Executive Report

Pre-study Urban ITS

Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

July 2016

Foreword

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1 Executive Summary

1.1 Context

CEN/TC 278/PT 1701 was established to advise the European Commission in respect of which standardisation related projects should be supported under an upcoming Commission Implementing Decision. (*standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) in urban areas.* Ref M/546 (Published February 2016).

The task of PT1701 was to identify gaps and overlaps in ITS standards that may be needed by Urban Administrations to assist them to implement Urban-ITS. The PT was further charged to outreach into the Urban Administration community and EC Urban-ITS related projects community to identify the scope and issues relating to its work, and subsequently, to validate its interim findings. The project team itself comprised 11 persons comprising: Urban Administrations; practitioners and advisers to Urban Administrations; professional standards developers; ITS industry; automotive industry.

Some 116 urban authority/related outreach direct contacts have been made, and more than140 projects/reports studied for relevance and content. A list of outreach contacts can be found in Annex P.

The interim findings were made available in January 2016. An open workshop was held on 11/12 February 2016, and as a result of discussion, based on early feedback from Urban administrations, the recommendations have been significantly consolidated, and the summary report and executive summary significantly (as expected) rewritten to focus on the issues as identified by the Urban Administrations, and to remove technical terms/jargon from the high level recommendations. In the INTERIM version, Use Cases were explored/examined and 103 interim recommendations made from these analyses. This revision retains those recommendations, and associates the recommendations to the priorities identified by Urban Administrations and other actors.

1.2 Perspective

This report, and the work of project Team PT1701, is approached from the perspective of identifying standardisation aspects in the areas of "*Multimodal Information Systems", "Traffic Management" and "Urban Logistics"* that need support in order to assist Urban Administrations to implement Urban-ITS.

This report does not purport to consider all standardisation aspects involved in Urban-ITS, and the PT has been charged to consider only three aspects of ITS, and from the perspective of requirements to assist Urban Administrations to implement Urban-ITS. By limit of its remit, PT1701 does not directly consider the objectives and issues facing other actors in Urban-ITS (service users, service providers etc.) save in respect that for the efficient enablement/implementation/support of Urban-ITS within the domains of Urban Administrations, certain requirements of other actors need to be fulfilled, and that the prime objective of an Urban Administration in enabling/supporting Urban-ITS is to serve the requirements of its population.

1.3 Current status

It turns out that, in respect of standards to assist Urban Administrations to implement Urban-ITS, the sector is already quite well served, but there are a number of major gaps that will weaken the ability of Urban Administrations to implement urban-ITS efficiently, and in some aspects, gaps may prevent its introduction unless faced and provided as a matter of urgency.

There are, additionally, a number of highly desirable aspects that could much better assist Urban Administrations to implement Urban-ITS, and a number of aspects of lower priority that need to be addressed at some point in time.

NOTE: shortage of resources named by most respondents as a principle barrier. This is recognised by the presence of this note, but is not, of course, a Standardisation issue.

Key issues identified by Urban Administrations as identified barriers to implementation of Urban ITS, where Standards are needed to remove/reduce the barrier to the implementation of urban-ITS are identified as follows:

a) Awareness of what is available
b) Location referencing
c) Vendor lock-in
d) Standards for "New Modes" and "new measures
e) Data exchange/data management
f) Immaturity of some concepts

The success of the introduction of Urban-ITS will also depend on the evolution and upgrades of existing work programmes and deliverables (such as the Transmodel family of standards developed by CEN/TC 278/WG 3, DATEX II by CEN/TC 278/WG 8, and cooperative-ITS security [ISO TC204 WG16/ ETSI TC-ITS/IETF/IEEE]), and these committees are urged and encouraged to continue their good work, and EC is encouraged to provide support for the evolution and development of these initiatives where required.

Section 1.5 of this report identifies the key requirements associated with issues a) – f). Section 2 of this report aggregates the individual (and rather technical) recommendations (that evolved from Use Case evaluation) into these issue groupings.

In addition to new standards that are required, (or existing standards that need updating and/or expanding), there are a number of associated support measures that are either highly desirable or necessary. It is important to state that some of these associated requirements and actions are ***essential*** and in some cases even more important than filling gaps in standards, for without them Urban-ITS will be extremely difficult or impossible to implement.

1.4 Automated/autonomous vehicles

Although not specifically mentioned in the remit to the Project Team, it would be wrong not to address the topical subject of autonomous /automated vehicles. The role of the autonomous vehicle will be mixed, and will change over time. Security will be a key factor for autonomous/automated vehicles

The introduction and take-up of this enhanced connected/automated paradigm will be dependent on three key factors: Technical capability; Legal and regulatory framework; User acceptance.

The remit to PT1701 has been directed to focus its work on standards deliverables that can be finalised within the three-year span of the CID mandate, and to focus on early measures to assist Urban Administrations to implement Urban-ITS, but PT1701 recognises that the integration of autonomous vehicles into the ITS and Urban-ITS environment is a major issue, but well beyond the scale and remit of this PT, or the timespan of the CID, but one that needs a project team to study at an early stage, and makes a recommendation to create a project team to address this issue.

See 6.2 and Annex C.8 for more detailed consideration of aspects concerning autonomous/automated vehicles.

1.5 Recommendations

Error! Reference source not found. of this Report provides a detailed list of 103 recommendations: specific standards deliverables required and actions that are essential or desirable, and work required by other Committees and ESO's.

The following 8 priority areas of this Executive Summary (Table 1) address the key priority issues listed above. Table 1 summarises the areas for high level recommendations that PT1701 considers should be supported by the Commission Implementation Decision M/546 .

Section 2 of this report now aggregates the individual (and rather technical) recommendations (that evolved from Use Case evaluation) that aggregate into the project groupings shown in Table 1.

Table 2 identifies priority areas that are already being prioritised under the EC ICT 'Rolling Plan' or should be for the attention of other Committees or ESOs.

Table 3 identifies priority areas where action is required, to enable/support Urban-ITS but the action required does not result in a standards deliverable (therefore outside of the scope of the CID). In order to achieve its objectives for Urban-ITS, the European Commission is therefore challenged to find means to support these priority actions.

For detail of each of the aspects of this report and the process leading to, and logic behind, each of the recommendations, there is a detailed Annex, **Error! Reference source not found.** (see Table of Contents [below recommendations] for detail). A high level compilation of the constituent recommendations behind these priority areas is also summarised in Section 2 of this summary report.

Table 1 — Summary areas for high level recommendations for Standardisation Projects under the CID.

A	**1701-HLRa Location referencing Harmonisation**
B	**1701-HLRb Mixed Vendor Environments.(MVE)**
	1701-HLRb-1 Mixed vendor environments Methodologies & Translators
	1701-HLRb-2 Mixed Vendor Environment Guide (CONOPS)
	1701-HLRb-3 Mixed Vendor Environment Standards
C	**1701-HLRc Urban-ITS issues associated with autonomous/automated vehicles**
D	**1701-HLRd Traffic Management System status, fault and quality standards**
E	**1701-HLRe EU-ICIP. European ITS communications and information protocols**
	1701-HLRe-1 EU-ICIP Protocols
	1701-HLRe-2 EU-ICIP Guide
F	**1701-HLRf Data models and definitions for new modes**
I	**1701-HLRi Emissions management in urban areas**
J	**1701-HLRj Traffic Management Data Models and interfaces**
	1701-HLRj-1 TM Data Models
	1701-HLRj-2 TM interfaces and information

PT1701, in addition to standards deliverables that it recommends to be supported under the CID, also identified several other areas where the area are already initiatives within CEN/TC 278, or other European or global standards organisations, is also required in order to support Urban administrations to implement/support Urban-ITS. Table 2 summarises these strategic subject areas.

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Table 2 — Priorities for existing work under other lead, other Committees and ESO's

	PRIORITY RECOMMENDATIONS
G	**1701-HLRg Update/Develop Transmodel/ IFOPT and NeTEx/ SIRI.** These subjects are already prioritised in the EC ICT Rolling Plan.PT1701 encourages and supports CEN/TC 278/WG 3 in pursuing the following projects which are essential if these standards are to remain relevant
	ISO TC204/IEEE/IETF/ETSI
H	**1701-HLRh Application of C-ITS security in Urban-ITS paradigm (TR)** These subjects are already prioritised in the EC ICT Rolling Plan.
	1701-HLRh-2 Security in the Urban-ITS Paradigm These subjects are already prioritised in the EC ICT Rolling Plan.
L	**DATEX Community/ISO TC204/TISA** **Harmonisation of data concepts , extensions to DATEX II**

Table 3 summarised areas where support measures other than standards developments are required.

Table 3 — Priorities recommendations for other required support measures (that do not lead to a formal standards deliverable)

	Priority: EC Requirement to meet CID timetable
K	**1701-HLRk Data exchange/data management**
	1701-HLRk-1 Establish data registry (Support Action)
	1701-HLRk-2 Harmonise Data concepts

1.6 Panoptic (Multi-category) standards and support issues

1.6.1 Although the pre-study was directed to consider three aspects of Urban-ITS, PT1701 has been careful to consider these in the context of the interoperable Urban-ITS paradigm and careful not to create three new 'silos' by dealing with these issues independently.

1.6.2 There are a number of policy and strategy issues that need consideration by the EU and CEN. PT1701 makes some recommendations to streamline the process in order to get deliverables to the marketplace earlier. Recommendations are also made to re-strategize standards development to fit the interoperable Urban-ITS paradigm, and propose measures (such as the use of C-ITS communication architecture procedures and protocols) in order to provide migration paths from the current legacy silo situation to the new interoperable Urban-ITS paradigm.

1.6.3 Urban-ITS application services or infrastructure provision is rarely a 1:1 relationship with its supporting standards. A number of standards are normally required to implement such application services or support infrastructure. Alone, Urban Administrations cannot be expected to have the expertise to know what is required, and they should not have to rely on external advisors. Therefore, a guide, "EUropean ITS Communications, Information and Protocols", (EU_ICIP) will be necessary, and is required urgently. (Use Case ULG-0001).

The role envisaged for EU-ICIP would be to act as a focal point to guide, inform and advise about the existing large set of standards, and how and in which combinations to use them. Such a guide and support framework would assist the introduction and instantiation of Urban-ITS in a consistent manner across Europe, without binding the Nation States to implement a large raft of measures and standards, but by guidance as to the best options available, and would be beneficial in the wider context of the ISO community worldwide.

1.6.4 It has been subsequently been proposed that the project 1701-HLRc, Urban-ITS issues associated with automated/ autonomous vehicles, could be incorporated into the EC_ICIP project 1701-HLRe.

1.6.5 Many of the recommendations in this report are concerned with the development of standardised data models, data formats, and exchange of standardised data. However, the meta-data relating to this data, and indeed common definition of terms used, need to exist in a freely available central meta-data registry. Without such a meta-data registry, even if data formats are standardised, their presence will be largely unknown, and new projects will re-invent similar (but different) data definitions, thus creating silos and impeding interoperability. This is already a large, and growing problem, that does not have an easily soluble business case. If the European Commission wishes to enable Urban Administrations to implement Urban-ITS, it needs to establish and maintain such a central meta-data registry. (To be clear this is a registry of meta-data [restricted to data definitions] not a repository of live data).

1.6.6 Even with such a meta-data registry, data has been defined in ITS standards and common practices over a period of more than 25 years. The specifications for this data are in most cases inconsistent. Urban-ITS requires the exchange, sharing and re-use of data, which is of course required in standardised format. A harmonisation programme needs to be undertaken to identify these inconsistencies, bring the relevant parties together to find a common future standard data format, and to identify a translation/migration path for presently implemented solutions.

1.6.7 New standards are required in the area of security, especially for wireless transactions. A number of proposals are made to support trust between entities whilst protecting privacy.

1.6.8 A number of recommendations concern data and access to data. The pre-study makes recommendations for joint initiatives to provide new data concepts and transactions in the Urban-ITS paradigm.

1.7 'Multimodal Information Services'

The base of current standards for many multimodal information services, come from the 'Public Transport' sector (called 'transit' in many countries), and one of the core standardisation initiatives relevant to Urban-ITS in this area are the "Transmodel/ IFOPT" series of Standards, including the associated NeTEx and SIRI Standards. This work is undertaken by CEN/TC 278/WG 3. This is already recognised in the European Commission "*Rolling Plan for ICT Standardisation 2016*" (DG GROW).

Initiatives to extend and improve Transmodel are already overdue, and the Transmodel standards may need revising to better fit into the new "Multimodal Information Services" paradigm, and this pre-study encourages CEN/TC 278/WG 3 to proceed with this work with as much urgency as possible, and recommends that EC funding is found to support project teams where this is deemed to be necessary. This work is considered essential by public transport experts to enable Urban-ITS to function efficiently,

Further attention and standards are needed in the area of location referencing.

A significant number of the other new MIS proposals in this area concern enabling "new modes" and "trip planning" service provision. Most are not provided for in Transmodel. Similarly, this pre-study encourages CEN/TC 278/WG 3 to proceed with this work with as much urgency as possible, and recommends that EC funding is found to support project teams where this is deemed to be necessary.

1.8 'Traffic Management'

Traffic management is reasonably mature and locally well served with solutions for traffic management. Unfortunately, many of these lock Urban Administrations into particular vendors, and many of the proposals in this report face the issues of opening the 'European Single Market', removing vendor lock-in while at the same time enabling good relations to be maintained with system providers. Further work is required to enable the interoperable exchange of data. Two new data modelling standards, data standards, and interface standards, and a number of support measures, such as a 'Concept of Operations' (CONOPs) to assist Urban Administrations to move to the new multimodal business paradigm of Urban-ITS, and avoid vendor lock-in, are proposed.

A Project Team is proposed to develop standard(s) supporting multi-vendor integration interface providing vendor independent remote configuration of integrated and interconnected TM subsystems; linkage of roadside devices (such as signal controllers) to a central system; status and fault messaging for the monitoring of field-level sub-systems and their (semi-automated) fault clearance; and integration of widely used traffic adapted control and data processing methods in a traffic signal controller environment.

A Project Team is proposed to develop a domain overarching data exchange standard, supporting the exchange of traffic & network condition data (traffic volume, occupancy rates, average speed, travel times, traffic conditions (LoS) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) and traffic management data (circulation and traffic management plans), (subject areas which are currently not covered by DATEX II).

Along with other domains, a Project Team is proposed to harmonise location-referencing standards, see 1.5 above.

1.9 'Urban Logistics'

Urban logistics is the least mature and least organised/more diverse of the three subject areas that form the core of this pre-study.

New measures proposed as priorities by Urban Administrations include standards for emissions monitoring, geofencing, low emission zones data and applications; standardised emissions data; Geofencing data and applications. A project team is required urgently to develop technical specifications to fulfil these requirements. (UL-0301;UL-0302; UL-0303).

Energy efficient intersections services, and delivery vehicle real-time mapping/route optimisation, are considered desirable and a project team will probably be required meet these needs. Adaptations of existing standards and new standards have to be engaged for future 'Valet Parking' applications. New Mode examples of priorities suggested by Urban Administrations are smart 'Park & Ride' bicycles services (detection, communications); parking, reservation of parking; green waves; etc.

Many other concepts for urban logistics use-cases have been proposed, but at this stage are not well enough developed to make firm proposals.

1.10 Communications and security

It turns out that the C-ITS architecture, security and protocols are not only essential in order for Urban-ITS to operate and co-exist in the upcoming world of Cooperative-ITS, but provide an efficient migration path from current silos to the interoperable Urban-ITS paradigm, and provide solutions to security issues that have largely yet to be addressed in the Urban-ITS paradigm. The existing SDO's

that are working on these issues are encouraged to complete their work on C-ITS security as a matter of urgency.

The reader is also directed to the work of the DG MOVE C-ITS Platform. WG5, Security. See Section 7 of:

http://ec.europa.eu/transport/themes/its/doc/c-its-platform-final-report-january-2016.pdf

1.11 Coherence with 'FRAME' ITS architecture

The remit to PT1701 requires the PT to consider coherence to the 'FRAME' ITS architecture. An analysis of the Use Cases developed by PT1701 shows a good degree of coherence the FRAME architecture. Where coherence is lacking it is usually because either what is identified in the particular Use Case is not explicit in the FRAME architecture, or the Use Case represents an evolution of ITS that has taken place since the architecture was last updated.

Two of the recommendations in Annex K of this report are for updates to be made to the FRAME Architecture. Implementation of these would enable the coherence issues to be resolved and would also provide the opportunity for further promotion of the benefits to European ITS stakeholders that arise from using the FRAME architecture. However, this work is not identified as a priority, and in many cases not seen even as relevant, by Urban Administrations responding giving outreach feedback to this project.

1.12 Structure of this Summary Report

This report is structured as follows:

— Executive summary (S.1)
— Recommendations (S.2)
— Remit, Scope, Background, (S.3 - 4)
— Situational factors etc. (S.5 - 6)
— Summary of the results for each of the areas considered (S.7-14)

Annexes for each of the areas of the report providing the detailed work of the study, leading to (and including) the detailed recommendations, and where appropriate, the Use Cases and gap/overlap analysis.

See the Table of Contents (following Section 2) for detail.

1.13 Caveats

By its remit, this report is deliberately approached from the perspective of servicing Urban Administrations to implement Urban-ITS. It is recognised that the reader may have additional or different interests/requirements.

2 Summary of Recommendations

2.1 Key issues

This pre-study makes 103 recommendations for standards development or support actions to support/enable Urban Administrations to enable/introduce/maintain Urban-ITS. Each recommendation addresses a 'gap', a requirement, for an identified 'Use Case' for Urban-ITS. See **Error! Reference source not found.** for detailed recommendations.

Some Use Cases are near-term, or can already be implemented, some are for the near future. Some are capability enhancing and desirable, others are considered essential prerequisites.

While each of these recommendations emanates from a 'Use Case', and is justified within this document, it cannot be ignored that 103 recommendations is a long list of requirements, and, especially as resources available to implement the CID are limited, some prioritisation is required. This study therefore consolidates the most urgent actions into 11 priority projects, of which 8 can be assisted under the provisions of the CID; 2 can be supported under existing issues identified and prioritised in the EU ICT Rolling Plan.

Some 13 of the recommendations enabling Urban Administrations to support Urban-ITS are for support actions that do not result in Standards deliverables, and therefore cannot be assisted by the normal measures to support the CID (Project Teams funded from the Standardisation budget).

In respect of these recommendations, the principal task facing proponents of Urban-ITS, and the European Commission in particular, is to find sources of funding to enable these recommendations to be carried out.

2.2 Additional priorities identified by stage 2 outreach

Ensuring input and influence from real implementers- *the urban authorities* – on the basis that the objective of this pre-study is to focus the recommendations on *their* needs in order to enable them to quickly enable and implement Urban-ITS, is a recurrent theme of this pre-study, and a clear goal of the sponsor of this work – the European Commission, and the Chair of CEN/TC 278 (which proposed the pre-study).

It has to be stated that the compact timescale of the pre-study (effectively the 6 months covering the 4th quarter 2015 and 1st quarter 2016), was not conducive to obtaining constructive outreach consideration and feedback, particularly from such complex organisations as Urban Administrations. Nevertheless, by far the bulk of the feedback received has indicated that Urban Administrations recognise that implementing urban ITS is important, significant and putting the building blocks in place is necessary and urgent. But as to what building blocks are required, they, the urban authorities, consider that they are not in a position to advise us what is needed, but they look to our study for that expert advice. Thus providing us with a conundrum.

To ask Urban Administrations for their priorities for Urban-ITS is, as one respondent stated, "*a little like asking someone at their first lesson in Algebra, what equations they need to know to pass an exam in five years time, when, in lesson one, they probably have not yet grasped what an equation is*". The problem is that, unless they have already studied Urban-ITS, or some aspect of it, they do not yet know what building blocks they need. This feedback is important, but does not help the pre-study prioritise its recommendations.

The most valuable feedback comes from areas where Urban Administrations have already cooperated and some organisational studies have been conducted. OCA in the German speaking states, UTMC in the United Kingdom, the 'Dutch Profiles Table' in the Netherlands, and AFIMB in France. A few authorities in complex and developed cities, such as TfL (London), STIF (Paris), Amsterdam ad La Metropole de Lyon have also started to encounter these issues and have made solid proposals, and it is no coincidence that experts associated with all of these activities were put forward to be members of the pre-study team.

Of those authorities and organisations who have invested resource, the recommendations all centre on avoiding vendor lock-in, standardising data concepts and enabling data exchange, and updating

and expanding the underlying architecture behind public transport (Transmodel, NeTEx, IFOPT etc.), and getting guidance in this complex and largely unknown paradigm of Urban-ITS.

In respect of specific services, harmonising location referencing has been a recurrent issue across different domains. And in respect of areas that clearly lack and need standards, managing pollution aspects has rated most highly.

Given the make-up of the PT experts and their association with these urban organisations, that this aligns with the prime recommendations made by the PT, we cannot consider to be either a coincidence, nor an endorsement, … in any event it is no surprise. But perhaps it does provide the clearest advice on the areas where the CID should concentrate its support measures.

The lifespan of the CID is just three years, and if these nominated priorities, together with garnering, as the project progresses, an understanding of where the Urban-ITS initiative should move in its next phase after the CID lifespan, then the pre-study, and the CID will have done a good job providing these first steps.

The interim report identified prioritised 6 project Team proposals to address these areas as a matter of urgency. A further two areas of 'High Level Recommendations' for support actions (3 project teams), outside of CID support for standardisation deliverables, were also identified as priority areas. Each of these "High Level" recommendations emanate from a number of Use Cases, and embrace a larger number of specific recommendations. Annex P.3 provides outreach feedback for these interim recommendations, and largely affirms them. However, some additional areas were considered priorities by the outreach feedback.

The outreach response form asked for some simplified statistical information to identify the use of existing measure. Table A.1 shows the result from which it can be seen that the most widespread use/understanding tends to be localised- some administrations for example, use Transmodel, others do not, some use OTS/OCIT others use UTMC. DATEX II has the widest awareness and use. Few use or see the relevance of the FRAME architecture at the Urban Administration level. It would be wrong to imply any precision to these results because of the elsewhere discussed lack of balance in statistical representation.

Turning to the Recommendations, Table A.2 (reproduced below) summarises the top 10 responses from outreach.

Table A.2 - most prioritised 10 recommendations

Rc_Gn12	**Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)**
Rc_TM05	**An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)**
Rc_TM07	**A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (H.4)**
Rc_TM03	**A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)**
RcPl01	**PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP**
Rc_SM13	**It is recommended to that the EC financially and institutionally supports the creation and existence of an organisationin order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles verification). (F.4.14)**
Rc_TM02	**A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)**
Rc_TM01	**A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) May be linked with MI20)**
Rc_TM08	**System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)**
Rc_TM06	**Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)**

The reader is advised not to pay too much attention to the relative ranking as the sample is small and not statistically representative.

2.3 Summarised recommendations

The outreach feedback largely endorsed the priority list put together at the outreach meeting, and supported most of the recommendations proposed by the PT experts, but enabled further clarification and some additional priority projects to be identified.

Table 4 replicates Table 1, in the Executive Summary but with the component individual recommendations added.

Table 5 replicates Table 2, in the Executive Summary but with the component individual recommendations added.

Table 6 replicates Table 3, in the Executive Summary but with the component individual recommendations added.

Table 4 — Elements for summary areas for high level recommendations for Urban-ITS Projects under the CID.

A	**1701- HLRa**	**Location referencing Harmonisation**
	Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
	Rc_GN02	To develop GDF 5.1 data model covering the connection between Transmodel and GDF and the corresponding data exchange format (G.4.11)
	Rc_GN12	Standard harmonisation: To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
	Rc_SO03	ESO/OEC: It is recommended that Standards be developed for New elements to include in Local Dynamic Map related to a Car Park internal description including :Available spots locations; Evolution of MAP standard to describe different paths to reach a spot; Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. This work is probably best led by the DATEX standards community. (I.2.10.3.4)
	Rc_SM09	A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services. A new or existing project is proposed to handle this issue. (E.4.3.5)
	Rc_Gn11	Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate. (E.4.3.5)
	Rc_Gn12	Standard harmonisation: To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
	Rc_MI30	New standard development To define a standard for data accuracy criteria and publication referring to space and time data. (G.4.6)
B	**1701- HLRB**	**HLRb Mixed Vendor Environments (MVE)**
	1701-HLRb-1	**Mixed vendor environments Methodologies & Translators**
	From Outreach meeting Rc_TM10	Stage A: MVE (mixed vendor environment) Protocols. A project team to collect technical and implementations details per method; propose a translator (Rosetta Stone); write guideline of when and how to use which method. The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (H.4)
	Rc_GN15	PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm. The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm (D.2.3.18; E.5.1, P.3.2.3)
	1701-HLRb-3	**Mixed Vendor Environment Standards**
	Rc_TM05	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)
	Rc_TM06	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)
	Rc_TM07	A control interface standard to link roadside devices such as signal controllers to an

		instation system, to support multi-vendor integration. (H.4)
	Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
C	**1701-HLRc**	**Urban-ITS issues associated with the introduction of autonomous/automated vehicles.**
		NOTE: This project may be joined with EU-ICIP
	Phase 1 outreach feedback	Funded European Project Team to study the Urban-ITS issues associated with the introduction of autonomous/automated vehicles. The work will study operational, technical and relevant legal issues related to introduction for AVs in the Urban environment. The PT will analyse the current status of AV standards, and propose new work that is needed for safe operation and seamless integration in the challenging urban environment (C.8; 6.2; A.3)
	Rc_PI04	It is recommended that there is a funded European project to study the ITS/Urban-ITS and regulatory framework issues associated with the introduction of autonomous vehicles. Automated vehicles: Funded European project to study the Urban-ITS issues associated with the introduction of autonomous vehicles. See PI04 NOTE: Created as a result of phase 1 feedback (therefore no opportunity for outreach response)
D	**1701-HLRd**	**Traffic Management System status, fault and quality standards**
	Rc_TM04	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. (H.4)
	Rc_TM08	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)
E	**1701- HLRe**	**EU-ICIP. European ITS communications and information protocols**
		1701-HLRe-1 EU-ICIP Protocols
	Rc_PI01	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP (9.2, F.1.2; F.1.12;)
		1701-HLRe-2 EU-ICIP Guide (F.1.13)
F	**1701-HLRf**	**Data models and definitions for new modes**
	Rc_MI13	To develop a standard reference data model for network topology for New Modes (car/cycle sharing areas, car pooling areas, battery recharging places) in coherence with Transmodel V6 and Part 7: Driver Management.. (F.4.1)
I	**1701-HLRi**	**Emissions management in urban areas**
	Rc_UL03	Emissions monitoring - Project Team to determine standard for Air Quality outstations and Traffic Management Systems Priority: Medium (in relation to other Urban Logistics recommendations). (I.7)
	Rc_UL04	Geofencing: A project team is probably required in respect of standardising geofencing protocols. (I.5.7.)
	Rc_UL01	A combined project “Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics” is therefore recommended whose scope is to (at least) include: Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement. (I.5.8.; I.7)
	1701-HLRj	**1701-HLRj Traffic Management Data Models and interfaces**
		1701-HLRj-1 TM Data Models
	Rc_TM02	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (H.4.3.2)
	Rc_TM03	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (H.4.3.2)

		1701-HLRj-2 TM interfaces and information
	Rc_TM01	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (H.4.3.2) May be linked with MI20)
	Rc_UL08	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)

Table 5 — Elements for summary areas for high level recommendations for priorities for existing work under other lead, other Committees and ESO's

			PRIORITY RECOMMENDATIONS
G	**1701-HLRg Update/Develop Transmodel/ IFOPT and NeTEx/SIRI.**		
		CEN/TC 278/WG 3	These subjects are already prioritised in the ECICT Rolling Plan.PT1701 encourages and supports CEN/TC 278/WG 3 in pursuing the following projects which are essential if these standards are to remain relevant
		Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisation in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles, verification). (G.3.9)
		Rc_MI08	OESO/OEC To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4) – see recommendation MI11. (G.4.11)
		Rc_MI01	OESO/OEC This report recommends that the EC, as a matter of urgency, makes call for experts and offers funding for the Transmodel update project so that it can align Transmodel with the Urban-ITS paradigm and accommodate new modes. (G.1.4.2)
		Rc_MI15	To develop a standard data model for cycling network in coherence with Transmodel V6 and GDF. (G.4.1)
		Rc_MI16	To develop a standard exchange format for New Modes planned data (topology, service description and fares). (G.4.1)
		Rc_MI17	New standard development : To develop a standard data model for New Modes operational aspects (in coherence with Transmodel). (G.4.2)
		Rc_MI02	OESO/OEC: Standard update To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel Operations Monitoring and Control with the requirements of SIRI standard, EBSF project & align with DATEX II part 3 (Situation Publication). (G.4.3)
		MI13; MI14; MI15; MI16: MI03; MI04; MI05; MI24; SM12	To develop a standard reference data model and data exchange format for network and service description (incl. booking, fares, etc.) for New Modes (incl cycling) in coherence with Transmodel V6 Part 1 to 7 (G.4.1)
	ISO TC204/IEEE/IETF/ETSI		
H	**1701-HLRh Application of C-ITS security in Urban-ITS paradigm (TR)**		
		Rc_PI11	A PT to study how C-ITS security shall be applied for Urban use. Specifically : practical advice to city authorities, and national/regional level needs to get going based on recommendations.
		1701-HLRh-2	**Security in the Urban-ITS Paradigm**
		Rc_PI10	Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.

		Rc_PI05	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_SO01	OESO/OEC :The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_PI13	One specific task is identifying the missing security standards regarding interfaces between Roadside/Personal/Central ITS Stations, patterned on well-established Vehicle ITS Station security standards.
	Other PT1701Recommendations that ESOs/OSCs should consider progressing		
	CEN/TC 278/WG 3		
		Rc_MI03	OESO/OEC :Standard update: To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). (G.4.1)
		Rc_MI04	OESO/OEC :Standard update: To develop Transmodel v6- Part 6: Passenger Information to take into account complex queries and filters as requested by NeTEx -informative annex. (G.4.13)
		Rc_MI05	OESO/OEC To develop Transmodel v6-Part 7: Driver Management. (G.4.3)
		Rc_MI06	OESO/OEC Standard update : To develop Transmodel v6- Part 8: Management Information & part 7: Driver Management). (G.4.3)
		Rc_MI07	OESO/OEC Standard update: To develop the update of the TR "Transmodel informative documentation". (G.1.4.2)
		Rc_MI11	OESO/OEC To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). (G.4.2)
		Rc_MI21	New standard development: To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner or information service. (G.4.4)
		Rc_MI22	New standard development: To develop standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems in coherence with Transmodel v6 (as initially planned by CEN/TC 278/WG 3 SG8 Open Journey Planner Interface). (G.4.5)
		Rc_MI26	New standard development: To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. (G.4.1)
		Rc_UL02	Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas Car Park Operators deliver information about parking space availability using DATEX. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged. To be included in work proposed in MI10. (I.2.3.10.1)
		Rc_MI09	OESO/OEC Standard update : To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the Study and Control stage. (G.4.3) May be linked to TM01
	DATEX Community/ISO TC204/TISA		
		Rc_SO02	OESO/OEC Further development of DATEX II. a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-station broadcasted services, to describe equivalent Local Dynamic Map elements related to: Available places; Cost of parking lot €/hr; etc… And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.3.10.2)

Table 6 — Detailed Priorities recommendations for other required support measures (that do not lead to a formal standards deliverable)

			CEN POLICY
		Rc_Pl02	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as "Technical Specifications" (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.
			Priority: **EC Requirement to meet CID timetable**
K	**1701-HLRk Data exchange/data management**		
	1701-HLRk-1 Establish data registry (Support Action)		
			A project team to review existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry. This requires 'Support Measures' (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures.
		Rc_SM01	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary.
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM03	Other action: To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.2.4.3.1)
		Rc_SM04	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.4; D.2.7; E.3.1)
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
		Rc_Pl06	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
	1701-HLRk-2 Harmonise Data concepts		
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data

			elements it requires (E.3.1)
		Rc_Gn09	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).

8 of the priority requirements are therefore for areas that can be assisted as projects under the CID; 2 of the priority areas are already priority areas identified in the EC ICT Rolling Plan; and one is a support action activity which will not result in a standards deliverable so needs a different means of support.

The 8 CID priority projects embrace 28 of the specific interim recommendations of PT1701. The 2 projects for support other committees/ESOs/existing WG items embrace 20 of the specific interim recommendations of PT1701.(and a further 15 associated interim recommendations are forwarded to the groups leading these activities, but without a request for priority). The 2 projects for other types of support cover embrace 15 of the PT 1701 interim recommendations. Thus 75 of the interim recommendations are accommodated in these 11 projects. Taken together with the further 15 associated interim recommendations, some 90 of the recommendations are therefore accommodated. The PT1701 withdraws remainder of the original recommendations as the result of negative feedback from outreach. This does not, however mean that these projects are not needed nor important, only that there are higher priorities for the CID, and these recommendations require further consideration and consultation before progressing.

Further, some of the recommendations concern areas where there is already well established standardisation activity and programmes (such as Transmodel and associated standards), and it is the intention to support the continuation and furthering of such work within the existing committees, and to identify them as priority areas for action within existing committees (and not to claim domain over these areas for Urban-ITS). This pre-study encourages these committees to use the recommendations of this pre-study in pursuance of seeking funding to continue this important work. Attention is drawn particularly to projects associated with the enhancement and extension of Transmodel and associated Standards (NeTEx, IFOPT, SIRI), DATEX II, and C-ITS security.

The analysis of the 103 recommendations in **Error! Reference source not found.** is organised by functional domain

While Table 1 identified the summary project headings, and Table 4 detailed the individual recommendations behind the headings, Table 7 provides the suggested proposed actions required for these 'High Level Recommendations', under the support measures of the CID M/456.

Table 7 — Proposed actions required for the list of 'High Level Recommendations'

A	**1701- HLRa Location referencing Harmonisation** Interoperable location referencing (all domains), mostly harmonization of multiple standards and sometimes need for new standard(s); intersections topology. Necessary for data exchange for ITS services (essential for planned and real-time data processing and information dissemination, and also for in-vehicle signage). USE CASES: ULG-0001; GEN-0001; ULG-0002; MIS-0002; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0007; MIS-0008; TM-0001; TM-0005; TM-0006	**Project Team** Location Referencing for Urban-ITS to: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when to use which method (PT estimate 200 man days: Team of 3 est. €150k)

B	**1701- HLRb Mixed Vendor Environments.(MVE)** Prevention of vendor lock-in in future systems. Legacy systems and migration paths out of vendor lock-in. Vendor lock-in free procurement of ITS systems, and vendor independent usage of IT systems for synchronized Traffic Management. USE CASES: TM-0001; TM-0003; TM-0009; UL-0301	
	1701-HLRb-1 Mixed vendor environments Methodologies & Translators	A) Vendor lock-in mitigation and migration: Protocols Content: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when and how to use which method (PT estimate 170 mandays – 130 k€: Team of 3)
	1701-HLRb-2 Mixed Vendor Environment Guide (CONOPS)	B) Vendor lock-in mitigation and migration: Guide (Concept of Operations' (CONOPs)) Guidance document: Guidance to foster open deployment and avoid vendor lock-in Content: • Analyse: what interfaces must be open • Describe migration path from current to open • Propose policies for authorities (PT estimate 170 mandays: 130k€ Team of 3)
	1701-HLRb-3 Mixed Vendor Environment Standards	C) Mixed vendor environmental standards (PT estimate 130 mandays: 100k€ Team of 3)
C	**1701-HLRc Urban-ITS issues associated with autonomous/automated vehicles (6.2; A.3; C.8)**	Technical Report: Urban ITS issues associated with autonomous/automated vehicles (PT estimate 130 mandays: 100k€ Team of 3)
D	**1701-HLRd Traffic Management System status, fault and quality standards (H.4)**	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (PT estimate 170 mandays: 130k€ Team of 3-4)
E	**1701- HLRe EU-ICIP. European ITS communications and information protocols** Guidance to Urban Authorities/understanding standards combinations/clusters USE CASE: ULG-0001 (See also 9.2, F.1.2; F.1.12;F.1.13)	

	1701-HLRe-1 EU-ICIP Protocols	EU-ICIP Protocols (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRe-2 EU-ICIP Guide	EU-ICIP Guide (PT estimate circa 250 man days: 190k€ Team of circa 7)
F	**1701-HLRf Data models and definitions for new modes** New Mode examples of priorities: Smart P&R bicycles services (detection, communications); Parking, reservation of parking; green waves etc. USE CASES: MIS-0001; MIS-0002; MIS-0005; MIS-0005-3; MIS-0005-4; UL0701; UL0801; UL0901; UL-1003; UL-1004; UL-1101; UL-1201	Technical Specification 'data models and definitions for 'new modes' (PT estimate 130 mandays: 100k€ Team of 3)
I	**1701-HLRi Emissions management in urban areas** New Measures: examples of priorities: emissions monitoring. Low Emission zones data and applications; Geofencing data and applications; Energy efficient intersections services USE CASES: UL-0104; UL-0108; UL-0112; UL-0213; UL-0215; UL-0226; UL-0301; UL-0302; UL-0303	Emission Management in Urban areas • Technical Standard: Standards and data definitions for Emission management in urban areas Use Case: Low Emission Zones Use Case: Emissions enforcement measures Use Case: Geofencing Content: • Functional Specifications based on Use Cases • Design consistent data concepts and interfaces • Geofencing management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas (PT estimate 130 mandays: 100k€ Team of 3)
J	**1701-HLRj Traffic Management Data Models and interfaces** Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). Access to and update of data models and extension of data models. Enable data integration and data re-use. USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
	1701-HLRj-1 TM Data Models	Harmonization project team to find common data concepts and migration paths for extant 'silo' developed work items. Access to and update of data

		models and extension of data models. Enable data integration and data re-use. (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRj-2 TM interfaces and information	Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). (PT estimate circa 100 man days: 75k€ Team of 3)

2.4 Location referencing

1701- HLRa - Project team to develop Technical Specification regarding Provision of a real time continuous location referencing data for the Urban-ITS environment. The referencing system should allow for planned and real-time data.

Location information has been a requirement since before the digital era, and most of it was founded on the Victorian principal of the "look-up table", and physical reference books and tables, and not related to actual physical position. But while some data is based on a latitude/longitude system (and there are multiple versions of such systems, others ae based on the gazetteered reference to physical objects (for example bus stops or parking bays in a car park). Because gazetteered referencing is institutionally entrenched, and migration to a geo-referencing based on physical location may be protracted, in the medium term we may expect to see the use of translators for some time to come.

An ITS deployment needs to draw data (for MIS, TM or UL purposes) from different modal systems, so that control systems for the various modes can interact to provide seamless services to the urban traveller, and to provide a location and time determination system that will work in the urban canyon and provide positioning and timing information in enclosed spaces.

Satellite positioning systems work well in the inter-urban space where there is no shielding of satellites by trees or tall buildings. However, they do not work well in some urban environments where a reduced number of satellites in line of sight due to the shielding effects of tall buildings (the urban canyon).

There will also be applications where positioning inside buildings such as multi-storey car parks requires other forms of location determination. (E.4.3; F.3.1.2)

USE CASES: GEN-0001; ULG-0001; ULG-0002; MIS-0002; MIS-0005-1; MIS-0005-2; MIS-0007; MIS-0008; TM-0001; TM-0005; TM-0006.

A	**1701- HLRa Location referencing Harmonisation** Interoperable location referencing (all domains), mostly harmonization of multiple standards and sometimes need for new standard(s); intersections topology. Necessary for data exchange for ITS services (essential for planned and real-time data processing and information dissemination, and also for in-vehicle signage).	**Project Team** • Location Referencing for Urban-ITS to: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when to use which method (PT estimate 200 man days: Team of 3 est. €150k)

2.5 Vendor lock-in/legacy systems and migration paths

1701- HLRb – : Mixed Vendor Environments.

Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

USE CASES: TM-0001; TM-0003; TM-0009; UL-0301

Annex C.7.6 analyses these issues and makes recommendations to avoid this situation. In summary, the historical evolution of traffic management systems has led to locally specified 'custom' solutions, usually provided by a single vendor, and dependent on proprietary solutions. Across the gamut of MIS and TM implementations, modern competitive bidding techniques (such as solution outsourcing) have exacerbated this problem. Local initiatives by OCA and UTMC have shown that there can be significant benefits by determining open multi-vendor protocols. This now needs to be lifted to the European standardisation level

B	**1701- HLRb Mixed Vendor Environments.(MVE)** Prevention of vendor lock-in in future systems. Legacy systems and migration paths out of vendor lock-in. Vendor lock-in free procurement of ITS systems, and vendor independent usage of IT systems for synchronized Traffic Management.	

This high level recommendation comprises 3 stages:

Stage A:

	1701-HLRb-1 Mixed vendor environments Methodologies & Translators	A) Vendor lock-in mitigation and migration: Protocols Content: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when and how to use which method (PT estimate 170 mandays – 130 k€: Team of 3)

Stage B:

	1701-HLRb-2 Mixed Vendor Environment Guide (CONOPS)	B) Vendor lock-in mitigation and migration: Guide (Concept of Operations' (CONOPs)) Guidance document: Guidance to foster open deployment and avoid vendor lock-in Content: • Analyse: what interfaces must be open • Describe migration path from current to open • Propose policies for authorities (PT estimate 170 mandays: 130k€ Team of 3)

Stage C:

	1701-HLRb-3 Mixed Vendor Environment Standards	C) Mixed vendor environmental standards (PT estimate 130 mandays: 100k€ Team of 3)

2.6 Autonomous/automated vehicles

Funded European Project Team to study the Urban-ITS issues associated with the introduction of autonomous vehicles. The work will study operational, technical and relevant legal issues related to introduction for AVs in the Urban environment. The PT will analyse the current status of AV standards, and propose new work that is needed for safe operation and seamless integration in the challenging urban environment.See also 6.2 and C.8.

C	**1701-HLRc Urban-ITS issues associated with autonomous/automated vehicles**	Technical Report: Urban ITS issues associated with autonomous/automated vehicles (PT estimate 130 mandays: 100k€ Team of 3)

2.7 Traffic Management System status, fault and quality standards

HLRd is one of the priority recommendations elevated to priority status as a result of outreach feedback.

D	**1701-HLRd Traffic Management System status, fault and quality standards**	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (PT estimate 170 mandays: 130k€ Team of 3-4)

2.8 Awareness of what is available/understanding standards combinations/cluster

Recommendation HLRe proposes a project team (multi-discipline) to develop a Technical Specification or Technical Report, "European ITS communications and information protocols" (EU-ICIP) followed by an ongoing maintenance programme. Based on Use Case ULG-0001.

Section 9.2 presents the case for EU-ICIP. In summary, once you move away from standardisation specialists, and into the offices of implementers, engineers and administrators, there is a poor understanding of ITS standards, or even the reasoning behind their need. It is unreasonable to expect to find in the offices of Urban Administrations, a high level of expertise concerning the complex mesh of standards required to support Urban-ITS, and it is unreasonable to require dependency on armies of advisors to plug this gap in each urban authority.

See also 9.2, A.3, C.5, D.2.6, F.1.2, F.1.12. F.1.13.

PT1701 is of the opinion that it is essential to also make guidance, information and support available to those who will have to make use of or require compliance to these standards. A guide and support framework is needed to assist the introduction and instantiation of Urban-ITS in a reasonably consistent manner.

EU-ICIP will explain to and enable Urban Administrations, road authorities and EU Member states to understand the mesh of standards needed to attain their goals for Urban –ITS, and ITS in general, and provide guidelines to move from abstract architectural concepts to effective instantiation.

EU-ICIP will support a family of open (existent) standards, referencing both common communications protocols and data definitions, that in combinations enable Urban-ITS/ITS to function and be managed, and will reference application standards where appropriate/available.

EU-ICIP will provide guidance, information and consistency for agencies implementing and operating Urban-ITS/ITS. EU-ICIP will assist interagency coordination and allows equipment of different types and different manufacturers to be mixed within the same or communicating systems; informing potential users of the compatibilities and incompatibility issues of various options, and provide the opportunity for training opportunities, and guidance to universities to assist training programmes for ITS experts. (1.6.3; 9.2, A.3, C.5, D.2.6, F.1.2, F.1.12. F.1.13.).

The work required is proposed in 2 parts a) identification and description of ITS protocols and standards required to support Urban-ITS, and, b) the production of a 'Guide' to explain how aspects of Urban-ITS can be achieved through combinations/clusters of standards, and what additional management measures are required.

E	**1701- HLRe EU-ICIP. European ITS communications and information protocols** Guidance to Urban Authorities/understanding standards combinations/clusters USE CASE: ULG-0001	
	1701-HLRe-1 EU-ICIP Protocols	• EU-ICIP Protocols (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRe-2 EU-ICIP Guide	• EU-ICIP Guide (PT estimate circa 250 man days: 190k€ Team of circa 7)

2.9 Data models and definitions for new modes

HLRf is required for all three of TM, MIS and UL because many of the "new modes" lack standards and good definition and common data models.

F	**1701-HLRf Data models and definitions for new modes** New Mode examples of priorities: Smart P&R bicycles services (detection, communications); Parking, reservation of parking; green waves etc. USE CASES: MIS-0001; MIS-0002; MIS-0005; MIS-0005-3; MIS-0005-4; UL0701; UL0801; UL0901; UL-1003; UL-1004; UL-1101; UL-1201	Technical Specification 'data models and definitions for 'new modes' PT estimate 130 mandays: 100k€ Team of 3)

2.10 Emission management in urban areas

As cities grow ever larger, the concentration of pollution becomes not only more important, but a significant health hazard. Cities are therefore turning to "low emission zones", emissions sensing, as short term measures, and geofencing to control the mode of driving for hybrids, or to create exclusion zones. However, this is currently being explored on a piecemeal city level. Development of Technical Specification(s): Standards and data definitions for emission management in urban areas is considered a high priority so that these measures can be implemented quickly and consistently across Europe.

UL-0301 Emissions monitoring –General

UL-0302 Urban Low Emission Zone Management

UL-0303 Monitor Emissions Compliance in Urban Zone Use Case: Low Emission Zones

UL-0307 CO2 Footprint Monitoring and Estimation

Content:

Functional Specifications based on Use Cases

Design consistent data concepts and interfaces

Geofencing management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas

I	**1701-HLRi Emissions management in urban areas** New Measures: examples of priorities: emissions monitoring. Low Emission zones data and applications; Geofencing data and applications; Energy efficient	Emission Management in Urban areas • Technical Standard: Standards and data definitions for Emission management in urban areas

	intersections services	Use Case: Low Emission Zones Use Case: Emissions enforcement measures Use Case: Geofencing Content: • Functional Specifications based on Use Cases • Design consistent data concepts and interfaces • Geofencing management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas (PT estimate 130 mandays: 100k€ Team of 3)

2.11 Traffic management data models and interfaces

This is a requirement not only for traffic management, but in order to provide the traffic content for multimodal information systems and urban logistics., therefore is a priority for all three aspects of Urban-ITS

J	**1701-HLRj Traffic Management Data Models and interfaces** Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). Access to and update of data models and extension of data models. Enable data integration and data re-use. USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
	1701-HLRj-1 TM Data Models	Harmonization project team to find common data concepts and migration paths for extant 'silo' developed work items. Access to and update of data models and extension of data models. Enable data integration and data re-use. (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRj-2 TM interfaces and information	Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). (PT estimate circa 100 man days: 75k€ Team of 3)

2.12 Elements for summary areas for high level recommendations for priorities for existing work under other lead, other Committees and ESO's

Table 5 provides details of the recommendations of PT1701, endorsed by outreach response, as priority issues for standards developments, where PT1701 has established that these are already priority areas under the lead of other working groups of CEN/TC 278, of other CEN or other ESO's.

PT1701 brings to the attention of these committees the importance and priority of these recommendations.in respect of Urban Administrations introducing and supporting Urban-ITS.

PT1701, however, respects the current lead in these areas and does not presume to do any more than bring these requirements to their attention, and leave it to their expertise and prioritisation strategies to address these issues. We have identified where these are already prioritised in the EC's ICT 'Rolling Plan', and offer to the lead groups our identification and confirmation of these areas as of priority in respect of supporting Urban Administrations to implement Urban-//ITS, and suggest that they cite our prioritisation of these recommendations in their submissions for financial assistance to progress these standards deliverables.

2.13 Detailed Priorities recommendations for other required support measures (that do not lead to a formal standards deliverable)

The CID M/546 is designed to provide assistance to ESO's to identify and deliver standards to enable or support Urban-ITS. However, some of the requirements identified by PT1701 are for measures that do not result in a "Standards deliverable" and the European Commission is challenged to find means to support these measures.

Error! Reference source not found., and in particular Annex A.5, provides greater detail in respect of these measures. Three of these issues are highlighted as priority recommendations in Table 6.

2.13.1 Deliverables first published as Technical Specifications

A simple recommendation is made that CEN/TC 278 first develops all of its ITS work items, but especially Urban-ITS work items, as Technical Specifications, as this brings the work items into the public domain much more quickly, and provides opportunity for earlier test of the standard, and opportunity to make any modifications required that have been identified in early implementation before the deliverable is finalised as an EN. See 9.7, E.8, F.1.12.

			CEN POLICY
	Priority: EC Requirement to meet CID timetable	Rc_Pl02	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as "Technical Specifications" (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.

2.13.2 Establish data registry

HLRk-1- A project team to revue existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry.

As can be seen from the number of referenced Use Cases, most MIS, TM, and UL Use Cases depend on the interoperable exchange of data, and this is only possible if standardised meta-data concepts (data about data: definitions of the form and content of data. This does not currently exist, and a commercial business case is difficult to find. However, it will be the ambitions of Urban Administrations to implement and support Urban-ITS that will suffer without the existence of such a

meta-data registry. This needs to be followed with a process to harmonise (and provide migration paths/translation for) legacy data concepts.

This requires 'Support Measures' (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures. Set-up costs circa €150k; annual maintenance/operating cost, circa €75k).

USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201

K **1701-HLRk Data exchange/data management**			
	1701-HLRk-1 Establish data registry (Support Action)		
			A project team to review existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry. This requires 'Support Measures' (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures.
		Rc_SM01	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary.
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM03	Other action: To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.4.5)
		Rc_SM04	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.7; E.3.1)
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires(E.3.1)
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
		Rc_PI06	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators. (E.4.5.1)
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)

HLRk-1- Support Measure Establish EU ITS/Urban-ITS Meta-Data Registry (Support Action [not CEN] Set-up costs circa €150k; annual maintenance/operating cost, circa €75k)

2.13.3 Harmonise Data concepts

HLRk-2 Harmonization project team to find common data concepts and migration paths for extant 'silo' developed work items.

Cost circa €250k

USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201

	1701-HLRk-2 Harmonise Data concepts		
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_Gn09	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).

2.14 List of 'Use Cases' analysed/assessed in this pre-study

GEN & ULG+ General/Panoptic; Multimodal Information Systems; TM=Traffic Management; UL= Urban Logistics.

<*> indicates still under development

1) GEN-0001 Urban-ITS Interoperable Location Referencing
2) GEN-0002 Urban-ITS Location and Time Determination
3) ULG-0001 EU-ICIP Use Case
4) ULG-0002 Urban-ITS Interoperable Location Referencing
5) MIS-0001 MIS Planned Data Retrieval
6) MIS-0002 MIS Real-time Data Capture
7) MIS-0002-1 MIS Operational Raw Data Provision
8) MIS-0003 MIS Planned Data Processing
9) MIS-0003-1 MIS Scheduled Trip Plan Provision
10) MIS-0003-2 MIS Planned Data Updating
11) MIS-0004 MIS Real-time Data Processing
12) MIS-0004-1 MIS Real-time Data Updating
13) MIS-0005 MIS Actual Trip Plan Provision

14) MIS-0005-1 MIS Dynamic Car-pooling
15) MIS-0005-2 MIS Driver Guidance
16) MIS-0005-3 MIS Car Sharing
17) MIS-0005-4 MIS Bicycle Sharing
18) MIS-0005-5 MIS Demand Responsive Systems
19) MIS-0006 MIS Information Structuring
20) MIS-0007 MIS Information Dissemination
21) MIS-0008 MIS Query Structuring
22) MIS-0000 User Support
23) TM-0001 TM Planning and system configuration data retrieval
24) TM-0002a TM Real-time Field Data Capture
25) TM-0002b TM External System Real Time Data Capture
26) TM-0003 TM Planned Data Processing & Subsystem Configuration
27) TM-0004 TM Real-time Data Processing
28) TM-0005 TM Traffic Condition calculation and Event/Incident detection
29) TM-0006 TM Decision and Measure Selection & Structuring
30) TM-0007 TM Measure realization
31) TM-0008 TM Information dissemination
32) TM-0009 TM Procurement and maintenance of Traffic Management infrastructure
33) UL-0101 Optimising Modal Choice <*>
34) UL-0102 Providing Delivery Service
35) UL-0103 Exchange information with other authorities in area of security <*>
36) UL-0104 Exchange information with other authorities in area of environmental risk <*>
37) UL-0105 Pre-trip planning – Freight
38) UL-0106 Dynamic navigation <*>
39) UL-0107 Embedded digital maps <*>
40) UL-0108 Last mile parcel tracking <*>
41) UL-0109 Freight Manager and driver assistant <*>
42) UL-0110 Access to Traffic information
43) UL-0111 Customer/Receiver databases
44) UL-0112 Delivery vehicle real-time mapping/route optimisation
45) UL-0113 Comply with regulations
46) UL-0201 Access Control and Management
47) UL-0202 Remote Tachograph Monitoring
48) UL-0203 Emergency messaging system/eCall
49) UL-0204 ADR management
50) UL-0205 Driver Work Records Monitoring
51) UL-0206 Vehicle Mass Measurement
52) UL-0207 Mass information for control and enforcement
53) UL-0208 Vehicle Speed Monitoring
54) UL-0209 Consignment and location monitoring

55) UL-0210 Vehicle Parking Management/Facilities
56) UL-0211 Vehicle weigh-in-motion
57) UL-0212 Vehicle enforcement using roadside sensors
58) UL-0213 Urban Consolidation Centre Management
59) UL-0214 Oversize management
60) UL-0215 Scheduling infrastructure (restrictions – day- time of day- length of stay- other
61) limitations)
62) UL-0216 Description of freight offer <*>
63) UL-0217 Monitor Compliance <*>
64) UL-0218 ICT framework handling RT heterogeneous mobility resources <*>
65) UL-0219 Network management (<*>
66) UL-0220 Freight Fares <*>
67) UL-0221 Freight Delivery schedule timetables
68) UL-0222 Optimise Resources <*>
69) UL-0223 Improve E2E Freight efficiency <*>
70) UL-0224 Vehicle Technology <*>
71) UL-0225 Innovative load units <*>
72) UL-0226 Restriction Zones Information Harmonisation
73) UL-0227 Intelligent Truck Parking and Delivery Areas Management (ITP/DAM)
74) UL-0228.1 Priority and Speed Advice Service
75) UL-0228.2 Priority and Speed Advice Service (Macro Approach)
76) UL-0301 Emissions monitoring –General
77) UL-0302 Urban Low Emission Zone Management
78) UL-0303 Monitor Emissions Compliance in Urban Zone <*>
79) UL-0304 Cross Border
80) UL-0305 Green balancing and controls <*>
81) UL-0306 Eco-drive Support Service
82) UL-0307 CO2 Footprint Monitoring and Estimation
83) UL-0401 Loading unloading places
84) UL-0501 Measurement place : weight no of axles etc./ covered
85) area/freightlines/limitations- time of day-day-size/ADR rules) <*>
86) UL-0601 Cargo Identification- Predetermined <*>
87) UL-0602 Cargo Identification – Dynamic <*>
88) UL-0701 Use of alternatively fuelled vehicles for urban logistics
89) UL-0801 Charging alternatively fuelled vehicles
90) UL-0901 Charging (e.g. during loading/unloading at the specific bays) <*>
91) UL-1001 Parking Availability in multimodal areas
92) UL-1002 Intelligent parking for light vehicles: Off-street Parking Access and Availability
93) UL-1003 Intelligent parking for light vehicles: On-street Parking Availability
94) UL-1004 Intelligent parking for light vehicles: Parking spot internal access management
95) UL-1101 intelligent parking for light commercial vehicles <*>

96) UL-1201 Intelligent parking for heavy goods vehicles <*>
97) UL-1301 Automated/autonomous vehicles in the Urban-ITS environment