road ERA net

road research in europe

Seamless traffic data dissemination across urban and inter-urban networks

SEAMLESS

21/11/2012

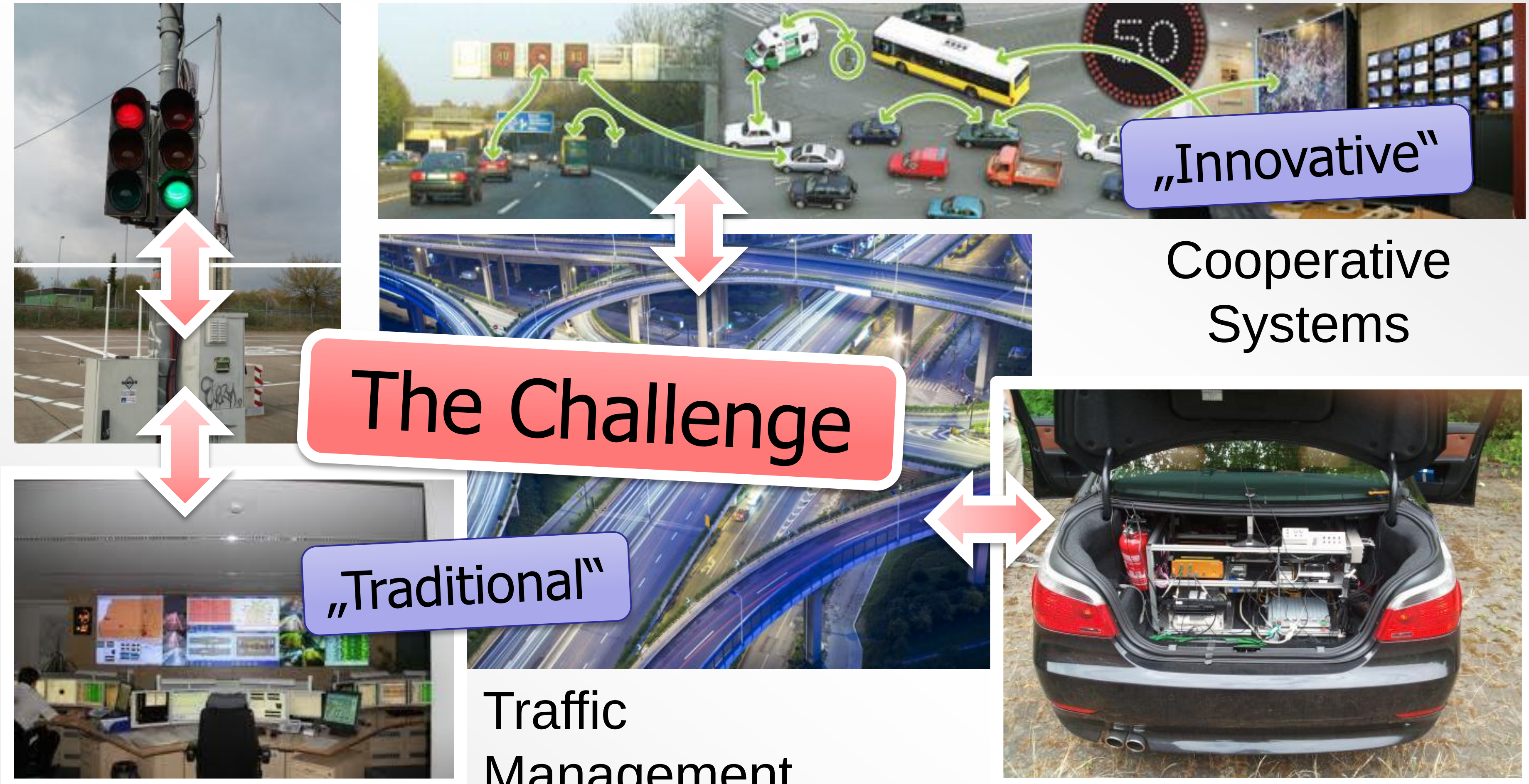
PEB Meeting, Delft

Jörg Freudenstein

SEVENTH FRAMEWORK PROGRAMME

SEAMLESS

The Story



The Story

- Wake up call for traditional Traffic Management: Cooperative Systems are coming!
  - new technologies
  - new infrastructure
  - new players
  - maybe even new mindset
- Two strong and proud communities – who takes care of connecting the two worlds?

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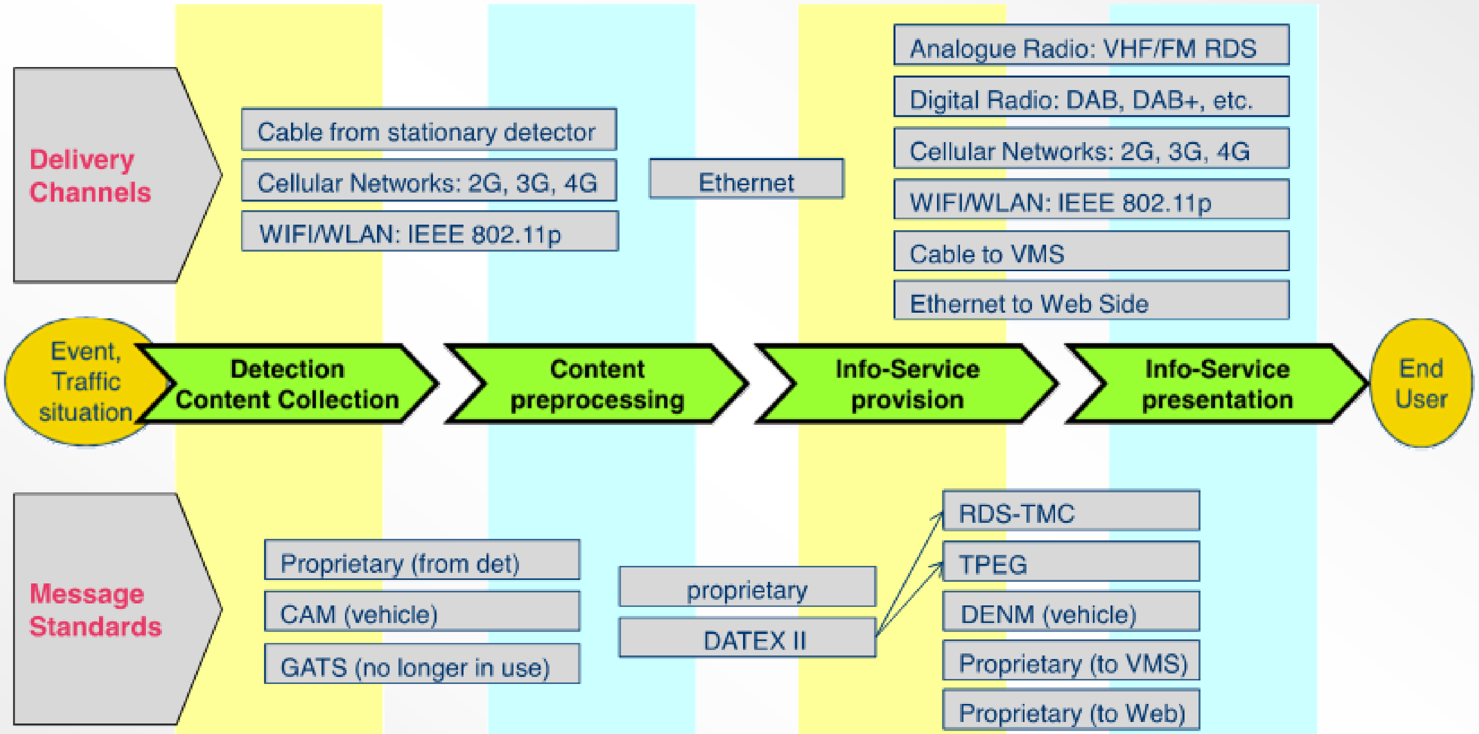
The Story

Traditional Service Chain



What is spared here - for the sake of simplicity - are the Location referencing standards, which is big issue, too.

TISA Traveller Information Services Association

TISA - Traveller Information Services Association - January 2012 /13/

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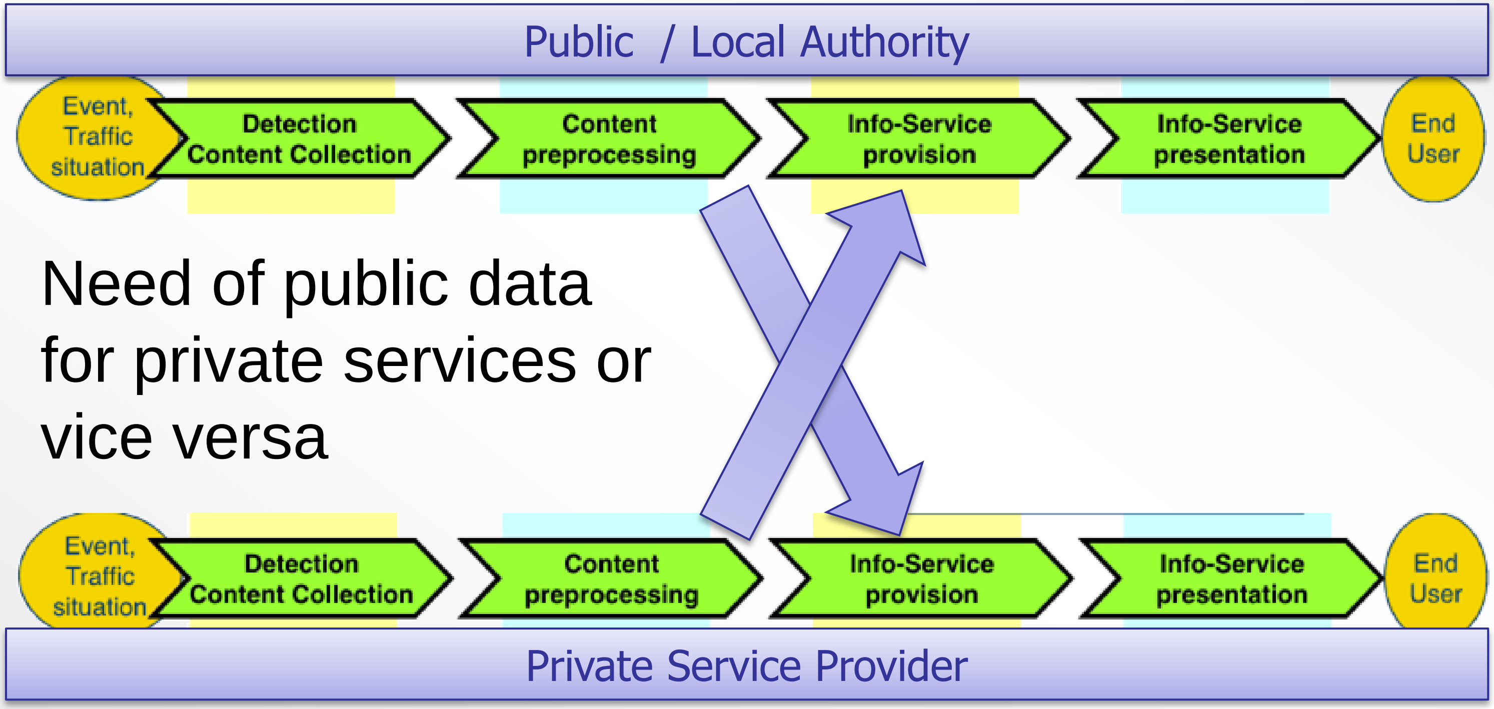
The Story

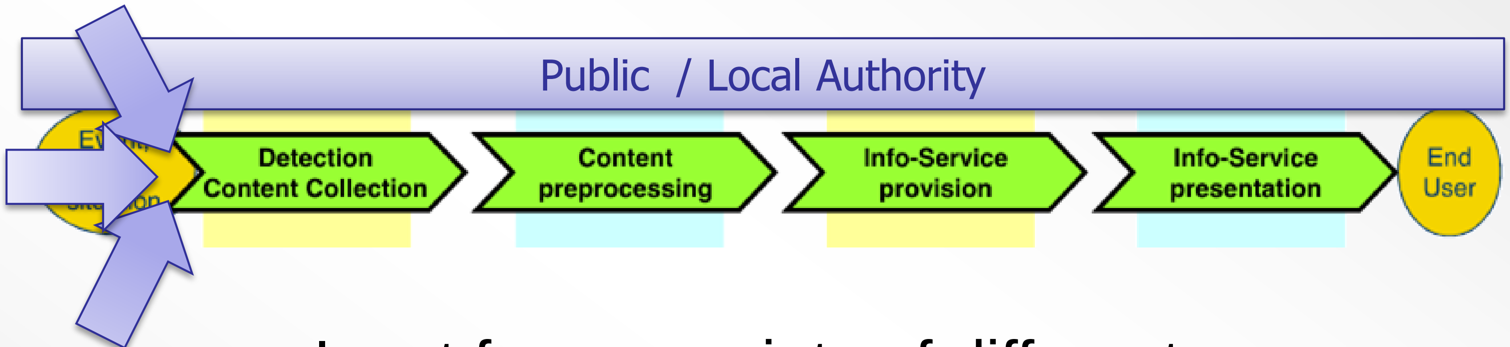
Possible influence of Cooperative Systems



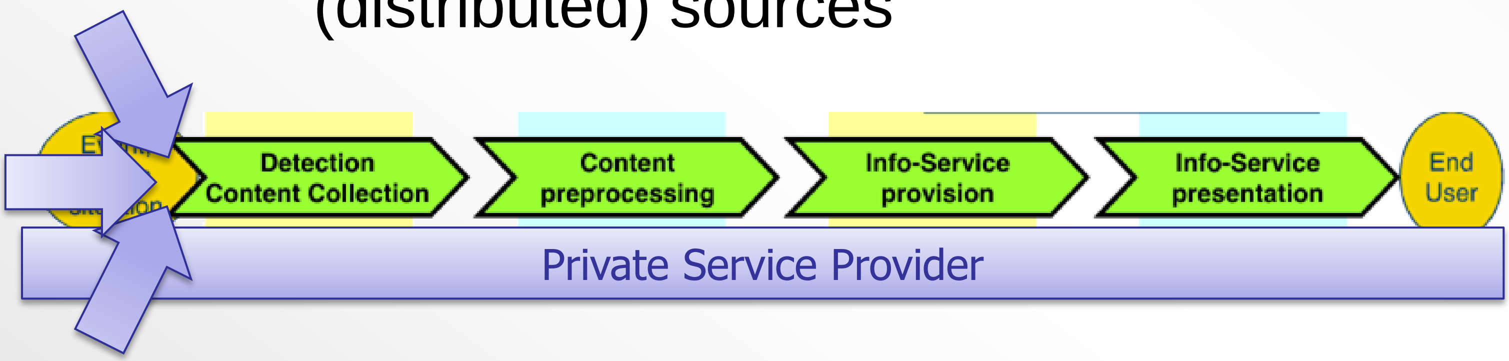
Need of public data for private services or vice versa

The Story

Possible influence of Cooperative Systems

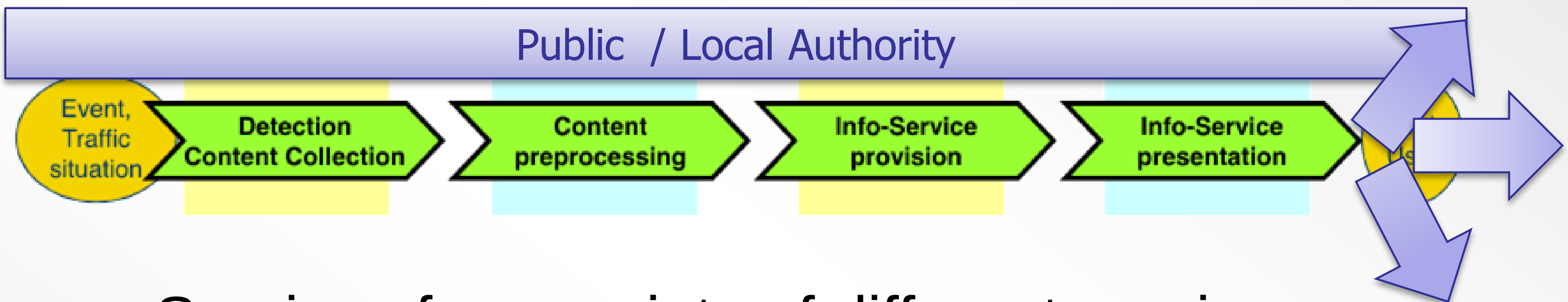


Input from a variety of different (distributed) sources

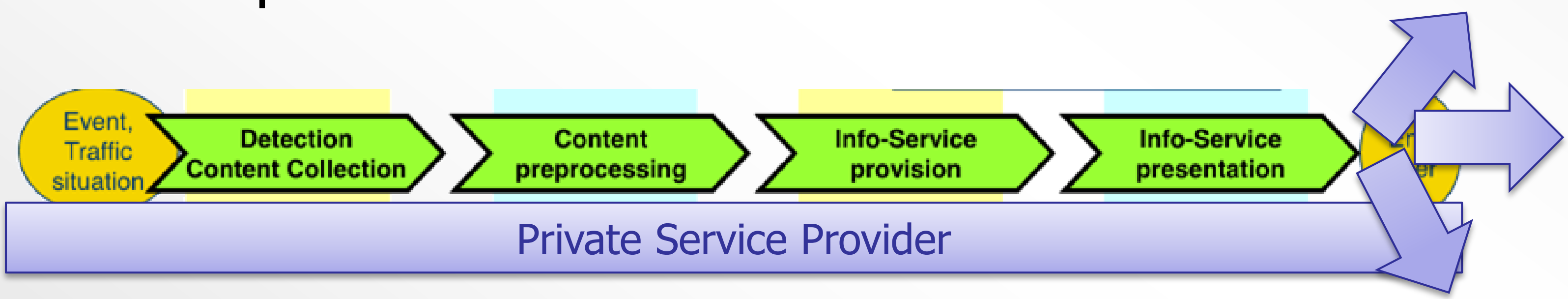


The Story

Possible influence of Cooperative Systems

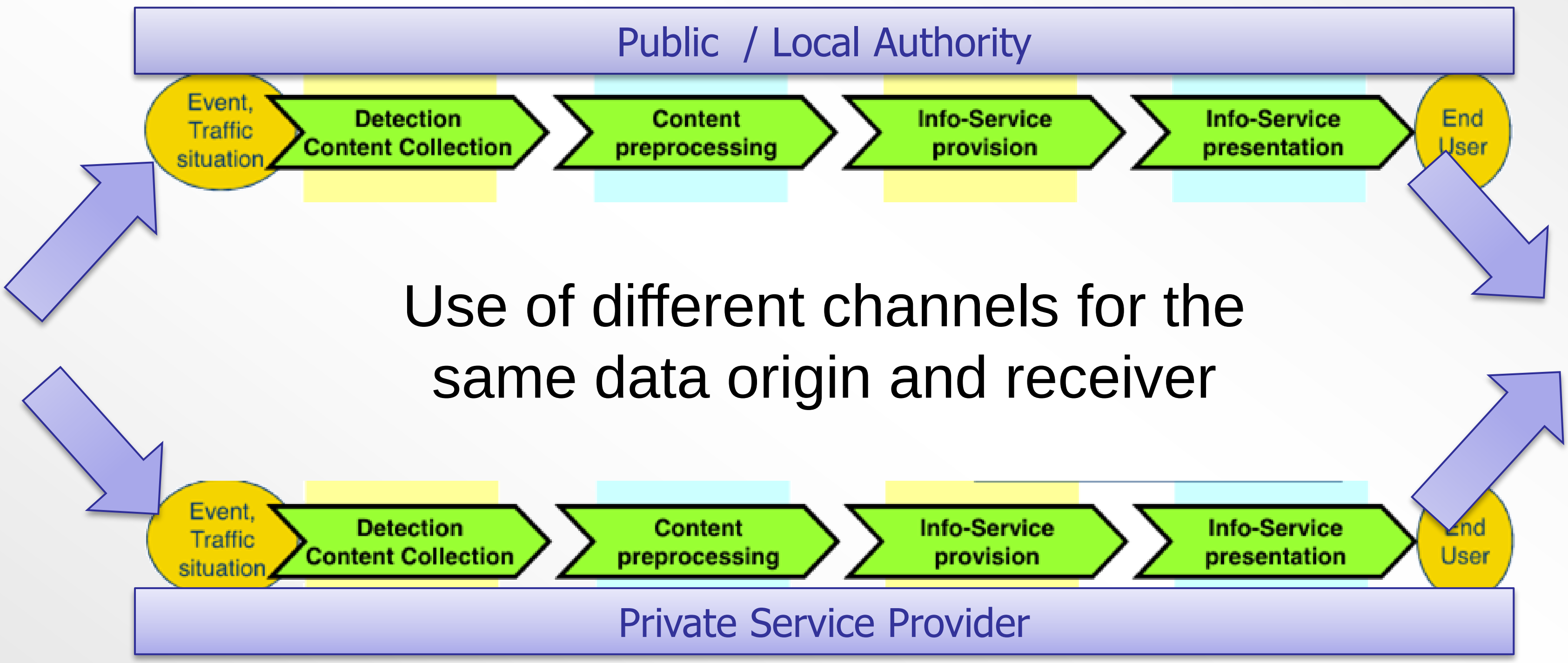


Services for a variety of different service providers and end-user channels



The Story

Possible influence of Cooperative Systems



The Story

- A lot of Test Fields for Cooperative Systems
- And yes if you scratch the surface there are efforts to **connect legacy**
  (somewhere in the Annex …)

- Often bespoke/proprietary solutions
  which do not survive the end of the project
- Few (no?) use of standards
- **There is a gap!**

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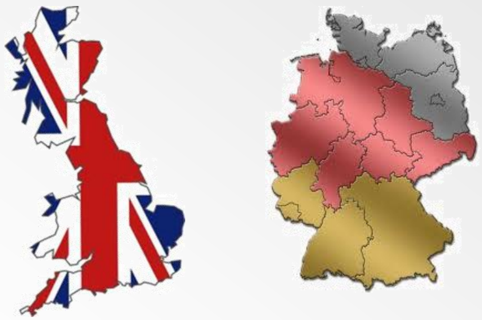
Project ‘SEAMLESS’



- “Prepare traffic data dissemination that works seamlessly across urban and inter-urban networks”
- Main topics
  - Data dissemination to in-vehicle systems
  - Link to cooperative systems
  - Linking Legacy

The Challenge

so far

Road authorities must make best use of existing road capacity and keep track of

- Rising traffic demand
- Environmental challenges
- Economical feasibility

now

Road authorities have recognised the growing importance but also the huge potential of intelligent infrastructure

Challenges in distributing road authority data to travellers:

- Not all data available (with public funding?!) reaches travellers (e.g. due to administrative problems)
- Road authorities are seeking to reduce their dependency on bespoke roadside infrastructure for traffic management

The Challenge (cont.)

- Lots of money was invested

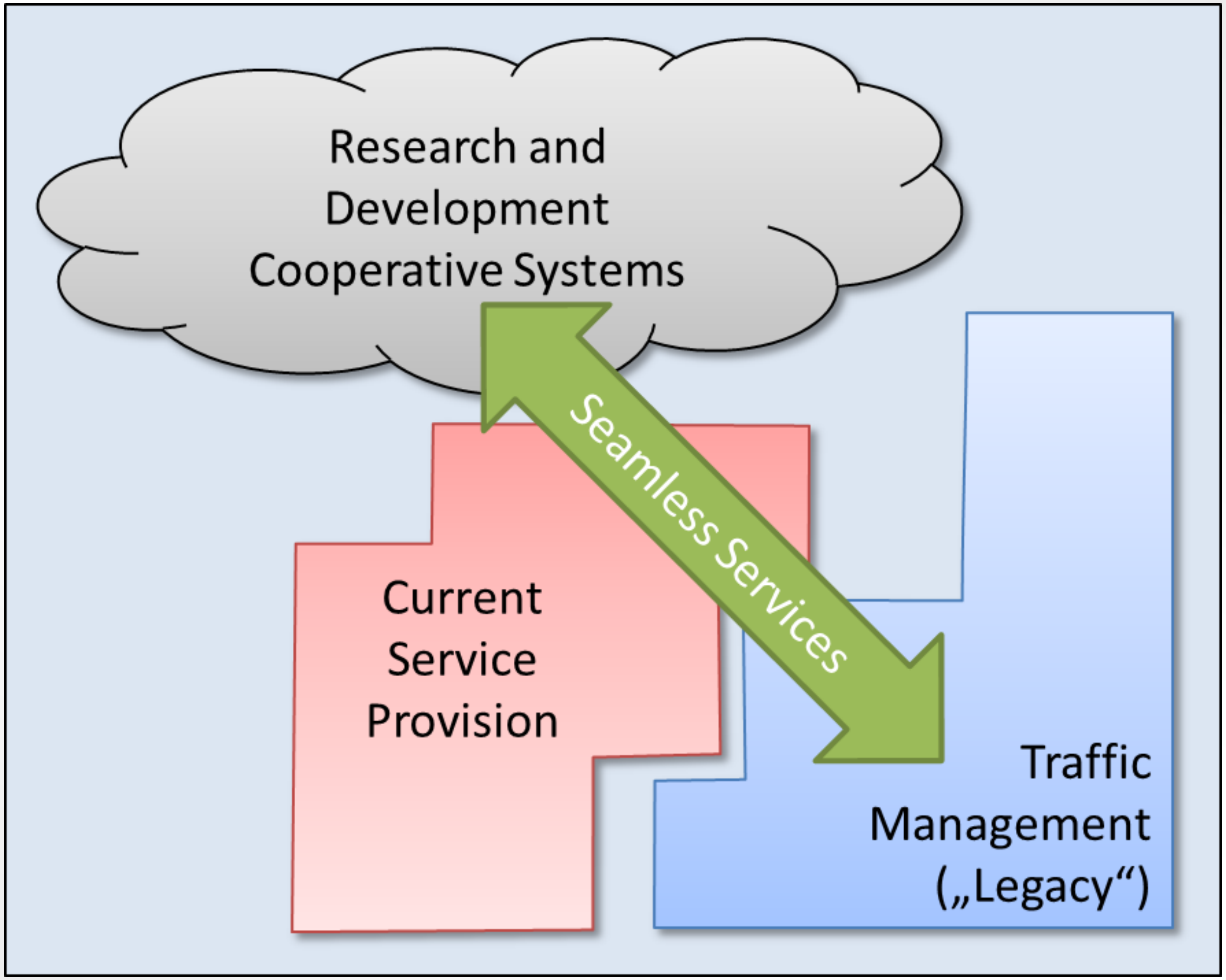
But results are poor

- New technology-channels are to come up

But even new channels have no content,
if back end data exchange does not work

⇒ **Lack of seamless services**

Seamless Services



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WP1: Analysis

- Deliverable Nr 1 “Analysis of existing research on road data dissemination to in-vehicle devices”
- Analysis of existing research
  - Summarized 42 projects in total with respect to Cooperative Systems
  - Description of standards
  - Stakeholder and their objectives
  - Description of Use Cases

Actor – Role Matrix

	Traffic Management Centre	RSU Operator	Content Centre	Service Centre	Control Centre	Communication Infrastructure Provider	Device Manufacturer	OEM / Automotive
Public	X	X	X	X				
Private		(X)	X	X	X	X	X	X

WP1: Analysis (cont.)

Table of project information
- example CVIS

CVIS		
Project Organisation	Coordinator	ERTICO
	Partner involved	OEM, suppliers, reserach, academia
	Contact Seamless	Dr.-Ing. Thomas Benz, Dr.-Ing. Michael Ortgiese
	Start date	01.04.2008
	End date	30.06.2010
Application Use Cases	Description	Cooperative network management, Cooperative Area Routing, Flexible Lane Management, Flexible Lane Allocation, Cooperative Driver Awareness, Travellers Assistance, monitoring and guidance of dangerous goods, parking zone management, an access control to sensitive infrastructures. Cooperative Traffic Monitoring
	Relevance for SEAMLESS	Architecture for C2X services based on a hybrid communication architecture. x UC Traffic Light x UC Journey Time
	Category	☐ Safety x Efficiency ☐ Environment x Urban x Interurban

WP1: Analysis (cont.)

Business Structure	Stakeholder	x Road Operator x Automotive ☐ Service Provider
	B2C payment	x Free of Charge ☐ Paid service
	B2B / B2A payment	x Free of Charge ☐ Paid service
	Contracts	--
Expected Benefits of the cooperation	Infrastructure	Increase the efficiency of the traffic network
	Automotive	Benefits for the customers, e.g. reduction of travel time.
	Service Provider	--
Information Exchange	Content Semantic	Proprietary information model for the different use cases.
	Communication Protocol	IPv6
	Channel	☐ Broadcast x Cellular x Short Range
Architecture	Entities	x Center - Center ☐ Center - Car x Center - Infrastructure x Car - Infrastructure x Car – Car
	Description	Decentralised architecture in a research phase; Results were influencing the ETSI station architecture.

WP1: Analysis (cont.)

- Huge number of standardisation and business development activities
- Work of TISA as well as of ETSI/CEN will influence the future market
- innovation-oriented activities are mainly based on
  - COMeSAFTEY
    (consolidation the outcomes of the research projects)
  - CVIS/SafeSpot/Coopers
    (basic technology oriented results)
  - SimTD and Drive C2X
    (most relevant field operation tests (FOT))
- introduction of new services must be based on sound migration strategy

WP2: Business Case Considerations

- Value and cost of urban data
- Value and cost of seamless services
- Data characteristics necessary for effective services
- Current Business Models and Factors Driving the Evolution of New Business Models

- Questions which were driving this workpackage
  - Why should road authorities who generate urban data from legacy traffic management systems seek to make it widely available?
  - How can this data be most effectively disseminated to in-vehicle devices?
  - Why is maximising usage and up-take of such in-vehicle devices by end users important?
  - What is the value of the benefits that can ultimately be realised?

WP2: Business Case (cont.)

- Advantages of new data-exchange cooperations

  Road Operators:
  - Direct communicate with the driver
  - Better acceptance of the measures

  Car Manufactures:
  - improvement of vehicle safety systems
  - driver information and efficient engine control

  Service Providers:
  - commercial distribution of data and information

- Exchange of data
- Free Delivery
- Payment Model

- Appropriate organizational arrangements needed for cooperation – for example Mobility Data Market Place
- Focus on long period operation without losing quality
- Business structures must be in line with all technical and organizational aspects

⇨ Cost savings, quality improvement of information

Current Activities: WP3

- WP3: Architecture
  - Adapting existing architectures
  - Options on existing architectures are rated with respect to seamless services
  - Considering and publishing
    - the architectural assumptions that can be made
    - the architectural recommendations that the SEAMLESS project will make

Architecture

Now building up a **generic architecture …**

Service Providers

Road Operators

Central Layer

Field Layer

Mobile Layer

Service Providers

Road Operators

Central ITS-station

Central ITS-station

Central Layer

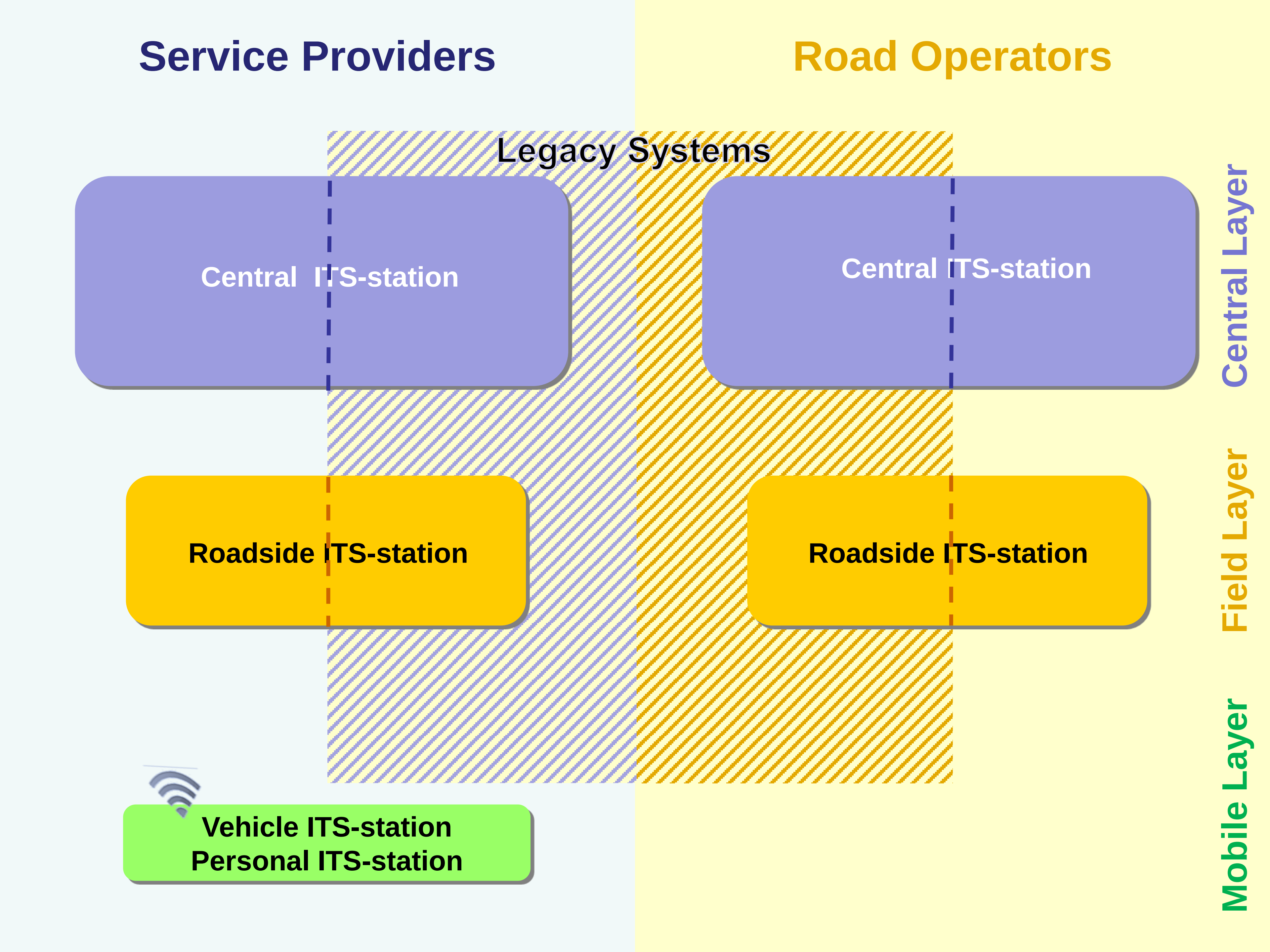
Roadside ITS-station

Roadside ITS-station

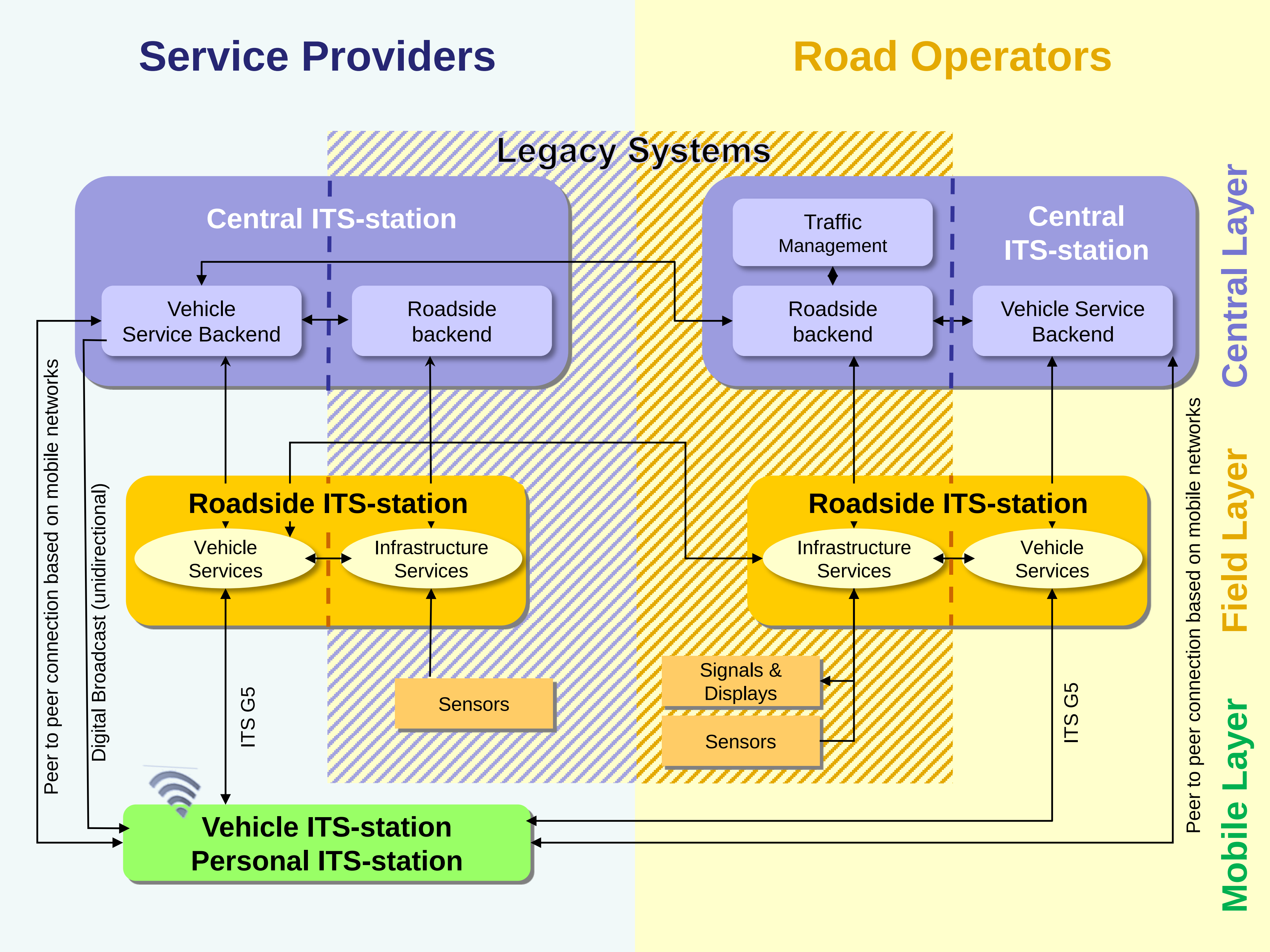
Field Layer

Vehicle ITS-station
Personal ITS-station

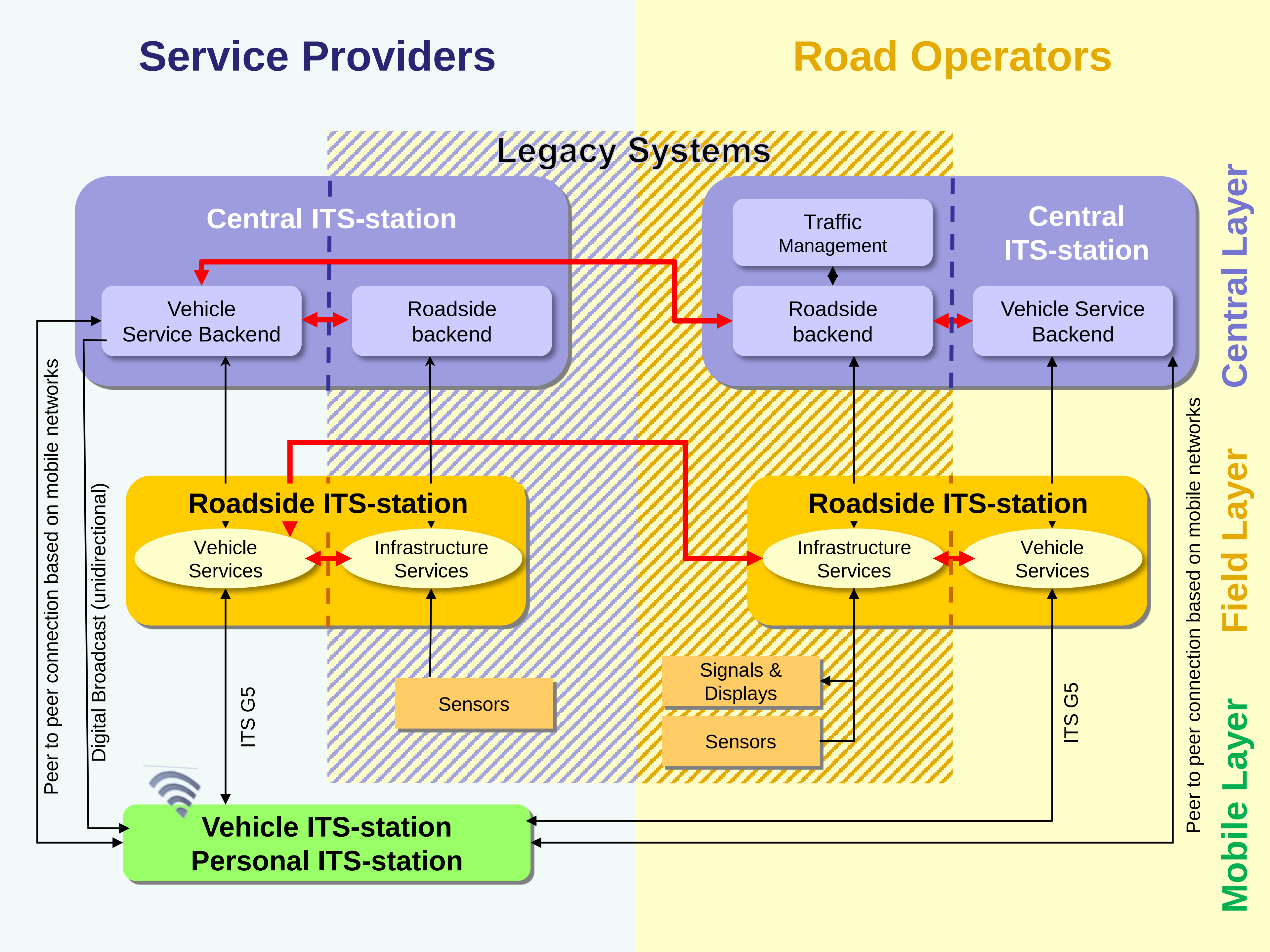
Mobile Layer



Service Providers
Road Operators
Legacy Systems
Central ITS-station
Central ITS-station
Roadside ITS-station
Roadside ITS-station
Vehicle ITS-station
Personal ITS-station
Central Layer
Field Layer
Mobile Layer



Service Providers
Road Operators
Legacy Systems
Central ITS-station
Vehicle Service Backend
Roadside backend
Traffic Management
Roadside backend
Central ITS-station
Vehicle Service Backend
Central Layer
Roadside ITS-station
Vehicle Services
Infrastructure Services
Roadside ITS-station
Infrastructure Services
Vehicle Services
Field Layer
Sensors
Signals & Displays
Sensors
ITS G5
ITS G5
Peer to peer connection based on mobile networks
Digital Broadcast (unidirectional)
Peer to peer connection based on mobile networks
Vehicle ITS-station
Personal ITS-station
Mobile Layer


Service Providers
Road Operators
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Central ITS-station
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Roadside backend
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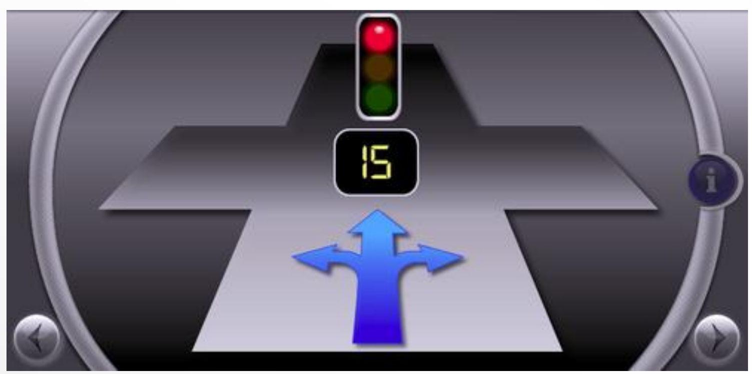
Vehicle Service Backend
Central Layer
Roadside ITS-station
Vehicle Services
Infrastructure Services
Roadside ITS-station
Infrastructure Services
Vehicle Services
Field Layer
Sensors
Signals & Displays
Sensors
ITS G5
ITS G5
Peer to peer connection based on mobile networks
Digital Broadcast (unidirectional)
Peer to peer connection based on mobile networks
Vehicle ITS-station
Personal ITS-station
Mobile Layer

Hybrid communication

- Service Providers
  - want to deliver their information through a dedicated channel
  - want to set their services apart from other service providers
  - do not feel unhappy when controlling both ends of the channel (e.g. bespoke solution on customer side)
- Road Operators
  - are interested in complete and coincident information on customer side and
  - consistent data deliveries
  - like to use more than one channel to get a wider information spread and to compensate channel constraints

Use Case

Example Traffic Light Phase Assistant



Traffic Light Phase Asst.

- Different architectures possible

  (direct communication via Field Layer, Central routing, …)
- Different communication channels

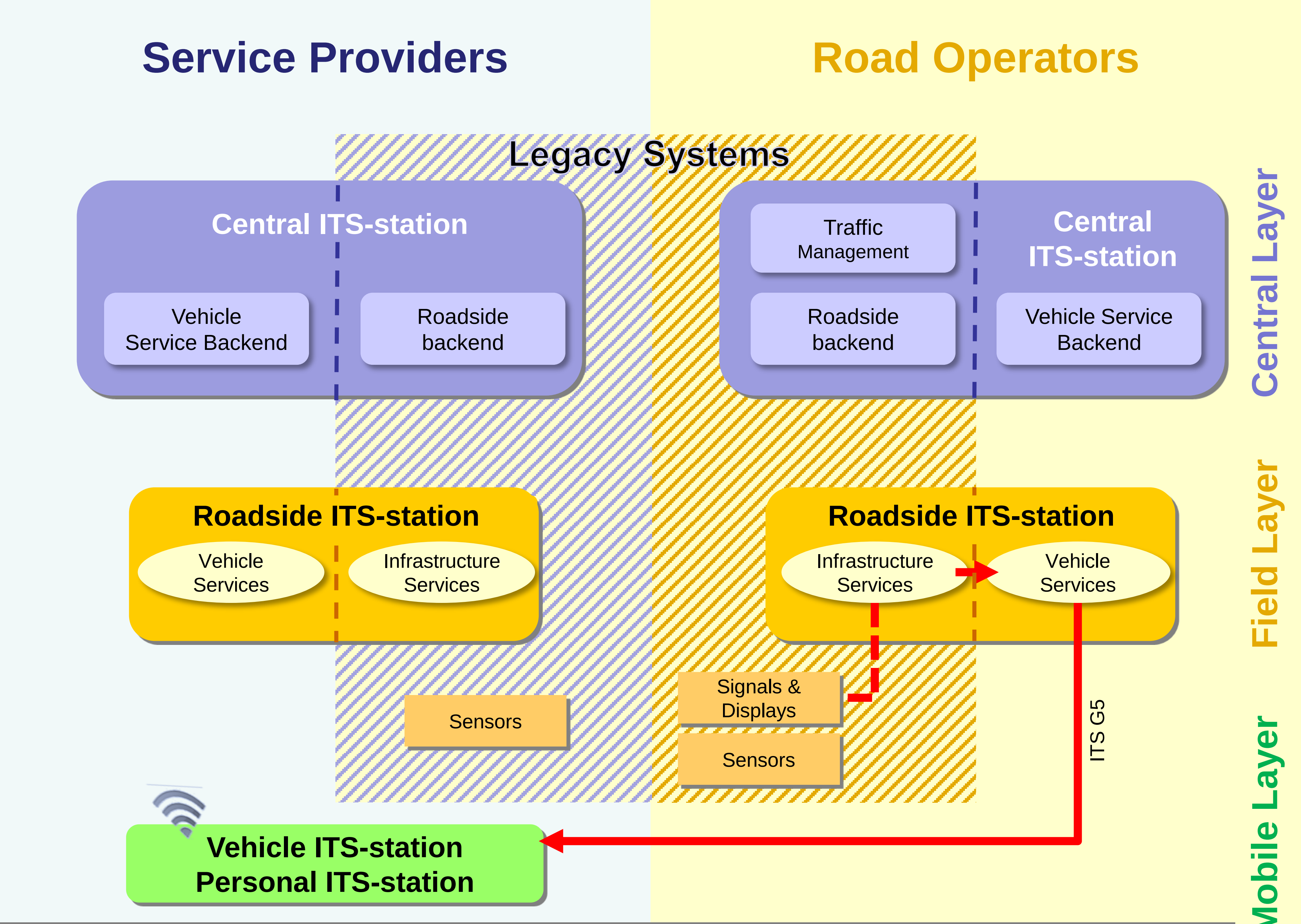
  (digital or local broadcast, peer to peer, …)
- Different Data Models

  (type and amount of data to transfer differs a lot)
- Different channel characteristics

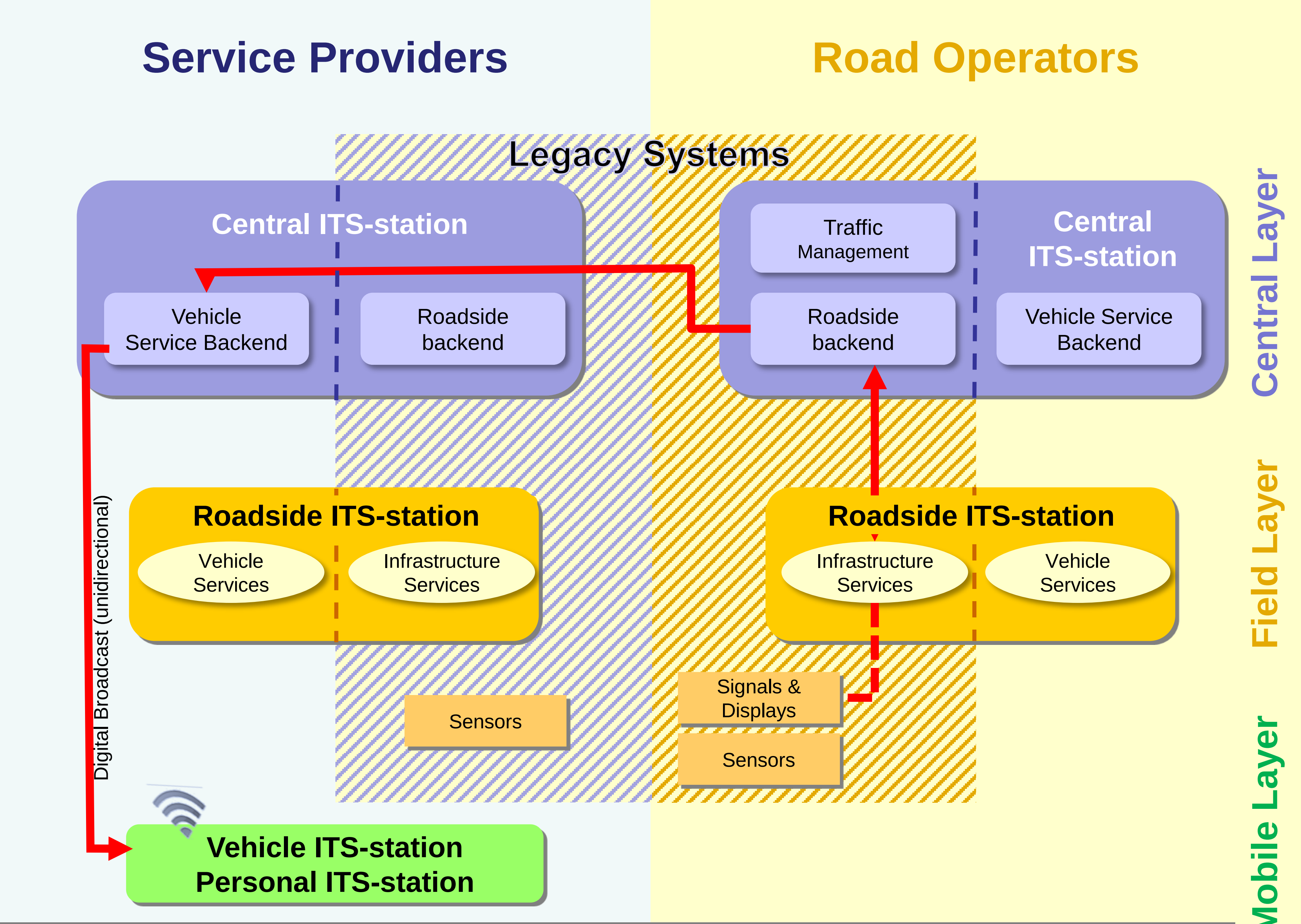
  (Latency, Bandwidth)
- Different applications

  (Real time prognosis, routing, eco-driving, …)

All of these Points influence each other!



Example communication via Field Layer



Example communication via Service Provider

Traffic Light Phase Asst.

- Roadside ITS station is raising questions
  - Where is it placed physically?
  - Multifunctional approach
    (like sim^{TD}, with framework and applications)
    sim^{TD}, CVIS paradigm: adding elements at runtime

  or "Plug-in" for Traffic light controller
    (intended by manufactures of traffic light controllers
    → more complex data handling inside the controller necessary)

Lots of unregulated activities

- And even more
  - Own radio module for every application?
  - Will OCIT-O need to transport FCD data? (in fact, this is planned)
  - New controlling methods/software necessary?!
    (also think of budget approaches regarding Public Transport)

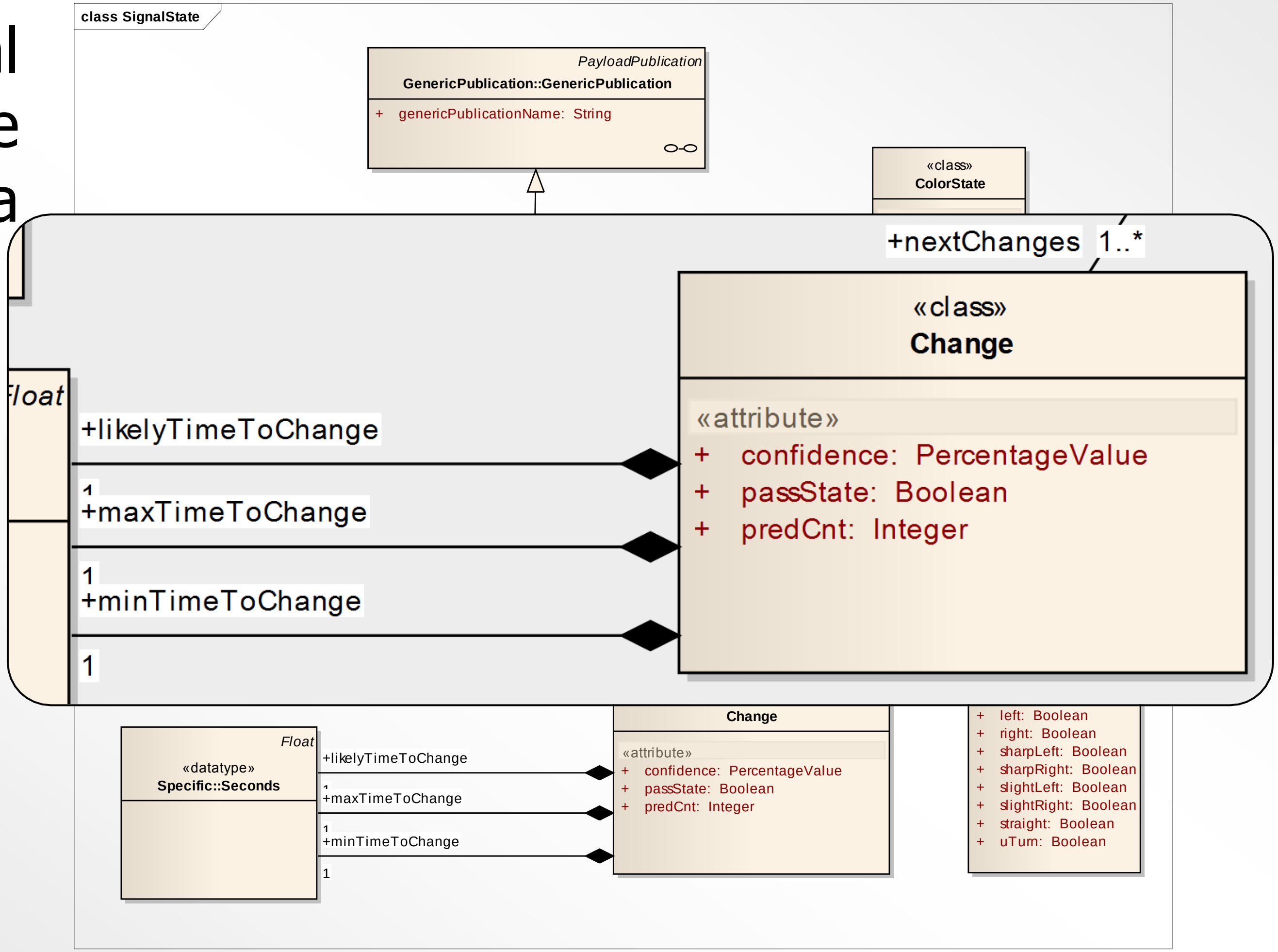
Questions are the same as for inter-urban systems!

Example Traffic Light Phase Assistant (cont.)

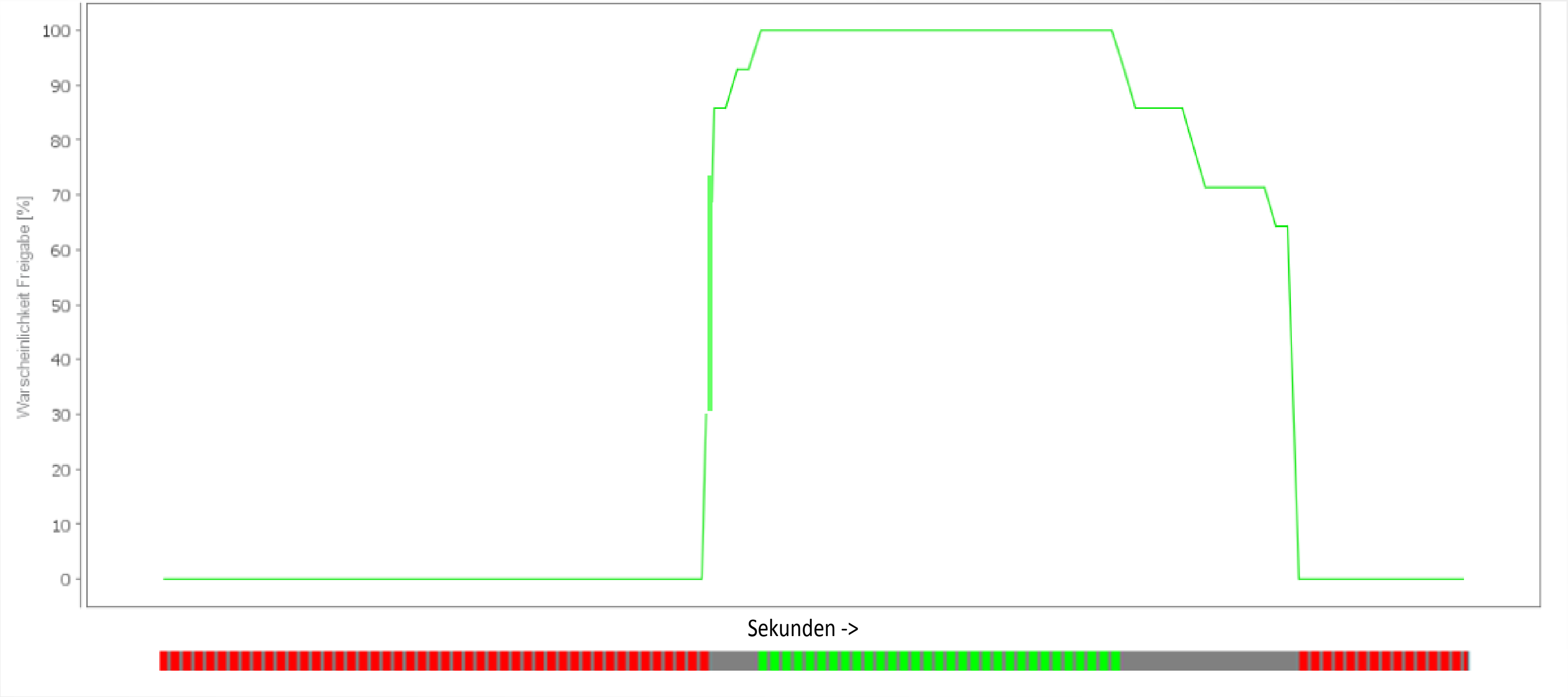
Communication part of an ITS Roadside Station (left side)

Example Traffic Light Phase Assistant (cont.)

Signal Phase Data



Another Possibility:
Coding by vector of probabilities for "Green":



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DATEX II – TPEG mapping

	DATEX 2 Payload - SituationPublication				
	Class Name	Attribute Name	Definition	Multiplicity	Data Type
on Management	PayloadPublication	publicationTime	Date/time at which the payload publication was created.	[1]	DateTime
ation	Header Information	urgency	This indicates the urgency with which a message recipient or Client should distribute the enclosed information. Urgency particularly relates to functions within RDS-TMC applications.	[0..1]	UrgencyEnum

TPEG TEC Message				
Class Name	Attribute Name	Definition	Multiplicity	Data Ty
MMCTemplate	messageGenerationTim	Date and time when the message was inserted into the delivery channel. Where message carousels and delivery channel codec delays may exist, Message generation time provides an important system diagnostic tool used for testing. End-user devices should ignore this value.	[0..1]	DateTime
	cancelFlag	This flag has to be set (cancelFlag = 1), if a message, identified by its messageID, is no longer valid and has to be deleted in the client device. The message body of messages with the cancelFlag set shall be empty.	[1]	Boolean
	messageExpiryTime	Mandatory timestamp. If the current time is past the messageExpiryTime, the message has to be considered "invalid". The transmission system has to ensure that the message, or a newer version thereof, is sent before the message expires. Expiry times are channel specific and might differ from transmission channel to transmission channel.	[1]	DateTi
MMCTemplate	priority	Messages with higher priority should be decoded/processed prior to other messages if resources in the client device are limited or overloaded. This is a relative indicator only; it is not directly related to the priority of the content. For example a new message might have a higher priority than another one with similar content that has been on air for some time.	[0..1]	typ

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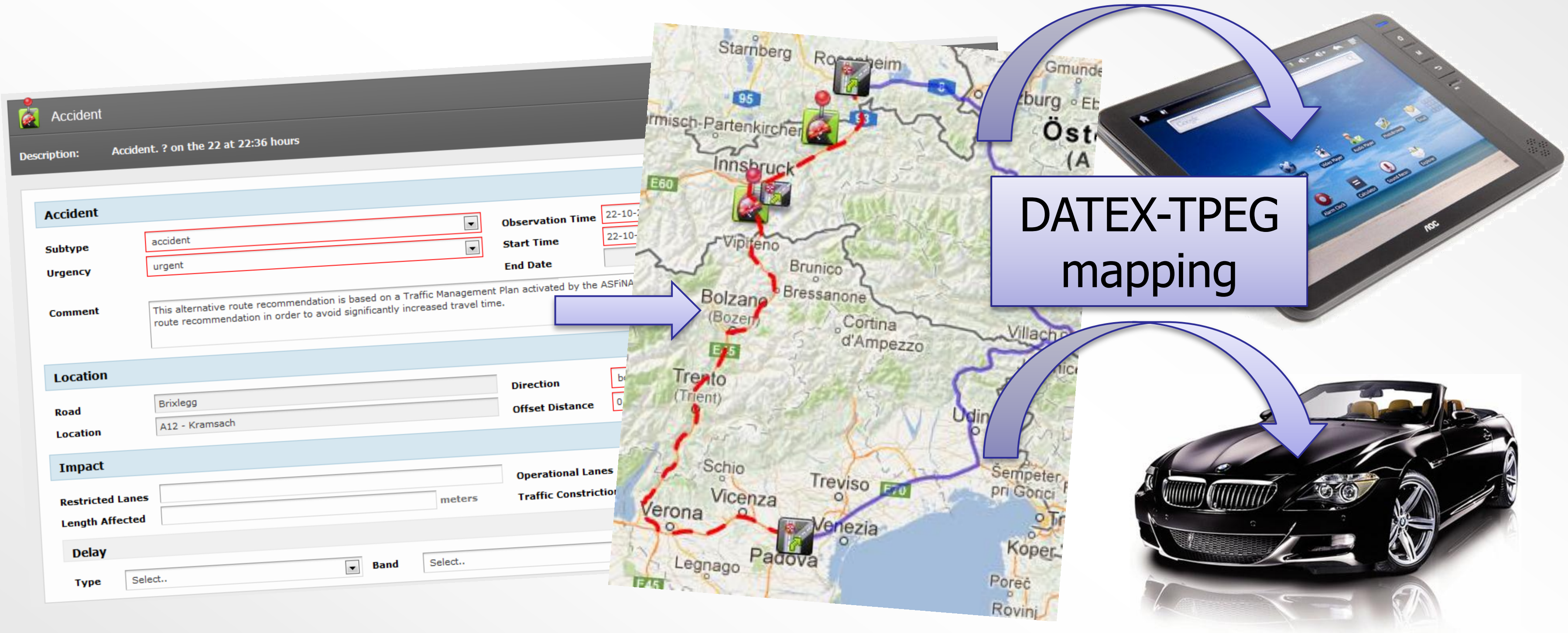
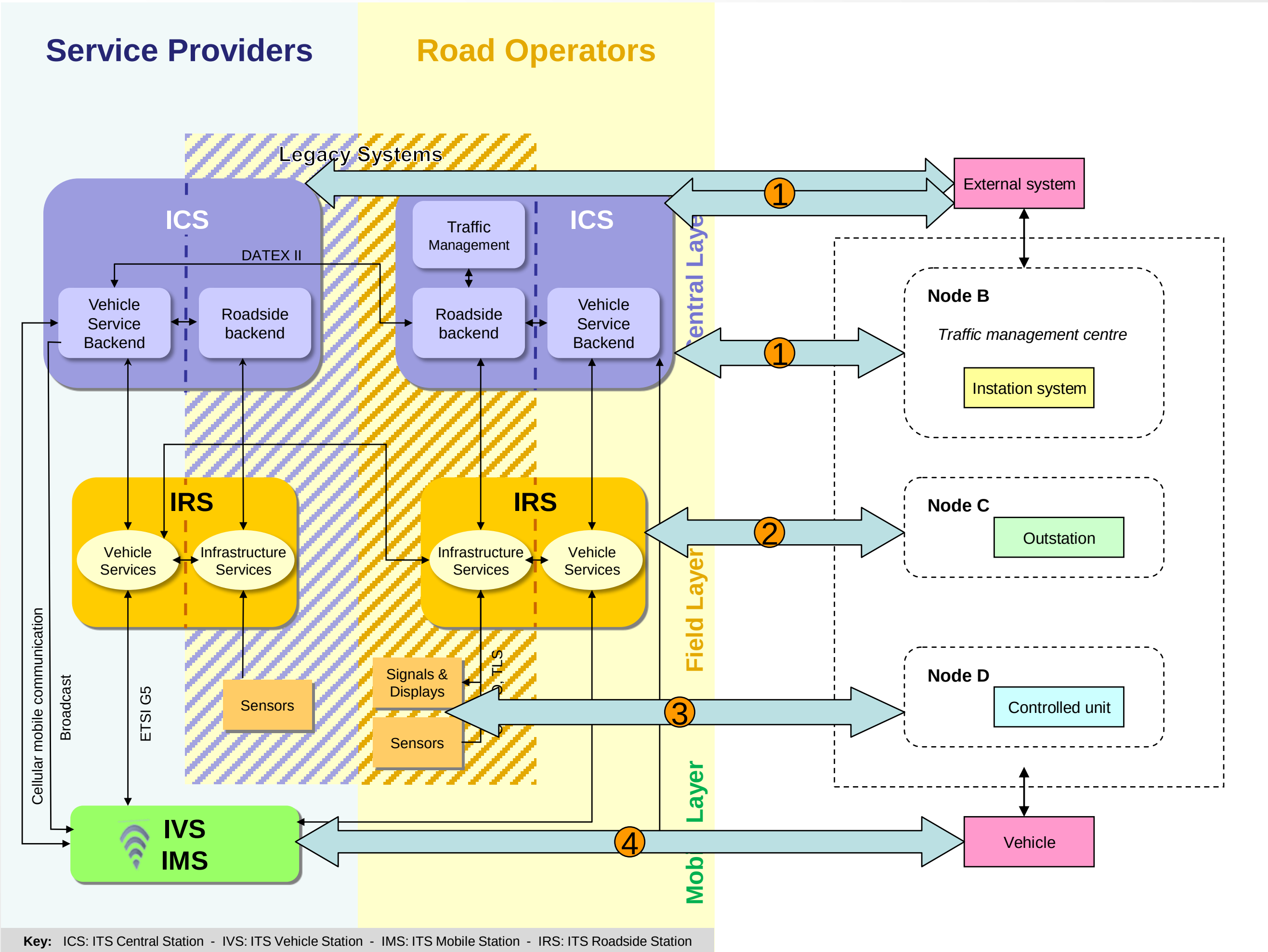
DATEX II – TPEG mapping

- DATEX II message of profile for Traffic Management Plan and Navigation Service was translated to TPEG



Example Mapping to UTMC



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In Summary

- Data today is still not always accessible in a satisfying way

⇨ Danger of reducing interest in new technologies

Project SEAMLESS is encouraging …

- further trans-national deployments
- future developments to adopt interoperable approaches

and giving recommendations for Road Operators on how to deal best with the new technologies:

- Where do standards not fit?
- Are there right and wrong Deployment-szenarios?

Furthermore:

- EU-wide know-how and orientations are incorporated into SEAMLESS by the Deployment Guidelines (in form of knowledge from more than 140 road operators)
- A prospective successor of European Commission mandate M/453 could be a place for SEAMLESS thoughts

Thank you for your attention

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On behalf of the SEAMLESS partners:
Mott MacDonald, UK
PTV, Germany
TrafficMaster, UK
AlbrechtConsult, Germany

SEVENTH FRAMEWORK PROGRAMME

SEAMLESS

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