

# EU EIP SA4.1 – Determining Quality of European ITS Services

Task 2: Propose European minimum quality requirements and quality assessment practices for MMTIS – Quality assessment methods

21 March 2018

# Objectives of the EU EIP task on quality of MMTIS



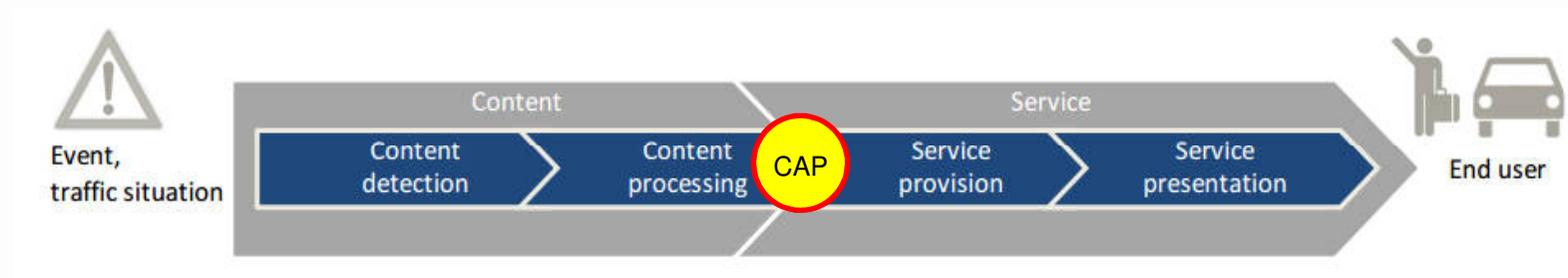
- Propose quality criteria, minimum quality requirements and quality assessment practices for multimodal travel information services as defined in EU Delegated Regulation 2017/1926
- All results will be presented in the “MMTIS quality package”

# Important terms used in relation to MMTIS



Term	Definition
Content Access Point (CAP)	A Content Access Point is a place (e.g. data portal) where information is available for users. The point can also be called a Single Point of Access (SPA).
National Access Point (NAP)	A National Access Point shall constitute a Single Point of Access (SPA) or CAP for users (national or international), or point to one or more CAPs/SPAs.
First detection	The first detection of an event is the first indication of the event at the traffic centre. The time of the first detection can be the same as the time of acceptance. If some validation or other considerations are needed before acceptance, first detection is before acceptance.
Acceptance	An event is considered accepted when it has been found trustworthy according to an organization's quality policy, so action will be taken to have the event report processed and published at the Content Access Point (CAP).
Validation	An event is considered validated, when it has been detected (manually or based on technical means) by a source different from the source originally detecting the event, as stipulated by an organisation's quality policy. Validation can start/end either before or after the acceptance.

# Where do we measure MMTIS quality?



# Which MMTIS are we talking about?



- In the EU Delegated Regulation on MMTIS, 23 modes/functions are specified, grouped in 3 levels of priority by timeframe of implementation and divided into 49 (sub)types of data/services
- To arrive at practical and usable results sooner, it was decided it would be more effective to first work through the whole process of quality definitions with a subset of services/types of data
- In an early EU EIP meeting a pre-selection of 25 (sub)types of data was made, based on expertise of the project partners. It was further reduced to 13 services based on the results of a survey organized among all EU EIP partners/countries

# Which MMTIS are we talking about?



- The survey

- average importance at least 4.0 (on a 1-5 scale)
- TLR's report for the European Commission (May 2016) describes that the expected functional content of MMTIS and supporting data requirements can be categorised into:
  - a) minimum expected functionality;
  - b) additional desirable functionality;
  - c) nice to have functionality.Relevant services must be categorized at least as 'additional desirable functionality' in TRL's report.
- decision: include datasets that received threshold values but that are seen as especially important from the viewpoint of the active project partners' role as road operators.

1. Please rate the importance of this service (at national level): \*  
*Mark only one oval.*

1 2 3 4 5

Not very important      Highly important

2. What is the status of this service at regional and national level in your country ? \*  
*Mark only one oval per row.*

	Operational	Implementation on-going	Implementation planned for the next 5 years	I do not know
Regional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
National	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. What criteria do you think could be used to measure the quality of this service ?  
*Check all that apply.*

- Geographic coverage
- Completeness of data
- Positioning accuracy
- Other

4. If you selected "Other" in the previous question, please name criteria you miss above:

\_\_\_\_\_

\_\_\_\_\_

# Which MMTIS are we talking about?



Type	Level of service	Enabled function	Service
Static travel data	1.1 Level of service 1	d) Trip plan computation – scheduled modes transport	I) Connection links where interchanges may be made, default transfer times between modes at interchanges
		d) Trip plan computation – scheduled modes transport	II) Network topology and routes /lines (topology)s
		d) Trip plan computation – scheduled modes transport	IV) Timetables
		d) Trip plan computation – scheduled modes transport	V) Planned interchanges between guaranteed scheduled services
		e) Trip plan computation – road transport	I) Road network
		e) Trip plan computation – road transport	II) Cycle network (segregated cycle lanes, on-road shared with vehicles, on-path shared with pedestrians)
Static travel data	1.1 Level of service 2	f) Location search	I) Park & Ride stops
		f) Location search	II) Bike sharing stations
		f) Location search	III) Car-sharing stations
		f) Location search	IV) Publicly accessible refuelling stations for petrol, diesel, CNG/LNG, hydrogen powered vehicles, charging stations for electric vehicles
Dynamic travel data	2.1 Level of service 1	a) Passing times, trip plans and auxiliary information	I) Disruptions (all modes)
	2.1 Level of service 1	a) Passing times, trip plans and auxiliary information	II) Real-time status information - delays, cancellations, guaranteed connections monitoring (all modes)
	2.3 Level of service 3	e) Trip plans	I) Future predicted road link travel times

# Quality criteria



<b>Level of Service</b>	<b>Geographical coverage</b>	Percentage of the transport system infrastructure covered by the (content provision) service.
	<b>Availability</b>	Percentage of the time that the (content provision) service is available.

# Quality criteria

Level of Quality	<b>Timeliness (start)</b>	The time between the occurrence of an event and the acceptance of the event.
	<b>Reporting period</b>	The time interval for refreshing / updating the status reports - <i>replacing "Timeliness (start)", as with status reporting there is no start.</i>
	<b>Timeliness (update)</b>	The time between the end or relevant change of condition and the acceptance of this change.
		The average age of data used in the most recent reporting period - <i>redefinition of "Timeliness (update)" for status reporting.</i>
	<b>Latency (content side)</b>	The time between the acceptance of the event and the moment the information is provided by the content access point.
		The time between the calculation of the reporting data and the moment the information is provided by the content access point - <i>redefinition of "Latency (content side)" for status reporting.</i>
	<b>Location accuracy</b>	The relative precision of the referenced location for the published entity or event with respect to what is considered as the corresponding true position of the actual entity or event. <i>(NB: several possibilities - for a point, stop, access node, road or area)</i>
	<b>Error rate</b>	Percentage of the values for a service which are different from the ground truth.
	<b>Event coverage</b>	Percentage of the actually occurring events which are known to be correctly detected and published by type, time and location (i.e. Detection Rate).
	<b>Report coverage</b>	The percentage of reporting locations for which a status report is received in any given reporting period - <i>replacing "event coverage" for status reporting.</i>
<b>Completeness of data</b>	Percentage of data elements available in the service provision with respect to the total data elements of that service or data type for which quality criteria have been defined. More precisely, for a given service or data type, are all the data elements foreseen in the Regulation provided?	

# Quality levels

**Table 6: Initial Target Values for Level of Quality (Criterion: Reporting period) |**

	Service	Interpretation	★ (Basic)	★★ (Enhanced)	★★★ (Advanced)	★★★★
MMTIS (Criterion: Reporting period)	Disruptions (all modes) Data entity: Type, Vehicle/line/connection, Effect, Duration, GIS attributes of closed locations, stops, segments, etc.	<i>Time interval for refreshing elements like effect or duration for all announced disruptions</i>	Best effort	5 min	1 min	100%
	Real-time status information - delays, cancellations, guaranteed connections monitoring (all modes) Data entity: Delay time, Cancelled lines, Cancelled stops, Real-time/actual vehicle positions	<i>Time interval for refreshing delay time for all status information within a network</i>	5 min - Best effort	1 min	<1 min	100%
	Future predicted road link travel times Data entity: Travel time	<i>Time interval for refreshing travel time value</i>	Best effort	5 min	1 min	100%

*Note: For Real-time status information, the Basic Level value of 5 min. is meant to reflect Public Transport related information services and 'Best Effort' may apply for other types of services.*

*Note: 'Occupancy' (e.g. for Park & Ride stops), although it may be considered real-time status information, is specified in the Delegated Regulation's Annex as a data entity for the separate service(s).*

# Quality assessment methods



- derived from the ‘Quality package for safety related and real-time traffic information services’ (version 1.06, 29-08-2017)
- applicable firstly to the services Disruptions, Real-time status information and Future predicted road link travel times with regard to the road network
- in MMTIS often not implemented or not fully mature
- methods presented are to be considered as a reference for possible, adapted assessment methods
- further validation and development efforts, with stakeholders in the field, are required

# Quality assessment methods



- **Method 1: Continuous monitoring of equipment performance and availability**

Automated or human user monitoring of detector networks to get timely alerts of the malfunctioning equipment.

**Criteria:** Availability, Error Rate, Event coverage, Report coverage and Completeness of data

- **Method 2: Manual verification of events or conditions**

- manual verification focuses on correctness of reported event occurrence or reported conditions. It is mainly used for verification of manually reported events or conditions

- relevant questions are: does an event occur (at the reported location)? Is the reported type and dimension of event or condition correct? Is the reported location of event or condition correct?

**Criteria:** Timeliness (focused on time for verification), Location accuracy, Disruptions, Real-time status information, Error rate and Completeness of data

# Quality assessment methods



- **Method 3: Reference testing of collected data**

- reference testing of data collected includes practices that are used to verify that traffic condition, travel time or event information produced by a certain method is correct
- the data or information under analysis is compared against a source known to be reliable (ground truth)
- the comparison is made for a limited period of time or limited amount of data in the context of an existing traffic information service

**Criteria:** Timeliness, Reporting period, Latency, Location accuracy, Error Rate, Event coverage, Report coverage, Completeness of data

- **Method 4: Time-space oriented reference test methods**

- this group consists of several methods, some well-established and widely used and some more experimental
- with these methods it is possible to compare the measured values in time and space – the data set under study – to the ground truth

**Criteria:** Timeliness, Location accuracy, Error rate and Event coverage

# Quality assessment methods



- **Method 5: Monitoring of data completeness and latency**
  - the objective of the automated monitoring of latency is to monitor the processing times of information in traffic information centre (TIC) or traffic management centre (TMC)
  - it may also be implemented for other purposes. Automated monitoring of latency is typically implemented with software that automatically registers the time stamps of incoming/ outgoing information related to a certain event within an organisation
  - this allows statistical analysis of the performance of the operator in the processing of the event and message provision

**Criteria:** Availability, Timeliness, Reporting period, Latency and Error rate

Example: Netherlands

# Quality assessment methods



- **Method 6: Monitoring of timeliness and data completeness**

- the objective of this method is the automated monitoring of timeliness and data completeness information in the Central Access Point (CAP)
- it may also be implemented for other purposes. Automated monitoring of timeliness is typically implemented with software that automatically registers the time stamps of incoming/outgoing information related to a certain event within an organisation
- this allows statistical analysis of the performance of the operator in the processing of the event and message provision

**Criteria:** Availability, Latency, Timelines, Reporting period, Error rate, Event coverage and Data completeness

Example: Netherlands

# Quality assessment methods



- **Method 7: Regular sampling of message or data content completeness and correctness**

- content samples of distributed traffic messages are checked once a month (manually) for correct message and data content; in a sample of around 20% of distributed messages of certain event types and around 20% of certain operator processes are collected and checked by a person who did not prepare the messages.
- specified parameters for the messages and reports are checked

**Criteria:** Error rate, Completeness of data

- **Method 8: Verification and calibration of traffic or weather conditions prognosis**

- these methods allow constant verification of the prognosis regarding traffic conditions/travel time or road weather. The prognosis is systematically compared to the measured condition at the time in question, and the algorithm is calibrated accordingly
- these methods may well be applicable also to e.g. public transport

**Criteria:** The method is applicable to service content but not data

- **Method 9: Surveys of perceived quality by users**

- the aim of a user survey is to measure how the end users experience/ perceive the travel information services
- data collection may be performed periodically (e.g. once a year). The degree of satisfaction, the degree of relevance, the user needs, and the perceived quality are covered by the questionnaire. Many other questions are also asked
- a web panel of a sufficient number active users can be asked to participate in a survey (e.g. 1,000 car users - each driving more than 8,000 km a year)
- the services which can be covered by the method are web sites, mobile applications, outbound phone surveying

**Criteria:** All, but users often cannot distinguish between the reasons or missing or wrong information.

Example: Denmark

# Quality assessment methods



- **Method 10: Collection of direct user feedback**

- collection of direct user feedback means using different channels established by the service provider to collect feedback from the users regarding the quality of the service in question
- in quality assessment, collection of direct user feedback is a relatively easy way to get information how the actual users of the service experience the service quality
- the feedback can be collected via web pages, smart phone apps or telephone (requiring more resources for registering), where the feedback can be classified by the user and directed to the responsible parties
- user feedback is a very important method considering consumer information services (end user services), but can also be applied to b2b-type of services such as Content Access Point

**Criteria:** Availability, Location accuracy, Reporting Accuracy and Error rate

# Quality assessment methods



- **Method 11: Monitoring of service use statistics**

- monitor the amount of service use to assess effect of service content and quality by using counters of internet page visits, smartphone application downloads and use etc.
- the method provides only indirect information of service quality, but is important as the main purpose of service quality is to provide benefit to the user of the service
- the users will only use a service if it provides such benefit, and thereby service use statistics are essential for the service providers

**Criteria:** all as they all affect the whole service quality reflected in willingness to use service – although it is very hard to establish link to availability, latency and timeliness



# Quality assessment methods



- Which quality criteria, standards, levels and kpi's does your organization live by?
- How do you measure them?
- How often do you report?
- To whom do you report?
- Are reports or results publicly accessible?
  
- Do you have any questions for us?