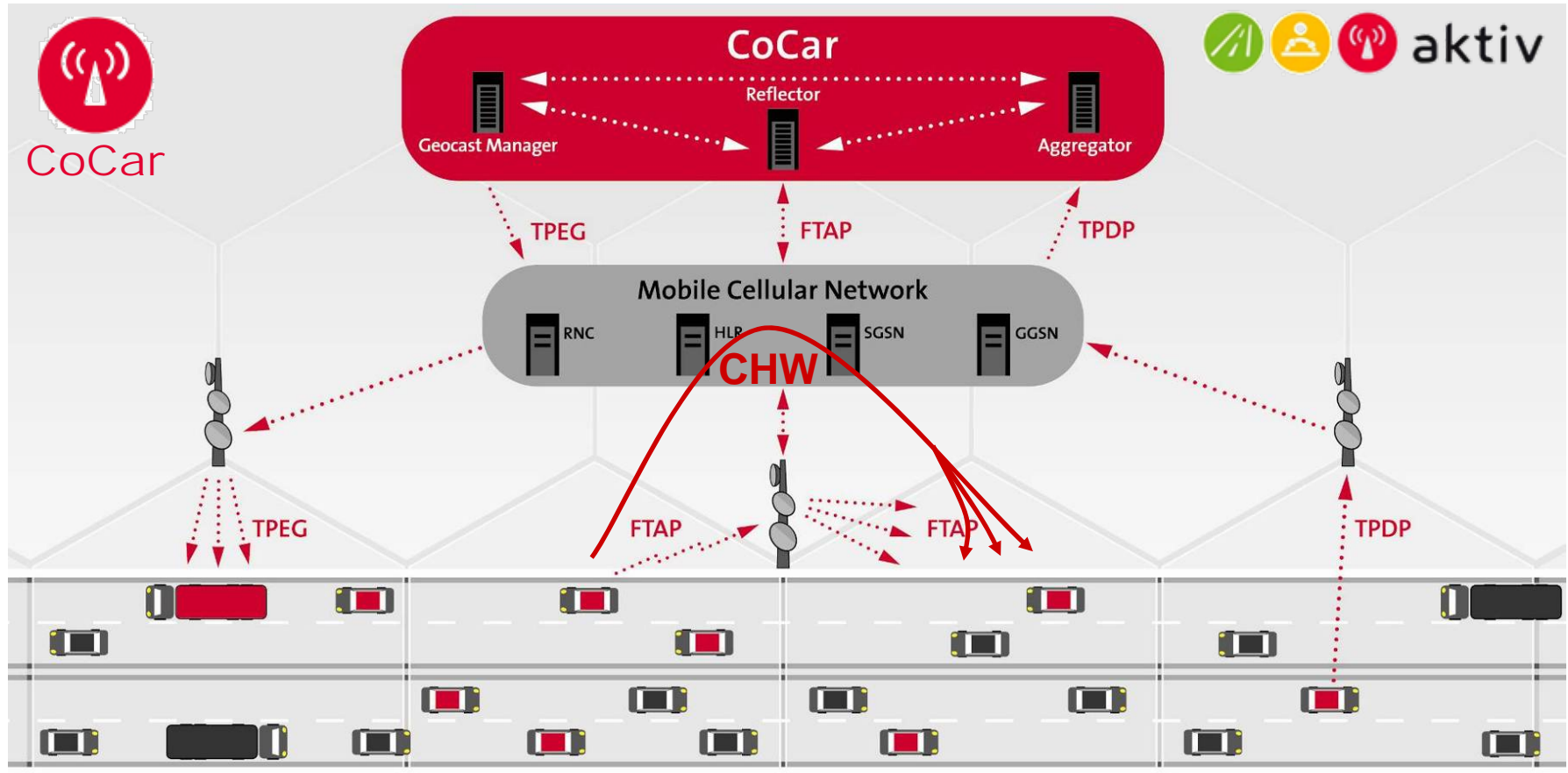
### IEEE 1609.2

- Security functions
- Approved as “trial use standard” in 2006

### SAE J2735

- Common message set and data dictionary
- Already in sponsor ballot

# Cellular: The CoCar Example

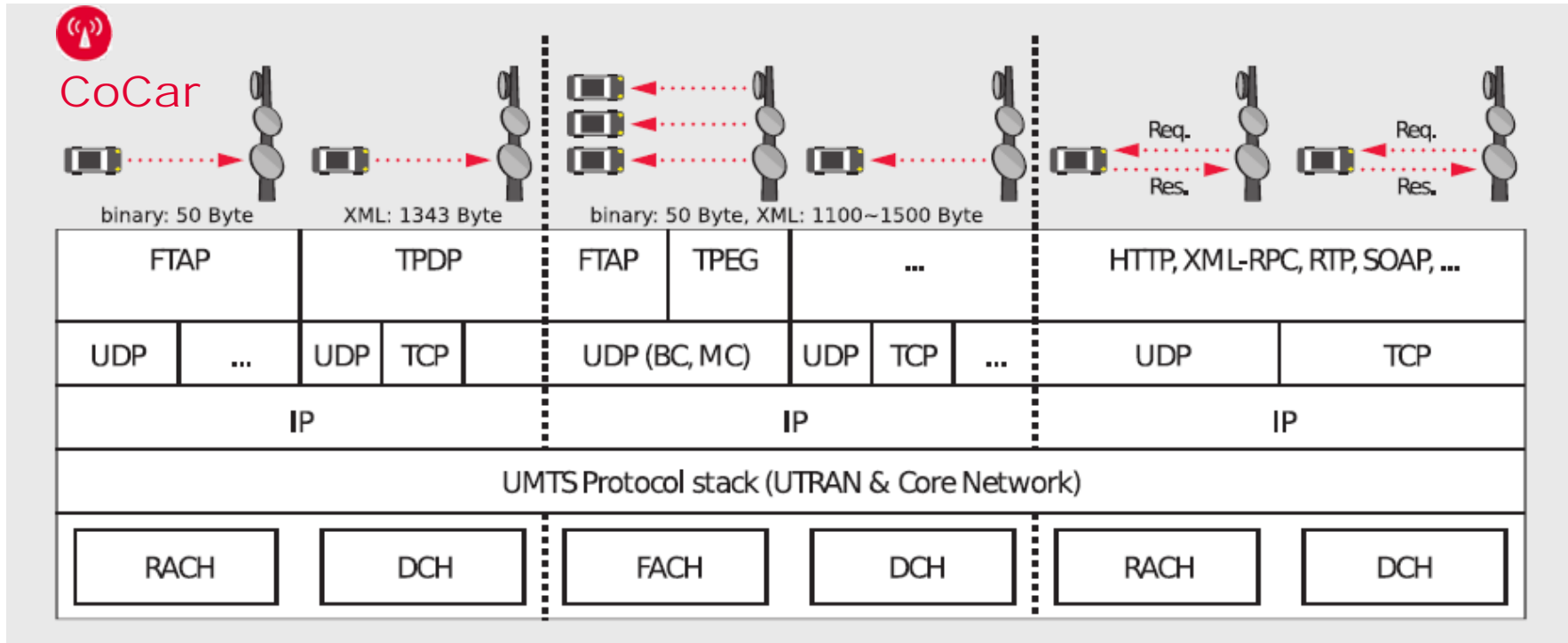


FTAP – Fast Traffic Alert Protocol

TPDP – Traffic Probe Data Protocol

TPEG – Transport Protocol Expert Group

## CoCar Protocol Stack with UMTS



- Fast Traffic Alert Protocol (FTAP): Optimized for fast traffic warnings in up-/downlink
- Traffic Probe Data Protocol (TPDP): Periodic transmission of vehicle status (location, speed, ...) to server. Sent regularly to the server to update on vehicle status (location, speed, other sensor data).
- No standardization activities up to now.

# Open Issues







## Questions

### General:

- Do the applications make sense? Which are the most promising?
- Is there a viable business case?
- What are promising introduction scenarios?
- Who will be the main drivers for introduction?
- How will the future C2X system look like? Will it be a single system or a hybrid unit?
- Will standardization in the different regions converge?

### DSRC:

- What are introduction scenarios with and without infrastructure?
- How can we cope with security issues in the ad-hoc domain?
- How can the remaining technical details of transmission power control, congestion control, etc. be addressed?
- What is the use of the current field operational tests?

### Cellular Systems:

- Is the “ITS load” acceptable in the mobile network?
- How will roaming / internationalization / harmonization be handled in Europe?
- What is the price projection?
- Who will operate the application server(s)?
- How will different network providers cooperate?