



Agreement on the co-operation and dialogue between C-Roads Platform and NAPCORE

Data quality topic

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1. Introduction

In the dynamic landscape of ITS and C-ITS, mobility-related data plays a central role in enabling effective and reliable digital services for travelers and road users, following the necessary processing steps. The NAPCORE initiative and the C-ROADS platform are pivotal in advancing this domain. The NAPCORE initiative represents a coordinated European effort to harmonize National Access Points (NAPs) across Europe. Its goal is to enhance the capacity of NAPs to facilitate access to, exchange, and re-use of standardized mobility-related data collected by European road authorities and transport service operators. In this context, NAPs serve as central nodes where mobility-related data is concentrated and published in the form of datasets. Meanwhile, the C-ROADS platform unites European Member States and road operators to harmonize the deployment of C-ITS services. By ensuring cross-border interoperability, it aims to improve road safety and efficiency, reinforcing the integration of innovative mobility solutions across Europe.

Recognizing that the delivery of reliable ITS and C-ITS services depends on multiple levels of data, information, technical, and service quality encompassing the majority of the ITS value chain, from content collection and processing to service provision and presentation, NAPCORE and C-ROADS have embarked on a collaborative effort to identify, among others, key intersections between NAPCORE's data quality frameworks and C-ROADS services and use cases. This common ground exists in addition to the structural distinction that ITS services are primarily business-to-business (i.e., between public authorities, operators, and service providers), whereas C-ITS services address both business-to-business and business-to-consumer contexts. Consequently, while the service dimensions are not directly comparable, the required data inputs share some common basis.

This collaboration aims to streamline critical dimensions and cooperation potential, including but not limited to data quality, which are essential for and may impact the delivery of effective end-user services. To support this broader objective, NAPCORE and C-ROADS formalized their collaboration with a cooperation agreement signed on May 23, 2023, during the European ITS Congress in Lisbon. This agreement emphasizes the importance of enhancing the cooperation between NAPs and C-ITS services, setting forth a framework to ensure that both platforms work together efficiently to support the growth and development of Europe's mobility data ecosystem.

2. Connection links

The collaboration between NAPCORE and C-ROADS is founded on the recognition that robust and standardized connection links are essential prerequisites for achieving seamless data exchange and interoperable services across Europe (on top of other existing requirements related to data processing). These connection links serve as the pathways through which data flows between NAPs and C-ITS services, ensuring that information reaches the right end-users reliably, timely, and efficiently. **Figure 1** illustrates the interconnected role of NAPCORE and C-ROADS within the ITS value chain: NAPCORE focuses on harmonizing the content of and access to diverse mobility-related datasets (such as on-street parking,



alternative fuels, MMTIS data, RTTI/SRTI, UVAR, data etc.), while C-ROADS specializes in the provision of interoperable C-ITS services across European motorways and in urban networks, such as real-time traffic alerts and road safety notifications.

Description of the various stages of the ITS value chain:

- Content detection and processing: Data is collected from various sources, such as traffic sensors, weather stations, and probe vehicles. NAPCORE's primary role in this stage is to support the detection and standardized provision of this data through the NAPs, ensuring that the information entering the service ecosystem is accurate, complete, and up-to-date. While some initial processing may occur (e.g., related to data formatting), more intensive data processing typically takes place externally, beyond the boundaries of a NAP, for example at the service provider side. The service domain can then utilize this data (itself or combined with other data sources) for real-time applications, such as hazard notifications and provision of information, and smart routing. This stage falls primarily with the scope of NAPCORE. However, the connection between NAPs and C-ITS services, at this stage, may further promote the accurate, complete, and timely identification of prevailing traffic/transport conditions and/or on-going events/situations on transport networks, as a means of providing end-user services with appropriate and valid content.
- Service provisioning: This stage focuses on transforming processed data into operational services for end-users, such as real-time traffic alerts, route recommendations, or safety messages. The actual generation of services is typically handled by service providers and lies largely outside the scope of the collaboration between NAPCORE and C-ROADS. While the quality and consistency of the underlying data remains an important enabler, this stage does not explicitly involve joint coordination efforts.
- Service presentation and delivery to end-users: This final stage concerns the delivery of information to end-users through various communication channels, such as mobile applications, in-vehicle systems, and roadside displays. It focuses on ensuring that the information is accessible, clearly presented, and relevant to the user's context. While this stage lies largely outside the direct scope of both NAPCORE and C-ROADS, it is supported by the preceding stages of data detection, processing, and provision. Although C-ROADS provides high-level recommendations on use cases, its core activities do not include service presentation. Additionally, in the context of C-ITS, end-users can also act as data sources – for instance, vehicles detecting events and generating messages (e.g., DENMs). This bi-directional flow highlights the collaborative nature of C-ITS but does not imply that C-ROADS is responsible for the final delivery of information to end-users..

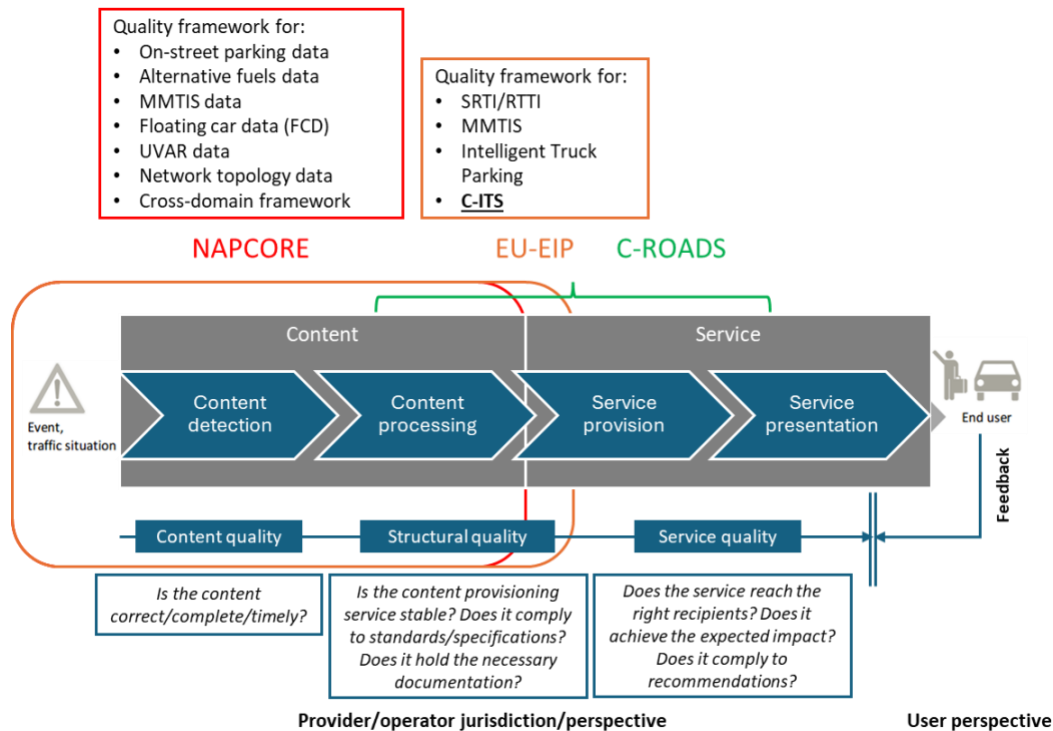


Figure 1: ITS value chain

As already outlined above, the ITS value chain implies several quality dimensions that help maintain a high standard of data management and usability across the entire ITS and C-ITS ecosystem. A preliminary understanding of these levels is provided below:

Content quality: Refers to the quality of the data itself from a content perspective. It ensures that the information collected and processed represents appropriately the real-world conditions. Key aspects of content quality include a) accuracy (data shall precisely reflect real-world conditions), b) completeness (data should cover all possible situations and measurable aspects as well as the required locations and parts of transport networks), c) timeliness (data shall be updated frequently to reflect the current conditions), etc.¹

Structural quality: Addresses the consistency, stability, and compliance of the data provisioning process. This dimension encompasses the technical continuity of the data provisioning service as well as its latency, compliance with commonly agreed standards, specifications, protocols, and security requirements². Structural quality is essential for enabling seamless communication across different machines, the ultimate goal of which is to serve the needs of end-users.

¹ In scope for both NAPCORE and C-ROADS.

² This aspect falls within the scope of both NAPCORE and C-ROADS, each in relation to their respective standards and specifications.

Service quality: Pertains mainly to the end-user experience, ensuring that the data reaches the intended recipients properly³.

3. Quality frameworks

The current section aims to provide an overview of the quality frameworks that are developed in the frame of NAPCORE. This activity responds to the need for harmonizing the approaches utilized by NAP operators and ITS data providers to monitor and report the quality of their provided (data

A Quality Framework (QF) is understood as a structured set of definitions and guidelines that outline quality expectations and assessment methods for ITS data and data services. It includes quality criteria – that are associated with specific indicators, metrics, or parameters – that help specify minimum requirements for each ITS data type⁴. Quality levels define the thresholds that must be met, while assessment methods provide different approaches for quantifying the above-mentioned indicators, metrics, and parameters.

NAPCORE initiative builds upon the groundwork laid by previous quality frameworks developed under the EU EIP project and extends these efforts by developing specific QFs. **Table 1** provides a quick overview of the QFs that **have been developed in the frame of NAPCORE**, including their functional scope and the legacy of QFs available by EU-EIP.

Table 1: List of quality frameworks

Quality framework	Related project	Data contents
On-street parking ⁵	NAPCORE	Location and type of on-street parking spaces; Parking demand (occupancy); Parking fees, restrictions, regulations.
Alternative fuels ⁶	NAPCORE	Location and availability of alternative fuel infrastructure (recharging points, refueling points, multitype gas stations); attributes of alternative fuel infrastructure; pricing; opening hours; status; contact information.
Multi-modal travel information services (MMTIS) ⁷	EU-EIP; NAPCORE (extension)	Static data (connection links where interchanges may be made, default transfer times between modes at interchanges; routes/lines topology; timetables; planned interchanges between guaranteed scheduled services; road network; cycle network (segregated cycle lanes, on-road shared with vehicles, on-path shared with pedestrians); park & ride stops; bike-sharing stations; car-sharing stations; publicly accessible refueling stations for petrol, diesel, CNG/LNG, hydrogen powered vehicles,

³ In C-ROADS pilots, some evaluation activities address service quality; however, these are highly dependent on the specific design choices of each pilot or project and are typically conducted only in the context of testing, rather than as a core component of the deployment.

⁴ Requirements may differentiate across different data use cases.

⁵ Also a C-ROADS use case.

⁶ An information element in the parking information use case of C-ROADS.

⁷ Non-related to C-ROADS.

Quality framework	Related project	Data contents
		charging stations for electric vehicles); Dynamic data (disruptions – all modes; real-time status information, incl. delays, cancellations, guaranteed connections monitoring – all modes; future predicted road link travel times).
Floating Car Data (FCD) ⁸	NAPCORE	Travel time and speed; vehicle/turn counts; trajectories.
Urban Vehicle Access Regulations (UVAR) ⁹	NAPCORE	UVAR types and attributes; UVAR classification (e.g., LEZ, PED, LTZ, CS, PARK); UVAR jurisdiction and status; issuing authority; type and location of imposed traffic regulations; hours of operation; affected/exempted parties; penalties; tariffs.
Network topology ¹⁰	NAPCORE	Road connectivity; relationships between road segments, nodes, and intersections; road segment directionality; intersection representation; turn restrictions; geometry and elevation; lane information; road hierarchy; classification.
Cross-domain ¹¹	NAPCORE	Formal (metadata) quality; substantive quality (essence of metadata, usability of the content provision service); distribution and reception quality (administrative & technical process of subscription, method, protocol, security, updates, message sizes).
SRTI/RTTI ¹²	EU-EIP	SRTI (Temporary slippery road, Animal/people/obstacles/debris on the road, Unprotected accident area, Short term roadworks, Reduced visibility, Wrong-way driver, Unmanaged blockage of a road, Exceptional weather conditions); RTTI (Event information, traffic condition information, travel time information, weather information); Data are assumed to stem from multiple sources (CCTV, crowd-sourcing services, accident reports, tolling systems, Bluetooth, FCD, road weather stations, 112 calls, automatic incident detection systems).
Intelligent Truck Parking ¹³	EU-EIP	Static data related to parking areas (identification information; location of entry point(s); main access roads and distance from access roads; parking capacity & price); Safety information and equipment in the parking area (description of security/safety/parking facilities; capacity for refrigerated vehicles; information on special

⁸ Relevant to PVD use case of C-ROADS.

⁹ Not currently in scope C-ROADS use cases, but on the radar for the upcoming period.

¹⁰ Not explicitly in scope of C-ROADS use cases.

¹¹ Not in scope of C-ROADS.

¹² Enhanced relation to C-ROADS use cases (i.e., relating to Day 1 C-ITS services)

¹³ Subset of Parking Information use of C-ROADS

Quality framework	Related project	Data contents
		equipment or services for certain cargo vehicles; contact details); Dynamic data on the availability of parking spaces, including where a car park is occupied or closed, or the number of available seats available.
C-ITS	EU-EIP	Focus on “Day 1” C-ITS services, particularly on Road Works Warning (RWW) and Weather Conditions Warning (WCW); remaining “Day 1” services considered (Emergency Brake Light, Emergency Vehicle Approaching – EVA, Slow or Stationary Vehicle(s), Traffic Jam Ahead Warning – TJW, In-Vehicle Signage – IVS, In-Vehicle Speed Limits, Probe Vehicle Data – PVD, Shockwave Damping – SWD, Signal Violation / Intersection Safety, Traffic Signal Priority request by designated vehicles – TSP, Green Light Optimal Speed Advisory – GLOSA).

The most common quality dimensions and criteria of the developed frameworks include:

- Correctness (e.g., accuracy-error rate)
- Completeness (e.g., spatial coverage, network coverage, missing data)
- Timeliness (e.g., average update frequency, latency)
- Reliability & usability (e.g., logical precision, granularity)

4. Relation with C-ROADS services and use cases

This section aims to investigate in further detail the connection between NAPCORE and C-ROADS platforms on the topic of data quality. This is based on the identification of which C-ROADS services/use cases are relevant with which QF developed in the frame of NAPCORE/EU-EIP. This relation can then fuel further discussions on lower-level aspects, such as additional quality criteria/requirements or even implications of data quality aspects on C-ITS service provision (and service quality thereof). **Table 2** presents the preliminary results of this analysis.

It is noted that i) Network Topology, ii) Cross-domain, and iii) C-ITS QFs are addressed as horizontal quality frameworks. This is based on the premise that: a) network topology constitutes the digital foundation for collecting information, geo-referencing information, and locating information recipients, b) the Cross-domain QF represents the level of “structural quality” mentioned in Section 2 and the need for “documentation soundness”, and c) the C-ITS QF provides criteria, metrics, requirements, and assessment procedures for a wide range of (mainly) Day-1 C-ITS services. For this reason, they appear frequently across all C-ROADS services and use cases that are related to NAP data and data services.

Table 2: Preliminary/potential mapping of QFs and C-ROADS services/use cases¹⁴.

Use case/service	Brief description	Related QFs
In-Vehicle Signage (IVS)		
Traffic Signs (IVS-TS)	The purpose of this use case is to inform drivers via in-vehicle information systems about all static and dynamic signs that are part of the Vienna Convention on Road Signs and are represented in the ISO 14823 graphic data dictionary for road traffic signs.	Network topology; Cross-domain; SRTI/RTTI ¹ ; C-ITS
¹ Various data categories of the RTTI DR (i.e., on traffic regulations and restrictions) encompass traffic signs.		
Free Text (IVS-FT)	The aim of this use case is to present in-vehicle information of type “Free Text” to the drivers. The information will either reproduce what is presented on a physical VMS (e.g., variable text panel) or present a completely new message that does not mirror a physical VMS (a virtual VMS).	On-street parking ² ; Alternative fuels ² ; Floating Car Data ² ; Network topology; Cross-domain; SRTI/RTTI ² ; C-ITS
² It is assumed that “free text” information presented in vehicle HMIs may encompass various elements and data categories of the DRs supplementing the ITS Directive. However, it is acknowledged that is quite challenging for road operators to check the quality of the conveyed content.		
Smart Routing (IVS-SR)	Optimizes traffic flows by providing dynamic travel time to key landmarks and traffic hubs (e.g. airport or train station) in response to traffic congestion levels caused by events such as jams, road closure and adverse weather conditions, etc. The information can be used to provide either simple travel time display on HMI or re-routing advice if an integrated navigation system is available.	MMTIS ³ ; Floating Car Data ³ ; UVAR ³ ; Network Topology; Cross-domain; SRTI/RTTI ³ ; C-ITS
³ It is assumed that smart routing advice makes use of several RTTI data categories (e.g., travel times) and shall respect any existing (urban) access restrictions. Moreover, smart routing advice may extend to additional transport modes. UVAR may be more strongly/explicitly related to IVS-TS; however, its inclusion here tries to cover the impacts of traffic regulations and restrictions on road user routing.		
Hazardous Locations Notification (HLN)		
Accident Zone (HLN-AZ)	The road operator detects that an accident has happened on the road network and sends the information to drivers who can benefit from this information.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Traffic Jam Ahead (HLN-TJA)	A road operator detects a traffic jam and sends the information to the drivers (mentioning the position and length of the traffic jam, as well as the affected section/lanes, if the information is available).	Floating Car Data ⁴ ; Network Topology; Cross-domain; SRTI/RTTI; C-ITS
⁴ A wide variety of (end of queue) collision prevention systems and services around the globe make use of FCD apart from data stemming from fixed-location devices (e.g., inductive loops).		
Stationary Vehicle (HLN-SV)	The Stationary Vehicle(s) service warns approaching drivers of stationary/broken-down vehicles ahead that present a hazard to other vehicles on the road. It is a preventive safety service, as drivers are informed in advance and have more time to prepare for danger. An interesting variation of this use case that contributes to the quality of the information is that the stationary/broken-down vehicle information is also processed by a nearby roadside unit and then, in order to further distribute the same warning via the roadside infrastructure, other RSU's connected through the road operator distribute the SV warning by resending it.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS

¹⁴ While the main purpose of this table is to assess the “connection” between C-ITS use cases and the QF developed in the context of NAPCORE and EU-EIP, it is acknowledged that the link between data contents and respective services (incl. feedback loops) may hold a greater potential in maximizing the synergies between NAPCORE and C-ROADS.

Use case/service	Brief description	Related QFs
Weather Condition Warning (HLN-WCW)	In the Weather Condition Warning (WCW) use case, drivers are informed about static and dynamic road weather conditions. As reported in the Study of the Deployment of C-ITS in Europe: Final Report, this service provides "(...) accurate and up-to-date local weather information. Drivers are informed about dangerous weather conditions ahead, especially where the danger is difficult to perceive visually, such as black ice or strong gusts of wind.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Temporarily Slippery Road (HLN-TSR)	A road operator knows that a section of a road (or a single lane or point) is temporarily slippery and sends this information to the drivers, and/or a vehicle detects that it is slipping and sends an alert message to other vehicles. The combination of these two information sources within a C-ITS system allows for much better information quality and accuracy compared to the two individual sources used so far.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Animal or Person on the Road (HLN-APR)	A road operator knows that one or several animal(s) is(are) present on the road network and sends the information to drivers. Or a driver detects one or several animals on the road and signals that information via his HMI, sending a message to other drivers. Both situations and warnings could also be combined.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Obstacle on the Road (HLN-OR)	A road operator knows that there is one or several obstacles on one or several lanes of the road network and sends this information to drivers. However, traffic can still pass the obstacles (not a blockage).	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Emergency or Rescue/Recovery Vehicle in Intervention (HLN-ERVI)	The intent of the emergency or rescue/recovery vehicle in intervention (ERVI) use case is to warn drivers about the location of the involved vehicle in intervention (e.g., a traffic accident, incident or rescue and recovery work) so the other drivers will be able to adjust their driving behavior accordingly and in time. The equipped emergency or rescue/recovery vehicle is sending a warning message when the vehicle is stationary with an activated light bar and being stationary for more than the defined time period.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Emergency or Prioritized Vehicle Approaching (HLN-EPVA)	The intention of this use case is to warn drivers about an approaching emergency or prioritized vehicle in order to facilitate free passage of such emergency or prioritized vehicle, when they are on a mission. There is a wide range of vehicles with a special role that participate in traffic and that need other drivers to give way or to facilitate their passage, when they are on a mission. In this use case, two categories of right-of-way are considered: • Certain vehicles have the absolute right of way in many countries (e.g. ambulance, police, fire brigade), if they activate their emergency signals – usually a light bar, often used together with a siren. • In some countries, certain vehicles (e.g., road operator vehicles) can have a kind of priority that does not give them the absolute right of way, but other drivers must facilitate their passage or give way to the extent necessary that they can fulfil their mission.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Railway Level Crossing (HLN-RLX)	The railway infrastructure manager or a service provider informs the drivers about the presence of a railway level crossing and its type/parameters/status. This use case covers both protected level crossings along with unprotected ones. The messaging to the drivers and the information provided is addressed, too.	Network Topology; Cross-domain; MMTIS ⁵ ; C-ITS
Unsecured Blockage of a Road (HLN-UBR)	An operator in the TCC gets the information that there is an unsecured blockage of a road. Till the time that operating agents arrive to the site to protect and manage it, the operator sends a warning message to the drivers. A blockage means that there is no traffic going through the road segment. The complete road is blocked (not an obstacle on one or more lanes).	Network Topology; Cross-domain; SRTI/RTTI; C-ITS

Use case/service	Brief description	Related QFs
Alert Wrong Way Driving (HLN-AWWD)	This use case is intended to warn a driver that he could encounter a vehicle that is driving in the wrong way. It is not the primary aim of this use case to alert the wrong way driver that he is on the wrong way. This V2V use case could be added in the future to the warning sequence if detection quality and confirmed status of information is improved.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Public Transport Vehicle Crossing (HLN-PTVC)	The use case applies mainly in cities, as there are many places where tram tracks cross a road with other vehicles and these places are not equipped with traffic lights. Mainly during turning maneuvers, drivers don't expect to cross tram tracks, which often can lead to accidents with trams.	Floating Car Data; Network Topology; Cross-domain; MMTIS ⁵ ; C-ITS
Public Transport Vehicle at a Stop (HLN-PTVS)	The intention of this use case is to provide in-vehicle information and warnings about public transport vehicles at a stop.	Floating Car Data; Network Topology; Cross-domain; MMTIS ⁶ ; C-ITS
⁵ While railway-level and public transport vehicle crossings do not necessarily fall within the scope of MMTIS, other data types (e.g., location of access nodes) may facilitate their identification.		
⁶ While MMTIS does not encompass the provision of information about public transport vehicles at a stop, other data types (e.g., location of access nodes) may facilitate the formulation of the awareness zones of C-ITS services.		
Road Works Warning (RWW)		
Lane Closure and other restrictions (RWW-LC)	The Road Works Warning – Lane Closure use case informs the drivers about the closure of part of a lane, the whole lane, or several lanes (including the hard shoulder) due to a static road works site. In this use case, alternate mode and road closure are excluded. This use case describes the simplest kind of roadworks, where just one lane is closed. It can be triggered several times as several lanes are closed consecutively.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Road Closure (RWW-RC)	The Road Works Warning – Road Closure use case informs the drivers about temporary road closures due to static road works. This use case describes a simple form of road closure, where lanes are closed one by one until all lanes are closed.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Road Works Mobile (RWW-RM)	The drivers receive information about a zone on the road that contains, at some point, the closure of part of a lane or the full lane (but without road closure) due to a planned mobile work site.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Winter Maintenance (RWW-WM)	The winter maintenance vehicle, equipped with necessary technology for a road operator vehicle-to-vehicle (Vro2V) communication, sends a message signaling their activity (salting and/or snow/ice removal). The alerted drivers can adapt their driving behavior accordingly.	Network Topology; Cross-domain; SRTI/RTTI; C-ITS
Signalized Intersections (SI)		
Signal Phase and Timing Information (SI-SPTI)	In this use case, drivers approaching and passing signalized intersections are provided with information about the current signal phase as well as upcoming phase(s) and the moment these are expected to start and end.	Network Topology; C-ITS ⁷
Green Light Optimal Speed Advisory (SI-GLOSA)	In this use case, drivers will be provided with speed advice information for a safe and efficient approach and crossing of signalized intersections.	Network Topology; C-ITS ⁷
Imminent Signal Violation Warning (SI-ISVW)	In this use case, drivers approaching signalized intersections will be provided with imminent signal violation warnings.	Network Topology; C-ITS ⁷
Traffic Light Prioritization (SI-TLP)	In this use case, designated vehicles (e.g., public transport, heavy goods vehicles, etc.) are given priority over individual vehicles at signalized intersections to ensure on-time transportation schedules (e.g. bus, tram) and/or minimize emissions.	Network Topology; C-ITS ⁷

Use case/service	Brief description	Related QFs
Emergency Vehicle Priority (SI-EVP)	This use case will actively contribute to the phase control of a signalized intersection to aid the passage of an emergency vehicle (EV). It will also provide the prioritization status to other users approaching and passing signalized intersections.	Network Topology; C-ITS ⁷
Toll Station Crossing (SI-TSC)	After an automated driving system aims for a specific lane at a toll station with traffic lights, the road operator sends information about the topology of the road and the status of the traffic light and the barrier.	Network Topology; C-ITS ⁷
⁷ Since data related to traffic signaling and signalized intersections are not within the scope of NAPs and the ITS Directive, the cross-domain QF is omitted.		
Automated Vehicle Guidance (AVG)		
SAE Level Guidance (AVG-SAELG)	The purpose of this use case is to provide guidance and information on the SAE levels of automation that road operators consider unsuitable for partly automated vehicles on certain road or lane segments on their network, at a given point in time, considering overall road conditions and the current traffic situation. The use case as a whole is strictly guidance and never to be understood as regulation or instruction. Any guidance provided is not a road operator's guarantee for safe operation of certain modes of automation nor is it a definitive statement that certain modes of automation are possible or impossible, allowed or not allowed. It aims to be an additional piece of information for the vehicle's decision-making process while engaging in modes of automation, transporting the road operator's view into the vehicle. This can result in an increase/decrease of functionalities required from the automated vehicle and a corresponding increase/decrease in what is required from the driver, based on the overall traffic situation, the sensory input from the vehicle itself and the message received by the infrastructure.	Network Topology; C-ITS
Platoon Support Information (AVG-PSI)	The purpose of the use case is to provide road operator-based guidance and information on the unsuitability of "platooning" on specific road or lane segments on the road network, considering different vehicle classes, overall road conditions and the current traffic situation. A platoon is a group of vehicles sharing the same destination, travelling closely together at a common speed.	Network Topology; C-ITS
Topology Information (TI)		
Toll Station Approaching (TI-TSA)	As a vehicle is approaching a toll station, a specific message is sent by the road operator, helping to orient the driver/vehicle towards the appropriate toll collection lane(s). Multiple information elements are provided within this message, amongst others the availability and authorized means of payment for each lane.	Network Topology; Cross-domain; SRTI/RTTI ⁸ ; C-ITS
⁸ Location of toll stations and tolled roads fall within the scope of RTTI.		
Collective Perception (CP)		
Collective Perception on Motorways (CP-MW)	Collective Perception on Motorways delivers perception data from infrastructure sensors to vehicles on the motorway. Infrastructure sensors can be mounted at elevated positions, such as overhead gantries or posts, providing an extension of the electronic horizon of a vehicle. This is beneficial especially at tunnel entries and in merging situations, where additional awareness can contribute to safe driving and collision avoidance. In linear, open range motorway sections, CP is generally not required.	Network Topology; C-ITS
Collective Perception on Urban/Interurban Intersections (CP-UI)	Collective Perception on urban/interurban intersections delivers object perception data from infrastructure sensors to vehicles on intersections. Infrastructure sensors can detect vulnerable road users, but also obstacles on the road. This is beneficial	Network Topology; C-ITS

Use case/service	Brief description	Related QFs
	especially in situations where vehicles are turning at intersections and crossing the paths of pedestrians and cyclists.	
Probe Vehicle Data (PVD)		
Vehicle Data Collection (PVD-VDC)	Vehicle data is automatically sent out by the in-vehicle system (i.e., vehicle C-ITS station). The road operator collects and processes the vehicle data sent out by vehicle C-ITS stations to improve traffic management and safety operations on the corresponding public road network.	Floating Car Data; Network Topology; C-ITS
Event Data Collection (PVD-EDC)	The drivers may provide consent to share event data from the vehicle. The in-vehicle system (i.e., V-ITS-S) sends out event data that was detected by the vehicle itself or manually by the drivers. Drivers may also report event data via their personal devices (e.g., smartphones). The road operator (or the service provider) collects and processes the event data sent out by the in-vehicle systems or reported by the drivers to improve traffic management and safety operations on the public road network.	Network Topology; C-ITS
Functional Description of Points of Interest (POI)		
Parking Availability Information (POI-PA)	The use case aims to provide to drivers of all vehicles (real-time) information related to parking places (location, availability, services, rates, etc) as well as potential specific information on parking spaces. This could be about parking lots on the highway as well in urban areas. In this use case there is a distinction between information on the aggregated area/facility level versus specific parking spot information by scenario. For further clarity in this use case description the following definitions are used: • Parking place (a.k.a. parking lot, parking facility) = a place or location used for parking, loading, unloading, standing, or some other mobility or transport related activity. Place typically identifies a parking structure, surface lot or on street parking zone. • Parking space (a.k.a. parking spot) = a single space for parking, usually designed for one vehicle, which may, but not necessarily, be denoted by painted or other road surface marker.	On-street parking; MMTIS; Network Topology; Cross-domain; C-ITS

5. Outlook and next steps

Future collaboration between the two platforms on data quality should follow a phased approach to deepen the understanding of the connection between data quality and consistency of data inputs in terms of static, semi static and dynamic data while maximizing the resulting benefits.

The initial phase will focus on identifying “high-priority” static and semi static data contents and their next links to service generation and C-ITS use cases and scenarios.

Building on this foundation, the data content analysis may also be extended to the feedback loops from users and the positive quality cycle included in this additional process steps and definitions. It could also reveal whether certain C-ITS services and their specifications necessitate extending existing quality



frameworks and especially feedback cycles, adopting a “bottom-up” approach from users and service providers tailored to specific use cases.

These investigations are envisioned to take place through targeted workshops involving C-ROADS and NAPCORE partners, experts, and representatives. Each workshop will concentrate on one or two priority use cases and their respective data categories and inputs, fostering focused and actionable insights.