Online Workshop on C-ITS Information Quality

December 14, 2020

Co-financed by the European Union
Connecting Europe Facility

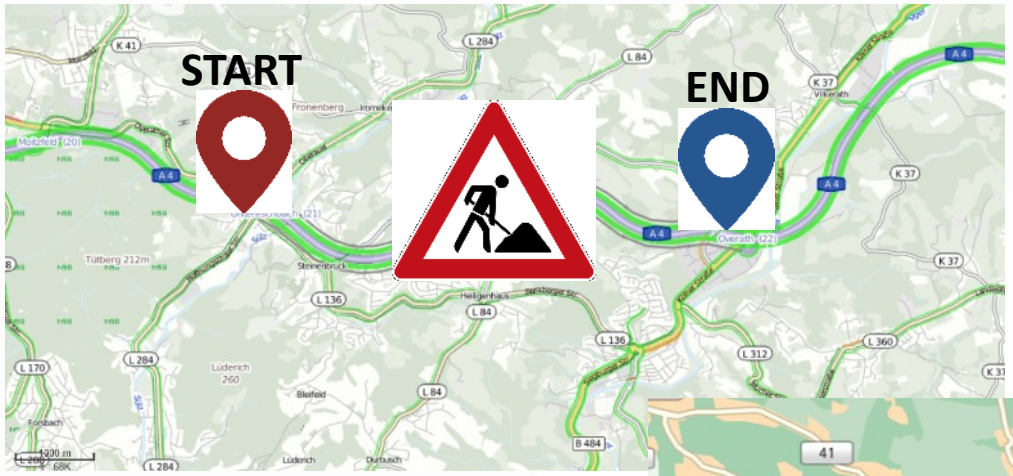
C-ITS Quality Workshop

- Session Topics
  - What is our **understanding on "Quality" in** the C-ITS Domain?
  - What is crucial in terms of **quality of C-ITS data and services**?
  - How to **describe and assess the quality** of the many data and service types in the field of C-ITS?
  - What could a **Quality Framework for the C-ITS domain** look like?
  - What could such a Quality Framework **be validated**?

C-ITS Quality Workshop

- Agenda
  - 10:00 Welcome and introduction
  - 10:20 Concept of the C-ITS Quality Package
  - 10:45 Mini Talk Show
  - 11:00 Open Session
  - 11:50 Wrap-up and closing

Why Quality?

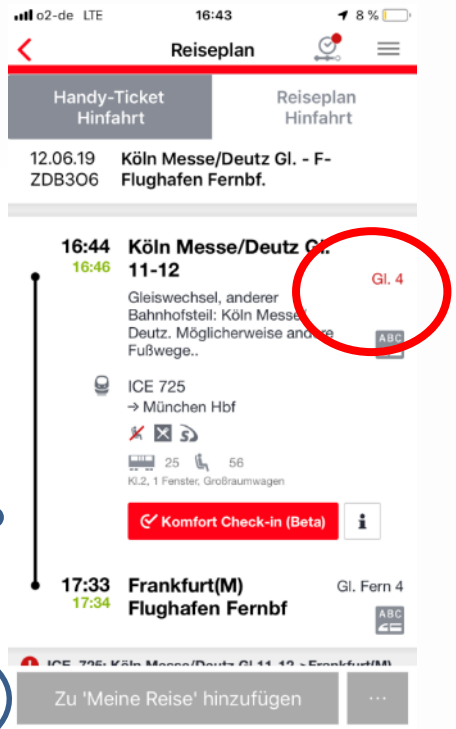


Map by road authority

Map by TomTom

Location accuracy?

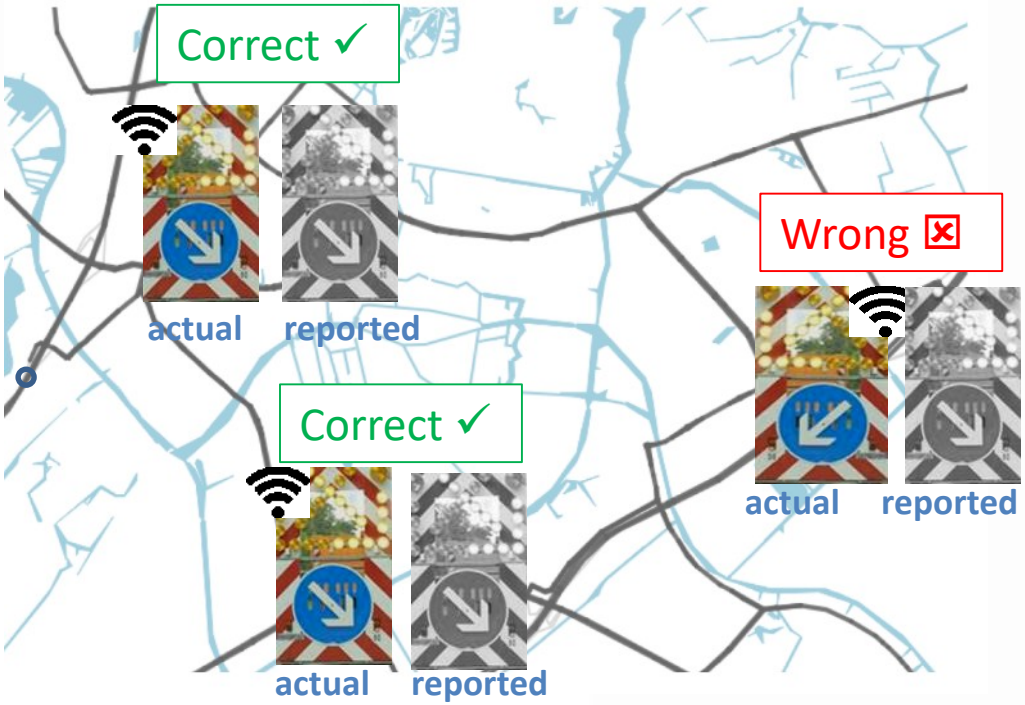
Why Quality?



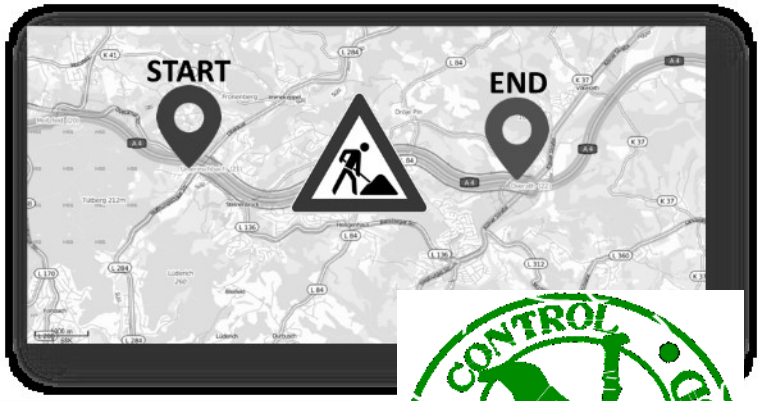
Information correctness?

Why Quality?

Information correctness?



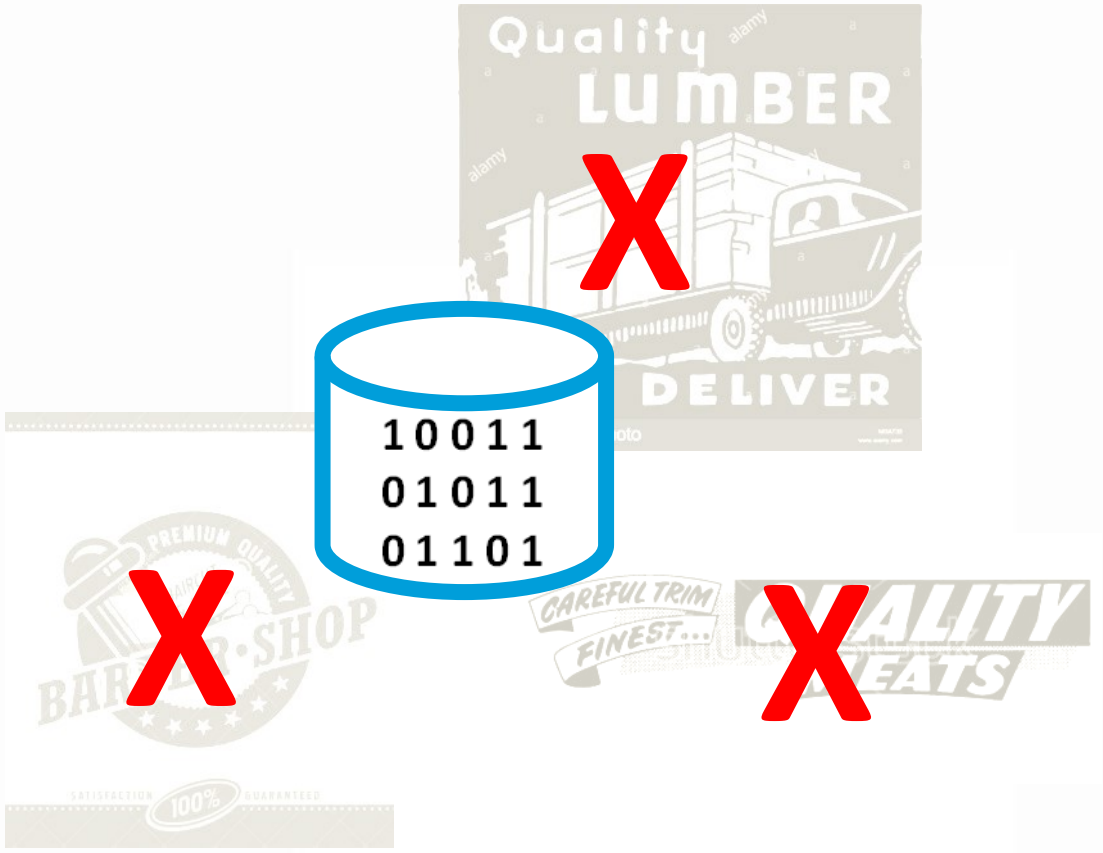
Why Quality?



- **Benefits**
  - Trust!
  - Transparency!
  - User Acceptance!
  - Facilitates Data Cooperation!

What is Quality?

What is Quality?



What is Quality?

- **Quality** =
- „degree to which a set of inherent characteristics of an object fulfils requirements“(ISO 9000)
- „fitness for use“ (J.M. Juran)

What to do with Quality?

- **Assess**
- **Document**
- **Report…**
  - … internally
  - … to external data consumers
  - … to European Commission
- **Implement QMS**

What is EU EIP?

- **Technical knowledge management center for ITS Deployment**

Key Mission of Quality Activity

Activity 4 - Harmonization Cluster

– Sub-activity 4.1: Determining Quality of European ITS Services

→ Works on:

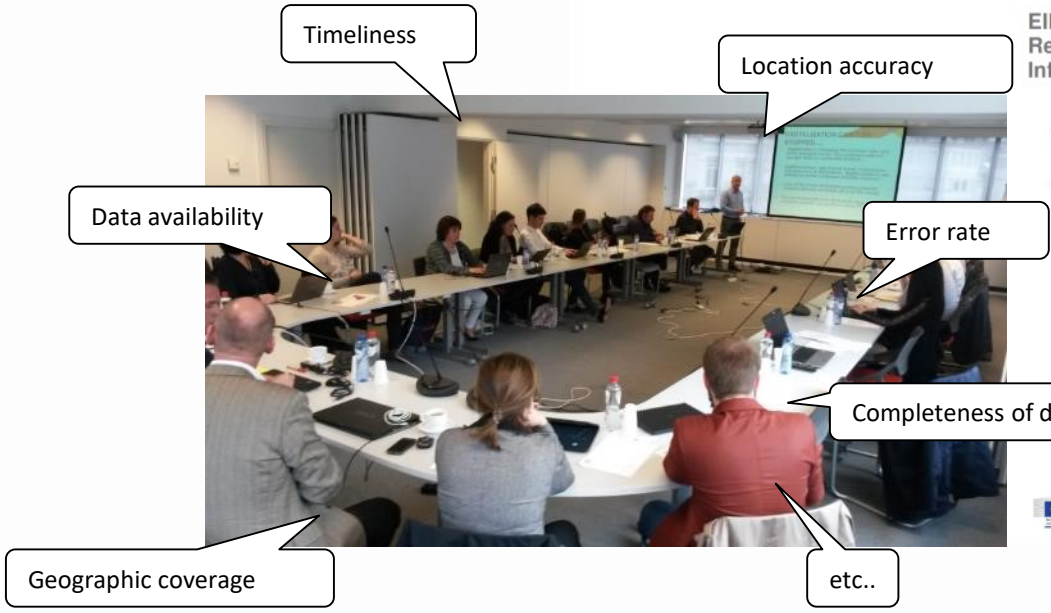
- … quality frameworks, recommendation papers and practical trials,
- … regarding data and service quality,
- …for all priority actions of the EU ITS Directive.

EU EIP Quality: Stage Plan

Priority Action	Domain EC (Del. Reg.)	Phase					
		Take stock →	Propose →	Test →	Validate →	Enhance →	Optimise
C)	SRTI (886/2013)	✓	✓	✓	✓	✓	✓
B)	RTTI (2015/962)	✓	✓	✓	✓	✓	✓
A)	MMTIS (2017/1926)	✓	✓	✓	✓	✓	
E)	Truck Parking (885/2013)	✓	✓	✓	✓		
	C-ITS (n/a)	✓	✓				

Activities & Products

- Quality Frameworks for Priority Actions of the EU ITS Directive



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The Quality Package Concept

- Contents

The Quality Package Concept

- Example

The Quality Package Concept

Available at EU EIP website:
www.its-platform.eu

C-ITS Quality: Principles

- Define an **agreed set of quality definitions and concepts**
  - quality criteria
  - quality requirements
  - assessment methods
- Regarding **data and information exchanged in C-ITS**
- **Valid for any C-ITS deployment** in Europe
- With a focus on **infrastructure-generated data**
- Start with base line (**minimum levels**) and refine from expertise in deployments!

C-ITS Quality – Baseline

- Starting point: previous EU EIP elaborations,, literature
- Expert pool & insights into C-ITS deployments : C-Roads, C-ITS Corridor, NordicWay, InterCor

C-ITS Quality – Scoping

- "Objects being evaluated"
  - System Quality (e.g. availability of an entire technical system)
  - Device Quality (e.g. reliability of devices within a system)
  - Functional Quality (e.g. efficiency of an expected function of the system)
  - Data Quality (e.g. accuracy of data used for a function)

EU EIP Quality Framework?

(✓)

(✓)

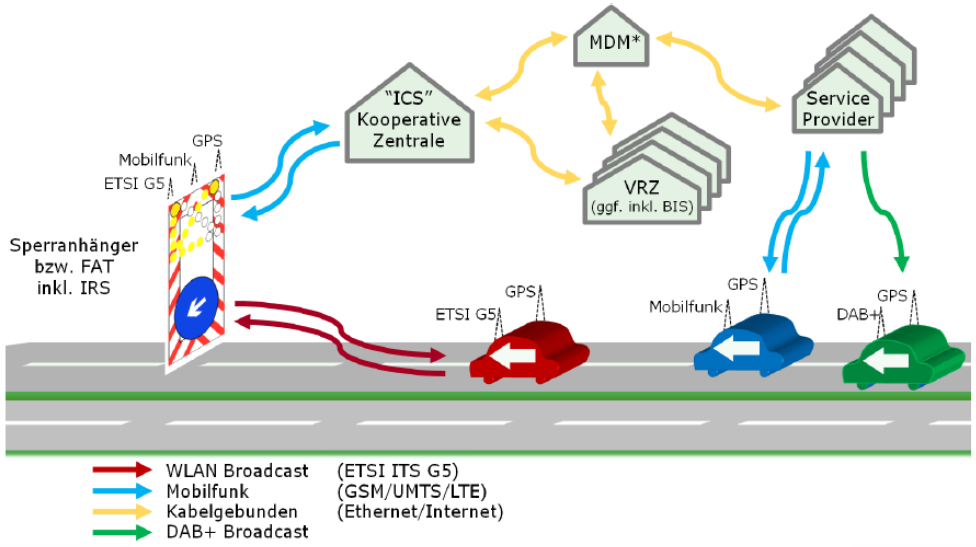
☒

✓

Based on: CEN/TC 278: „Intelligent transport systems—Traffic management systems—Status, fault and quality requirements"

C-ITS Quality Definitions- „Zoom-in approach“

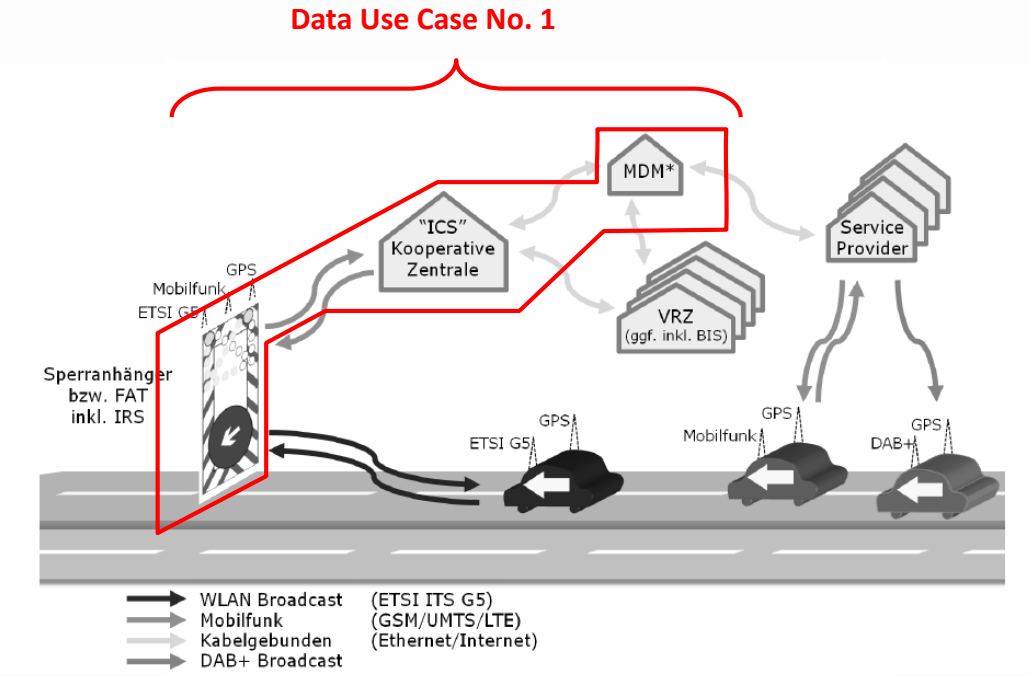
- What data are exchanged?
- Look at system architectures from deployments!



Based on: C-ITS-Corridor project DE

C-ITS Quality Definitions- „Zoom-in approach“

- Check individual **data use cases**
- Here: “warning trailer status data to NAP”



C-ITS Quality Definitions- „Zoom-in approach“

- Describe details of this data use case

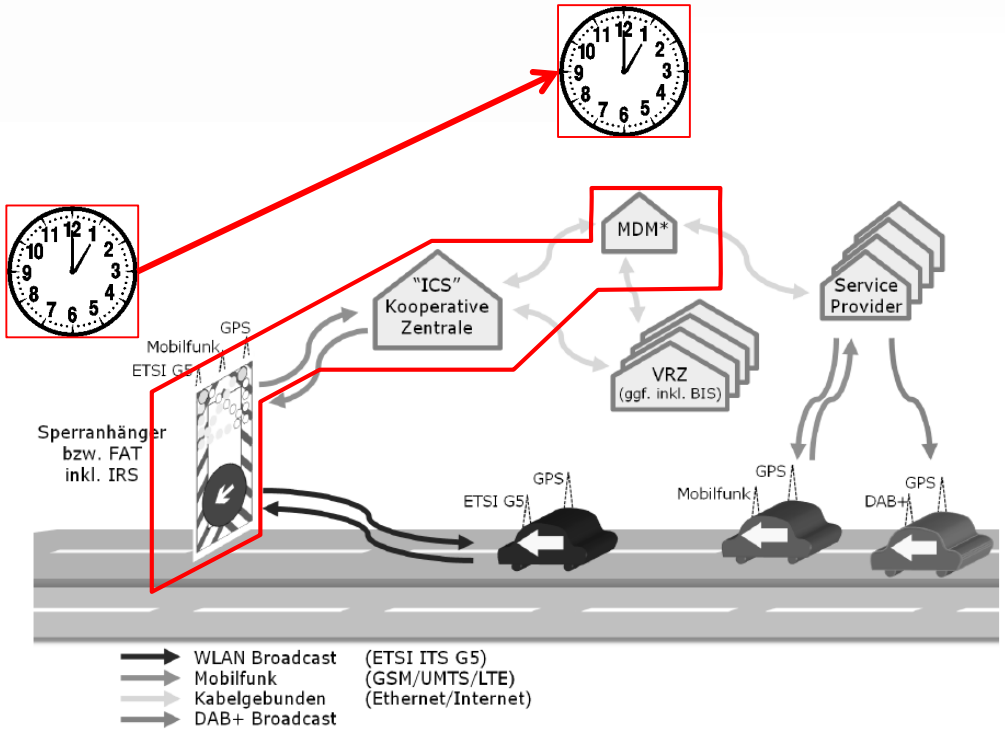
Data use case		C-ITS Service	Data Supplier	Data Receiver	Communi-cation Techno-logy	Data categories	Ref.	Elements of Value chain			
No.	Name							Content detection	Content processing	Service provision	Service
1	Warning trailer status data to NAP	RWW	Warning trailer	NAP via C-ITS-S and TMC	Cellular, cable, proprietary format	Position of warning trailer, status of warning trailer, …	1 2	x	x		

C-ITS Quality Definitions- „Zoom-in approach“

- Define **distinct Quality Criteria** for this data use case
  - Geographical Coverage
  - Availability
  - Latency
  - Refreshment Rate
  - Location accuracy
  - Error rate
  - Report Coverage

C-ITS Quality Definitions- „Zoom-in approach“

- Define **distinct Quality Criteria** for this data use case



„Latency“

“Total time for communicating messages between (a) actual status change of a warning trailer and (b) data input at a NAP.”

C-ITS Quality Definitions- „Generic approach“

- Find **universal definitions** for <u>any</u> data use case

„Latency“

Total time for communicating messages between (a) ~~actual status change of a warning trailer~~ <u>a timestamp at a C-ITS sender</u> and (b) ~~data input at a NAP~~ <u>a timestamp at a C-ITS receiver.</u>

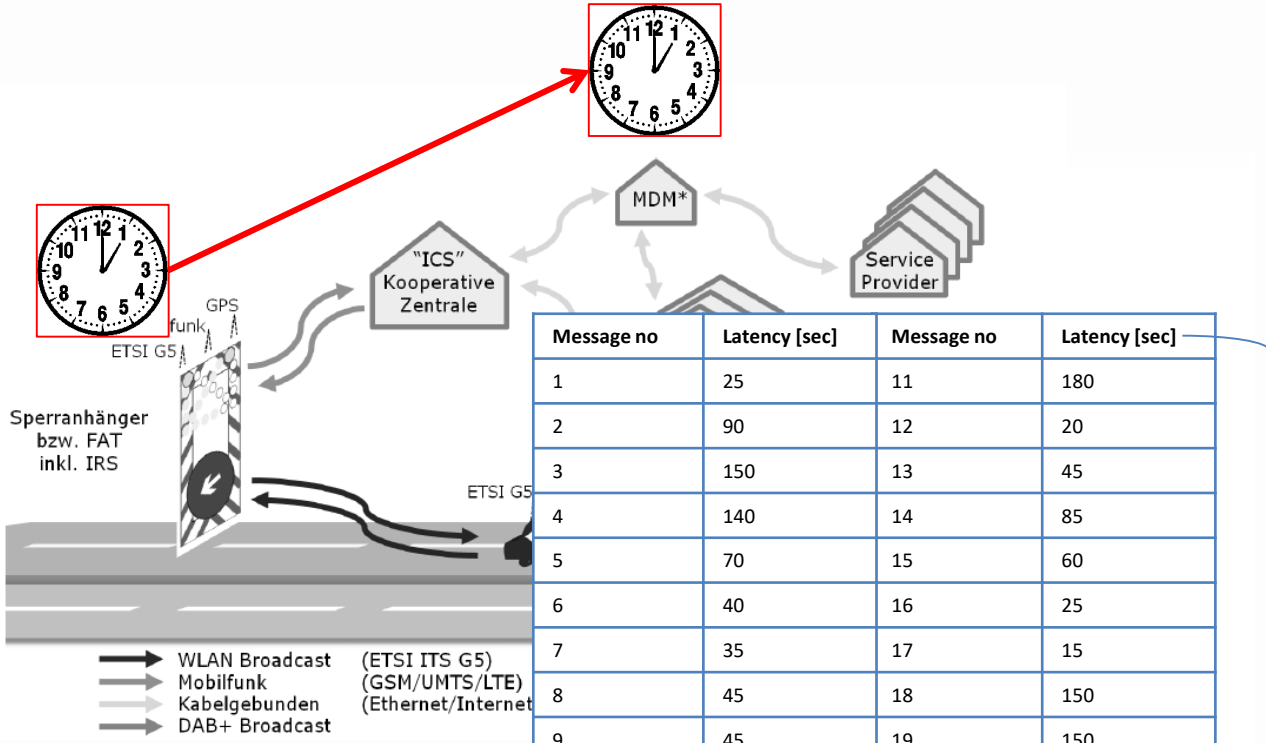
C-ITS Quality Definitions- „Generic approach“

- Definition table

Name	Definition
Geographical coverage	Percentage of the road network and/or selection of road classes, where a stationary, connected C-ITS stations operate.
Availability	Average availability for all operating connected data senders, including the communication chain up to the data receiver.
Latency	Total time for communicating messages between a timestamp at a C-ITS sender and a timestamp at a C-ITS receiver.
Refreshment Rate	Time interval for refreshing / updating the status reports coming from a data sender.
Location accuracy	Confidence for the horizontal position accuracy of an event information with respect to the actual location.
Error Rate	Percentage of messages with erroneous information, as reported by a data sender, with respect to the reality.
Report Coverage	Percentage of connected working C-ITS data senders out of all connected C-ITS data senders.

C-ITS Quality Usage Notes

- How to apply Quality Criteria in practice



Message no	Latency [sec]	Message no	Latency [sec]
1	25	11	180
2	90	12	20
3	150	13	45
4	140	14	85
5	70	15	60
6	40	16	25
7	35	17	15
8	45	18	150
9	45	19	150
10	60	20	20

95% of messages are <= 150 sec
5% of messages are = 180 sec

C-ITS Quality Requirements

- Specification of requirements to be met by individual C-ITS services

„Latency“		
★ (Basic)	★★ (Enhanced)	★★★ (Advanced)
95% of all messages <10 minutes	95% of all messages <7 minutes	95% of all messages <2 minutes

Quality aspects in C-ITS specifications

- ETSI Standard EN 302 637-3 (DENM)

B.23 informationQuality

Description	Quality level of the information provided by the ITS application of the originator ITS-S. It indicates the probability of the detected event being truly existent at the event position.
Data setting and presentation requirements	This DE shall be provided by the ITS application of the originator ITS-S. If the application is not able to determine the value, it shall provide the value set to 0. This DE shall be presented as specified in Annex A.

Quality aspects in C-ITS specifications

- Correlation ETSI specs ↔ EU EIP Criteria

Transmission Interval
(DENM data element)

Event Position / Position Confidence Ellipse
(DENM data frame)

Information Quality
(DENM data element)

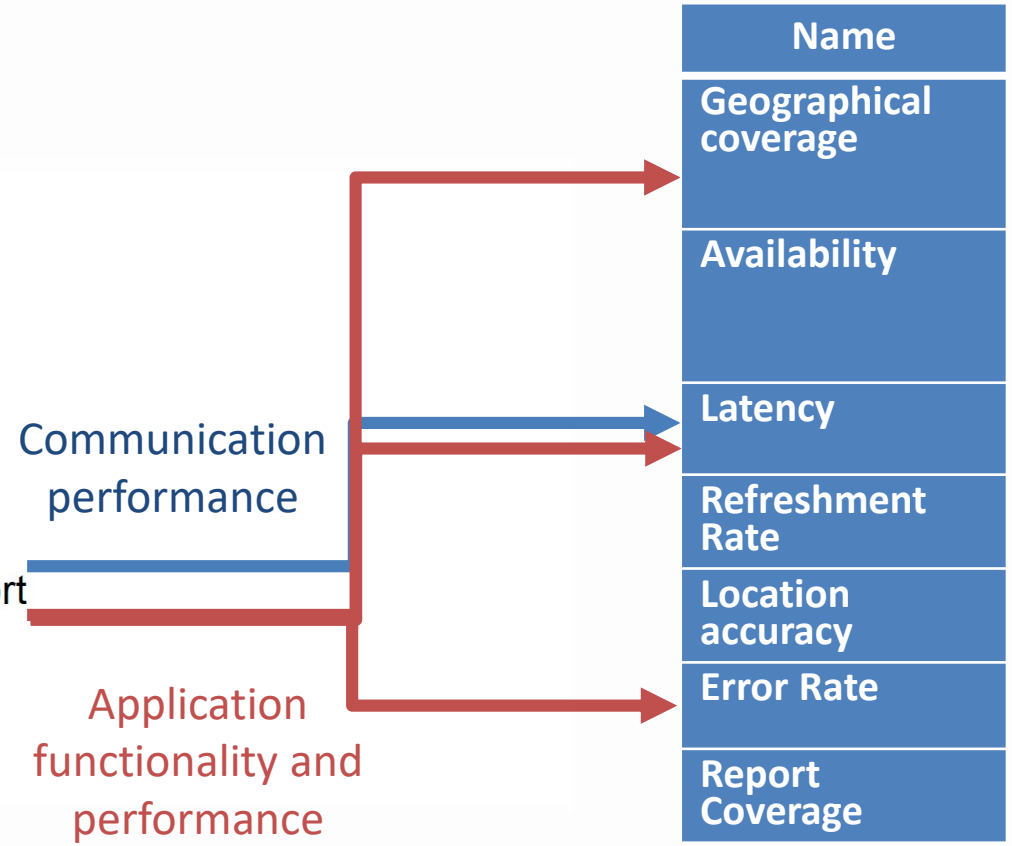
Name
Geographical coverage
Availability
Latency
Refreshment Rate
Location accuracy
Error Rate
Report Coverage

Quality aspects in C-ITS evaluations

- Correlation evaluation techniques ↔ EU EIP Criteria

InterCor

Milestone 13 - Pilot Evaluation Report



C-ITS Quality - First Draft of Quality Package

- Legal frameworks
- Analyses of existing work (EIP+, Automated Driving)
- Analyses of C-ITS projects (C-Roads etc.)
- Scoping of C-ITS Quality
- Proposals for
  - C-ITS Quality Criteria
  - C-ITS Quality Requirements
  - C-ITS Quality Assessment Methods
- First Conclusions

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Mini Talk Show

Question:
What quality aspects did you encounter in your C-ITS project?

Answer 1:
Stephanie Metzner, Hessen Mobil, DE

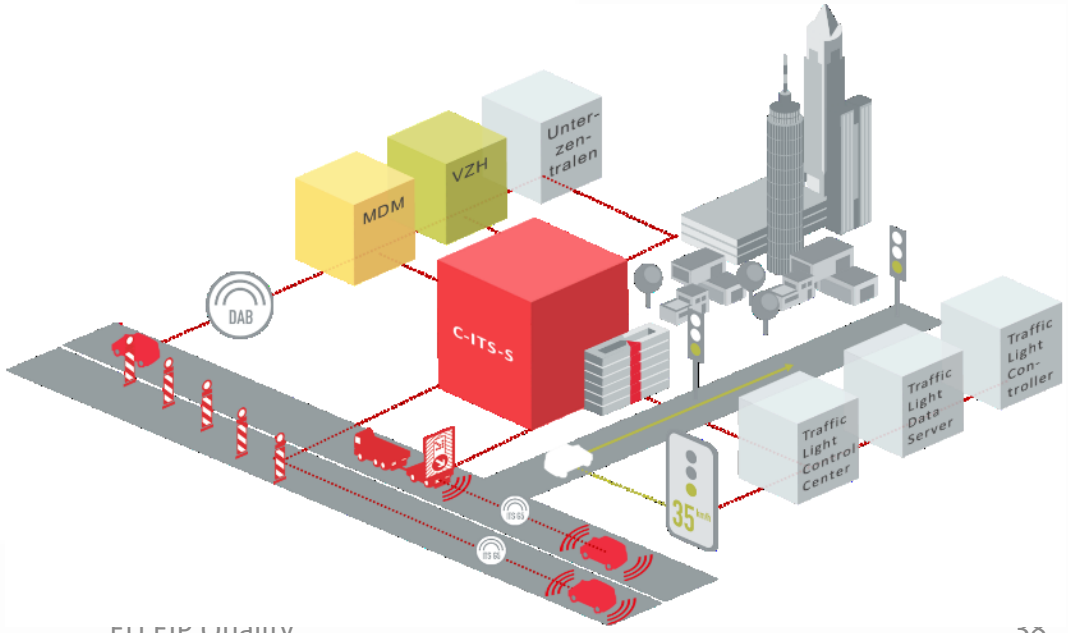
Answer 2:
Anna Schirokoff, Traficom, FI

Answer 3:
Jean-Philippe Mechin, Cerema, FR

Mini Talk Show

Focus: Road Works Warning

- informationQuality
  - ETSI standards (unavailable (0), lowest (1)…highest(7))
  - C-ROADS specification (certain (6), probable (4), risk of(2))
- latencies
- load tests



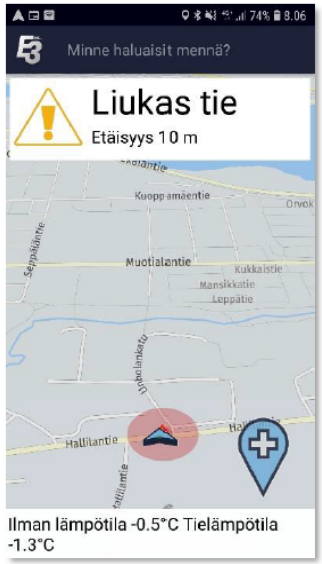
Mini Talk Show

- Anna's project: Nordic Way 2
- C-ITS Service, among others: Weather Warnings

Field tests in FI

Nordic WAY 2

- Limited end-to-end functional testing of selected C-ITS services for verifying:
  - Overall functionality of the service
  - Location accuracy KPI measurements
  - End-to-end latency KPI measurements (and comparison with the Server Latency from logs)
- Testing with two mobile apps ForeC (EEE Innovations), LouhiNW2 (Sitowise), and RoadAI (Vaisala map web UI)
  - Event reporting
  - Reception of the event data



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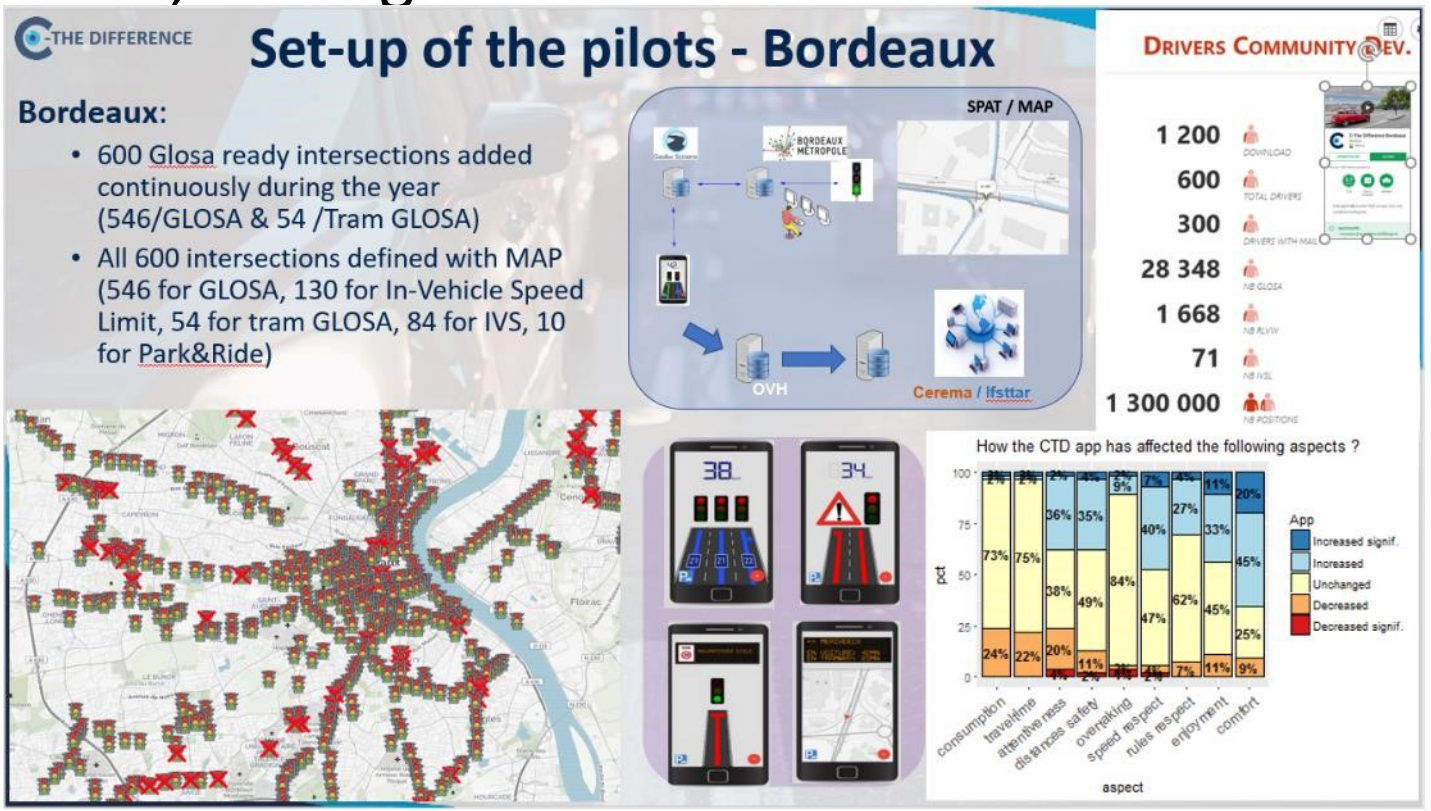
Mini Talk Show

- Jean-Philippe's project: C The Difference
- C-ITS Service, among others: GLOSA



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Open Session

- Discussion items
  - Are the **EU EIP quality definitions sufficient** for a common understanding on C-ITS quality? What (other) quality frameworks do you need?
  - How to embed the EU EIP Quality definitions into the **technology set-ups of C-ITS deployments**? E.g., communication technology?
  - Which part of the **communication value chain** should we focus on? Should we include the end user?
  - What is the **way forward** for the EU EIP Quality Package? How to validate the Quality Criteria?

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C-ITS Quality – Way forward

- C-ITS Quality Package ready for review

→ feedback welcome!

- Open invitation: Further workshops, interviews and reviews planned for 2021

→ stay in touch !

- Interested actors?

→ please respond, see contacts!

- Thank you!
- Questions?

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