TECHNICAL REPORT

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Intelligent transport systems — Joint APEC-ISO study of progress to develop and deploy ITS standards

Systèmes intelligents de transport — Étude de progrès conjointe APEC-ISO pour élaborer et déployer les normes ITS

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 28682 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems,* in collaboration with *APEC (Asia-Pacific Economic Cooperation)*.

Introduction

This Technical Report is intended to facilitate cooperation in ITS standardization activities by sharing recent information and experience on the application and deployment of ITS standards among APEC economies and ISO/TC 204 member countries.

The developers of this Technical Report:

(1) surveyed the current status of and plans for ITS standards and their deployment to increase understanding and boost technology transfer among APEC and ISO/TC 204 members,

(2) identified common problems that members are facing related to international standardization activities in the technical committee on intelligent transport systems (ISO/TC 204) of the "International Organization for Standardization" (ISO)

(3) Presented an ITS standards policy and collective opinions to improve ITS standardization activities and implementations.

The key questions addressed in this Technical Report are:

- How similar or different are each country's approaches to the development and deployment of ITS standards?
- Who develops ITS standards nationally, regionally and internationally?
- How many ITS standards have been developed worldwide?
- How many international ITS standards have been adopted or applied worldwide?
- What lessons have learned from the development and deployment of ITS standards?
- How to improve the practice of ITS standards development and application?
- What should be done to facilitate universal use of ITS standards?

This Technical Report contains:

- 662 ITS related standards worldwide (developed or under development) (Annex A)
- 89 Fact sheets of ITS related standards (including scope and conformance features) (Annex D)
- 100 ITS standards deployed world wide (Annex B)
- 20 Lessons learned from development or deployment experience of ITS standards (Annex C)
- Observations and Recommendations developing and deploying ITS standards (Section 4, 5, 6, 7, 8)

Intelligent transport systems — Joint APEC-ISO study of progress to develop and deploy ITS standards

1 Scope

This Technical Report

a) provides a survey of the current status and plan of ITS standards and their deployment,

b) identifies common problems which members are facing related to international standardization activities, and

c) provides collective opinions to improve ITS standardization activities and their implementations.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
eSafety
safety systems using electronics and or wireless communications

3 Abbreviated terms

AEI	automatic equipment identification
AFNOR	Association Française de NORmalisation
ANSI	American National Standards Institute
APEC	Asia-Pacific Economic Cooperation
APSC	advisory panel for standards cooperation (ITU)
ASN.1	abstract syntax notation.1
ASTM	American Society for Testing and Materials
AVI	automatic vehicle identification
CD	committee draft (ISO)
CD-ROM	compact disc, read-only memory
CEN	Comite Europeen de Normalisation
CENELEC	Comite Europeen de Normalisation Electrotechnique

CTI	committee on trade and investment
DATEX	DATa EXchange
DATEX ASN	DATEX using ASN.1
DIS	draft International Standard (ISO)
DOT	department of transport, department of transportation
ERM	electrotechnical and radio matters
EU	European Union
FDIS	final draft International Standard (ISO)
GIS	geographic information system
HoD	head of delegation
ICT	information and communication technologies
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IS	International Standard (ISO)
ISO	International Organization for Standardization
ITS	intelligent transport systems
ITSEG	ITS expert group
ITU	International Telecommunication Union
JPG	joint project group
JTF	joint task force
KATS	Korean Agency for Technology and Standards
LCR	road command language (France)
MEDIA	Management of Electronic Fee Collection DSRC Interoperability in Alpine Region
MOCT	Ministry of Construction and Transportation (Korea)
MRA	mutual recognition agreement
NAFTA	North America Free Trade Agreement
NP	new work item proposal (ISO)
NPA	National Police Agency (Korea, Japan)
NSB	national standards body
O member	observer member (ISO)

ORANGES	Orlando Regional Alliance for Next Generation Electronic payment Systems
OGC	Open Geospatial Consortium
P member	participating member (ISO)
PAS	Publicly Available Specification (ISO)
PC	planning committee (OGC)
PCS	personal communications services
PWI	preliminary work item (ISO)
RFID	radio frequency identification
RTLS	real time locating systems
RTSA	Road Traffic Safety Authority
SAFETEA-LU	Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users (USA)
SC	sub committee (ISO)
SCSC	sub-committee on standards and conformance (APEC)
SDO	standards development organization
SMR	specialized mobile radio
TC	Technical Committee (ISO)
TEL WG	telecommunications and information working group (APEC)
TELEMOV	telecommunications related to motor vehicles (ITU APSC)
TPT WG	transportation working group (APEC)
TR	Technical Report (ISO, country)
TS	Technical Specification (ISO, country)
TTA	Telecommunication Technology Association (Korea)
uGIS	ubiquitous GIS
UNECE	United Nations Economic Commission for Europe
VOIP	voice over internet protocol
VTS	Vehicular Technology Society (IEEE)
WG	Working Group (ISO)

4 An overview of ITS standards and related key players

4.1 Appreciations

NOTE Sincere appreciation is expressed to all the respondents, who voluntarily contributed to the report surveys. They are:

- Twenty-three members of ISO/TC 204 and APEC: Australia, Austria, Brunei Darussalam, Canada, China, Czech Republic, France, Germany, Hong Kong China, Hungary, Japan, Korea, Mexico, Norway, Peru, Singapore, Slovakia, South Africa, Sweden, Switzerland, Chinese Taipei, UK, USA, and;
- Six organizational representatives: APEC, CEN/TC 278, ETSI/ERM/TG37, IEEE, ISO/TC 211, ITU
- Dozens of contributors from APEC and ISO/TC 204: Chair and delegations of APEC, and Chair, Secretariat, HoDs, WG Convenors, rapporteurs and project editors of ISO/TC 204.

4.2 Structure of this technical report

Section 4 of this Technical Report provides the background of this project and introduces APEC, ISO/TC 204 and other important standards developing organizations for ITS.

Section 5 describes the methodology taken to conduct this project report and the questions and objectives of the two survey stages of this Technical Report.

Section 6 analyses the responses to two survey stages described in section 5. It shows the different approaches to developing standards and discusses implications of the survey results

Section 7 provides observations and conclusions aimed to support ITS standards developers. They are related not only to international standards development organizations, but also individual to members of ISO/TC 204 and APEC such as the government ministries and regulators, national standards bodies, domestic standards organizations, and trade associations, etc.

4.3 Benefits expected from ITS standardization

4.3.1 What are "Intelligent Transport Systems" (ITS) ?

Like many other parts of business and government around the world, the construction and operation of transportation systems is being transformed by computers, sensors, and communications technology – collectively called information technology (IT).

The application of IT to surface transportation is called “Intelligent Transport Systems” (ITS). ITS provides the ability to gather, organize, analyze, use, and share information about transportation systems. In the modern world, this ability is crucial to the effective and economical construction and operation of transportation systems and to their efficient use.

IT can be very helpful in conceiving, planning, and building new parts of the transport system. This use of IT is not specifically ITS, but it is very helpful in laying the groundwork for introducing ITS. ITS is being incorporated by manufacturers in “intelligent equipment ” that can be installed as part of the transportation infrastructure to gather and disseminate traveller information, control traffic signals and variable message signs, electronically collect tolls, and help manage the system

ITS provides vital support in operating transportation systems, including traffic management, pavement monitoring, oversight of system maintenance, and more effectively and reliably managing public transport •

ITS can store and evaluate archived data about the transportation system that is useful to planners who are evaluating transportation system improvements or to others evaluating safety aspects of the roadway

ITS also provides a wide array of in-vehicle technology to improve the safety, productivity, and comfort of road travel. In addition, a new direction for ITS in developed countries is worth waTC hing. This is a new focus on using wireless communications to help vehicles and the infrastructure cooperate with each other to enhance safety and the ability to manage the infrastructure well.

ITS encompass a broad range of wireless and wire communications-based information, control and electronics technologies. When integrated into the transportation system infrastructure, and in vehicles themselves, these technologies help monitor and manage traffic flow, reduce congestion, provide alternate routes to travellers, enhance productivity, and save lives, time and money.

ITS provide the tools for skilled transportation professionals to collect, analyse, and archive data about the performance of the system during the hours of peak use. Having this data enhances traffic operators' ability to respond to incidents, adverse weather or other capacity constricting events.

Traffic accidents and congestion take a heavy toll in lives, lost productivity, and wasted energy. ITS enables people and goods to move more safely and efficiently through a state-of-the-art, intermodal transportation system.

Source Information: 1)"ISO/TC 204 Business Plan" (www.iso.org – business plans for public review);
2) "ITS Technical Notes" (World Bank www.worldbank.org - Report no. 35680)

4.3.2 What are International Standards, standards and the role of ISO ?

ISO/IEC Guide 2 defines *standard* as "*document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context".* standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits

Standardization is "*activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context".* In particular, this activity consists of the processes of formulating, issuing and implementing standards. Important benefits of standardization are improvement of the suitability of products, processes and services for their intended purposes, prevention of barriers to trade and facilitation of technological co-operation.

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three international bodies are most widely recognized for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding electro-technical, which is the responsibility of IEC (International Electrotechnical Commission), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

Table 1 International SDOs: ISO, IEC and ITU

	ISO	IEC	ITU
Standardization area	All sectors (excluding IEC,ITU)	Electro-technical	Telecommunication
Members	156 (100: regular)	63 (51: regular)	189+
Technical Groups	733 TC /SCs 2,226 WG /ad hocs	179 TC /SCs 700 teams	ITU-T: 14 SGs+ ITU-R: 7 SGs+ ITU-D : 2 SGs+
Published standards type document	15,649 (IS, TS, TR, PAS, etc)	5,296 (IS, TS, TR, PAS, etc)	ITU-T : 2,900+ ITU-R : 4,500+ (Recommendations)

Active Projects	4,009	1,541	N/A
Website	www.iso.org	www.iec.ch	www.itu.int
Relevant European Organization	CEN	CENELEC	ETSI

ISO is a legal association, the members of which are the "National Standards Bodies" (NSBs) of some 140 countries (organizations representing social and economic interests at the international level), supported by a central secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the "International Standard" (IS). An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO technical committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO technical enquiry). ISO and its technical committees are also able to offer the "ISO Technical Specification" (ISO/TS), the "ISO Public Available Specification" (ISO/PAS) and the "ISO Technical Report" (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO offers also the "International Workshop Agreement" (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

Source: ISO website (www.iso.org)

4.3.3 Benefits expected from ITS standardization

Standards are a primary enabler of the widespread dissemination of ITS technologies and their safe and consistent use worldwide. Some of the benefits of ITS, built on International Standards, are listed below:

- The primary social, political, and economic benefit offered by ITS is increased safety: fewer and less severe crashes.
- Another primary social and economic benefit is the saving of travel time and cost and the potential for making travel time more productive for business travellers, more agreeable for all travellers. ITS can facilitate use of alternate or multiple travel modes, improving travel times and helping to load-level the transportation system.
- An additional primary benefit is the potential for an improved environment, including air quality and noise abatement. Secondary benefits from a social perspective, but very important from a commercial perspective are increased traveller comfort, convenience, and entertainment.
- Protocols for interconnecting traffic management, emergency response, and other centres across jurisdictions will increase the appeal and effectiveness of such centres.
- Protocols and message sets for delivering traffic and traveller information to vehicles will allow vehicles to receive service seamlessly wherever they are and will broaden the usable collection of data transmission technologies that can be applied to information delivery.
- Universal physical storage formats for map databases will promote interchangeability of storage media (e.g., CD-ROMs) and open markets for custom tailored data content.
- A reference architecture for vehicle and equipment identification along with protocols for electronic toll collection / road use charge devices and for commercial vehicle credentials checking will promote competition in the marketplace and encourage wider and more interoperable deployment of such systems.

- An ITS reference architecture promotes the process of defining simple, self-contained, readily interconnected components into more complex intelligent transport systems, opening the market to new applications and simplifying the deployment process.

- A glossary of ITS terms and an ITS data registry will help to reduce confusion in the marketplace and to simplify procurement and deployment activities.

- Performance and test measures/certification for safety-oriented and driver assistance systems (e.g., adaptive cruise control, collision warnings) will help build marketplace confidence in the value, consistency, and reliability of such systems and, when conscientiously implemented, provide a layer of protection against product liability exposure.

In general, global ITS standards will decrease costs and open markets for vehicle and equipment manufacturers, infrastructure operators, etc.

4.4 APEC places high value on ITS standards

4.4.1 APEC

The Asia-Pacific Economic Cooperation, or APEC, is the premier forum for facilitating economic growth, cooperation, trade and investment in the Asia-Pacific region. APEC was established in 1989 to further enhance economic growth and prosperity for the region and to strengthen the Asia-Pacific community.

Since its inception, APEC has worked to reduce tariffs and other trade barriers across the Asia-Pacific region, creating efficient domestic economies and dramatically increasing exports. Key to achieving APEC's vision are what are referred to as the 'Bogor Goals' *of free and open trade and investment in the Asia-Pacific by 2010 for industrialised economies and 2020 for developing economies*. These goals were adopted by leaders at their 1994 meeting in Bogor, Indonesia.

APEC has 21 members - referred to as "Member Economies" - which account for approximately 40% of the world's population, approximately 56% of world GDP and about 48% of world trade. It also proudly represents the most economically dynamic region in the world having generated nearly 70% of global economic growth in its first 10 years.

APEC's 21 member economies are Australia; Brunei Darussalam; Canada; Chile; People's Republic of China; Hong Kong, China; Indonesia; Japan; Republic of Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; The Republic of the Philippines; The Russian Federation; Singapore; Chinese Taipei; Thailand; United States of America; Viet Nam.

Source: APEC website (www.apec.org)

4.4.2 APEC TPT-WG promotes the use of ITS standards

4.4.2.1 APEC TPT-WG strives for the highest standards

Among APEC's eleven sectoral working groups, the APEC "Transportation Working Group" (TPT-WG) fosters economic development in the Asia-Pacific region through recommendations to increase the efficiency of the regional transportation system.

The work of the TPT-WG is set out in the action program which is derived from the APEC transportation ministers' statements of 1995 and 1997. At the beginning of 1998, three steering committees were established in line with the priority areas of the working group: More competitive transportation industry (including infrastructure); safe and environmentally friendly transporation systems (including new technologies); and human resources development (including training, research and education).

APEC transportation ministers have been striving for the highest possible standards of efficiency, safety, security and environmental sustainability for their transportation systems. This joint policy was expressed in the 2004 TPT ministerial statement.

Source: APEC-TPT website (http://www.apec-tptWG.org.cn/)

4.4.2.2 APEC TPT intermodal/ITS "Experts Group" works towards ITS standards requirements

The "APEC Transportation Working Group" recognizes that "Intelligent Transport Systems" (ITS) can contribute much to the region's most significant transportation needs relating to saving lives, time, money, energy and the environment through more effective use of the existing transportation systems and related infrastructure. At the transportation ministers request, the "ITS Experts Group" is working towards ITS standards development arrangements that will allow these benefits to be fully realized.

The goal of the "ITS Experts Group" is to save lives, time, money and the environment through the realization of ITS.

The objectives are to identify ITS standards requirements which are APEC priorities; to facilitate the establishment of ITS standards by ISO which are APEC priorities; to promote the universal use amongst all APEC Economies of ITS standards established by ISO; to share information among APEC economies regarding ITS developments.

The "APEC TPT ITS Experts Group" was merged with its "Intermodal Expert Group" in May 2006 and renamed the "APEC TPT Expert Groups on Intermodal and ITS Experts Group" (IEG).

4.4.2.3 APEC TPT ITS "Experts Group" and ISO/TC 204 collaboration: "Category A Liaison"

APEC TPT-WG , via its ITS experts group, has been cooperating with ISO/TC 204 in ITS standardization activities, and established ISO Category-A liaison relationship.

The summary of joint activities between APEC TPT-WG and ISO/TC 204 is as follows:

First joint workshop of ISO/TC 204 – APEC/ITSEG

Date and venue: 12 Oct 2002 in Chicago, USA

Topics: Common understanding of each group and future action items

The workshop identified a list of possible joint work or action items for considerations

Second joint workshop of ISO/TC 204 – APEC/ITSEG

Date and venue: 17 May 2004 in Vancouver, Canada

Topics: Discussion on public transport and fleet management standards

The workshop identified common interest areas for transit and fleet management standards. The collective needs of APEC economies were raised and discussed.

First joint project – "World Report for ITS standards"

1st Joint project mainly for the year from the year of 2005 and 2006

Project objective

To survey ITS standards developments and implementations

To share case studies and lessons learned among APEC and ISO/TC 204 members

To review ITS standardization activities, mainly ISO/TC 204, for future oriented planning

The final ouTC ome is this Technical Report.

4.4.3 APEC TEL-WG works on telematics

The "APEC Telecommunications and Information Working Group" (TEL) aims to improve telecommunications and information infrastructure in the Asia-Pacific region by developing and implementing appropriate telecommunications and information policies, including relevant human resource and development cooperation strategies. This is reflected in the TEL's expanded vision of promoting the transition from an Asia Pacific information infrastructure into the "Asia Pacific Information Society".

"APEC TEL - Telematics Strategy": APEC TEL Ministers, to broaden and deepen business facilitation, called upon the TEL to strengthen work on the development of an APEC information strategy and an APEC telematics strategy in the 2005 APEC TEL ministerial statement.

APEC TEL has also conducted work on other applications areas including telematics and has developed an APEC telematics strategy. APEC TEL has also considered that a project designed to uncover the potential issues involved in this developing market is a vital first step in understanding the impact this new technology will have on the populations in APEC region. Agreements on standards used between economies will be vital in enabling the spread of the usage of telematics. APEC TEL discussed that the trend towards the installation of telematics devices in cars is a growing and potentially profitable market.

Source: APEC-TEL website (www.**apectel**WG.org)

4.4.4 APEC SCSC encourages participation in international standardization process

APEC established the SCSC to achieve the Bogor Goals in the field of standardization. SCSC, under the "Committee on Trade and Investment" (CTI), has been working since 1994 on helping APEC economies to address those key issues and others related issues through several initiatives with the aim to facilitate trade, such as:

- Alignment of national standards with international standards in priority areas
- Improving participation on international standardization process through capacity building activities and through the regional input developed by technical groups
- Encouraging implementation of good regulatory practices in the process of preparation, adoption or review of regulations
- Developing means for conformity assessment recognition in the regulated sector such as "Mutual Recognition Agreements" (MRAs)
- Encouraging the recognition of conformity assessment in the voluntary sector, including the cooperation with the "Specialist Regional Bodies" (SRBs)
- Cooperation on technical infrastructure development
- Enhancing the information exchange and knowledge on matters related to standards and conformance
- Further increasing the transparency and access to information across the APEC region
- Encouraging business awareness and involvement in the whole process.

These activities increase the propensity for a free and open trade and investment, helping economies to grow, create jobs and provide greater opportunities for international trade and investment. In contrast, protectionism usually fosters inefficiencies and gives fewer and costly choices to consumers. Free and open trade helps to lower the costs of production and thus reduces the prices of goods and services - a direct benefit to all.

Source: APEC website (http://www.apec.org/apec/apec_groups/committees/committee_on_trade/sub-committee_on_standards.html)

4.5 ISO/TC 204-ITS: Main international forum developing ITS standards

4.5.1 Mission

ISO/TC 204 is responsible for the overall system aspects and infrastructure aspects of intelligent transport systems, as well as the coordination of the overall ISO work program in this field including the schedule for standards development, taking into account the work of existing international standardization bodies.

ISO/TC 204 is working for standardization of information, communication and control systems in the field of urban and rural surface transportation, including inter-modal and multimodal aspects thereof, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services in the intelligent transport systems (ITS) field. Standardization of in-vehicle transport information and control systems is the responsibility of ISO/TC 22 Road Vehicles.

ISO/TC 204's business plan can be downloaded at ISO's website ''Business plans of ISO technical committees open to public review '

See Annex A for the full list of standards developed and under development by ISO/TC 204.

Source: ISO/TC 204 Business Plan (www.iso.org – business plan for public review)
*A new website of ISO/TC 204 is www.isoTC 204.com.

4.5.2 ISO/TC 204 members

ISO/TC 204 has 25 P (Participating) members and 24 O(Observer) members.

ISO/TC 204 is currently chaired by Mr. Michael Noblett (noblett@connexis.com, USA).

ANSI (USA) is serving as the ISO/TC 204 Secretariat and Mr. David Thompson (dthomson@tiaonline.org) in Telecommunications Industry Association (ITA) performs the role on behalf of ANSI..

Table 2. ISO/TC 204 members

P-Members: 25		**O-Members: 24**	
Algeria			
Australia	Japan	Chile	Columbia
Austria	Korea	Croatia	Cuba
Belgium	Malaysia	Denmark	Egypt
Canada	Netherlands	Finland	Greece
China	Norway	Indonesia	Iran
Czech Republic		Ireland	New Zealand
Russian Federation		Pakistan	Philippines
France	Spain	Poland	Romania
Germany	Sweden	Serbia and Montenegro	Singapore
Hungary	South Africa	Slovakia	Sri Lanka
India	Switzerland	Thailand	Trinidad Tobago
Israel	United Kingdom	Turkey	Uruguay
Italy	USA		

4.5.3 ISO/TC 204 Organization (12 working groups)

Table 3 ISO/TC 204 working groups

WG	Title	Convenor (Country)
-	TC 204 Chair	M. Noblett (USA)
-	TC 204 Secretariat (ANSI)	T. Messa (USA)
WG 1	Architecture	R.K. Williams (U.K.)
WG 3	ITS database technology	M. Shibata (Japan)
WG 4	Automatic vehicle/Equipment identification	K. Evensen (Norway)
WG 5	Fee & toll collection	J. Engdahl (Sweden)
WG 7	General fleet management & commercial/freight	R. L. Sabounghi (Canada)
WG 8	Public transport/emergency	J. Bartosiewicz (USA)
WG 9	Integrated transport information, management & control	T. Vincent (Australia)
WG 10	Traveller information systems	R. Duckeck (Germany)
WG 11	Route guidance & navigation systems	VACANT (recently inactive)
WG 14	Vehicle/roadway warning & control systems	K. Yamada (Japan)
WG 15	Dedicated short range communications for ITS applications	C. H. Rokitansky (Germany)
WG 16	Wide area communications/protocols & interfaces	T. R. Shields (USA)

4.5.3.1 WG 1 – ITS System architecture, taxonomy and terminology

The mission of ISO/TC 204 WG 1 is to provide ISO/TC 204, its working groups, related bodies, and those involved in the ITS sector with a reference model of Conceptual Reference Architecture(s) that show the structure and interrelationships of the sector and to provide timely and appropriate definitions of Terminologies by means of glossaries and dictionaries, which explain, in plain language and with the minimum of jargon, the terms in use in ITS, and to develop standards for generic AVI(automatic vehicle identification) in the ITS sector. In all of this work, the overall objectives of TC 204, to provide cost efficient enabling structures, are paramount.

4.5.3.2 WG 3 - ITS database technology

The scope of WG 3 is to develop standards for geographic data files - The definition of an application independent standard for interchange of ITS database; Physical storage for ITS Database; The standard for the data models used for the storage of vehicle navigation and traveller information system databases compiled from geographic data file; location referencing procedure - This section of the standards specifies the location referencing procedures for the geographic database. Publishing updates for geographic databases - This section of the standard will specify the formats and procedures for publishing updates of geographic database used in ITS applications

4.5.3.3 WG 4 – Automatic vehicle and equipment identification

The scope of WG 4 is to develop standards for automatic vehicle identification (AVI), automatic equipment identification (AEI) and electronic registration information for ITS.

4.5.3.4 WG 5 - Fee and toll collection

The scope of WG 5 is to working for standardization of information, communication, and control systems in the field of fee and toll collection systems for urban and interurban surface transportation, including intermodal and multimodal aspects.

4.5.3.5 WG 7 - General fleet management and commercial/freight

The definition of standards in the areas of WG 7, "Fleet Management and Commercial/Freight operations systems" to improve the management and safety of these fleets and facilitate the interaction between the vehicles/freight operators and the local, national and international authorities within the intermodal and multimodal environments.

4.5.3.6 WG 8 - Public transport/emergency

The scope of WG 8 includes specific publicy transport functions: schedule adherence, driver and passenger safety surveillance and alert, fare collection systems, etc.

4.5.3.7 WG 9 - Integrated transport information, management, and control

The scope of WG 9 includes:

Define the systems that will operate to provide end-users with integrated transport information, management, and control, and to a list the intended functionality of these systems, where there is a need in terms of safety of users, the interoperability of the systems, or compatibility between system.

Define the data-flows between the end-user systems and specify the interfaces between them.

Define the data needs of these end-user systems and, in conjunction with the data providers specify the interfaces between providing and using systems.

Define the final outputs of the end-user systems and specify the form that they should be in to satisfy the end-user needs at their interface.

Define methods for accrediting acceptable systems.

4.5.3.8 WG 10 - Traveller information systems

The scope of WG 10 is concerned with the timely delivery of accurate, relevant information to travellers in a form suitable for them to use. This encompasses the broad range of travel modes in urban, inter- urban, and rural transportation. Travellers should have easy access to complete information about their travel alternatives and accurate information on current and expected travel conditions to enhance their mobility.

4.5.3.9 WG 11 - Route guidance and navigation systems

The scope of WG 11 "Route Guidance and Navigation Systems", provides to the driver orientation and gives route recommendations on how to reach a destination. The systems may also consider the actual traffic situation in providing route recommendations and may also make recommendations regarding alternate travel modes.

When routes are generated in the infrastructure, the in-vehicle system receives the calculated routes via a communication link.

Work items of WG 11 are aimed primarily at motorized individual drivers.

In "Locally Determined Route Guidance", route search and resulting route recommendations are generated in-vehicle, using locally stored map (road network data). Communication interfaces are to be harmonized between locally determined route guidance and dynamic ITS information.

In "Centrally Determined Route Guidance", all necessary information needed for route search and resulting route recommendations are generated in a traffic control centre (e.g., by using historical link journey times supplemented by real-time traffic information data) and subsequently transmitted to the individual driver.

4.5.3.10 WG 14 - Vehicle/roadway warning and control systems

The scope of WG 14 Includes the standardization of devices and systems that contribute to any one or more of the following purposes: avoiding crashes; increasing roadway efficiency; adding to driver convenience; reducing driver workload; improving the level of travellers' safety, security, and assistance by using information about the driving environment to perform anyone or more of the following functions: monitor the driving situation; warn of impending danger; advise of corrective actions; partially or fully automate driving tasks; report travellers' distress; and request needed emergency services where emergency services include medical, police, fire, and repair.

Information about the driving environment can come from sensors on board the vehicle, from other vehicles, and/or from the infrastructure. The driving environment includes all external factors that affect the vehicle or its driver including traffic, weather, and road surface conditions.

4.5.3.11 WG 15 - Dedicated short range communications for ITS applications

The scope of WG 15 – "Dedicated Short-Range Communications" (DSRC) describes data exchange between roadside stations (e.g., beacon, interrogator, leakage coaxial cable) and vehicles if equipped with an on-board-unit (OBU). DSRC is able to support many ITS applications already identified by ISO/TC 204. Therefore it will be an essential element of ITS. ISO/TC 204/WG 15 has been constituted to propose a common air interface standard for the DSRC-link.

4.5.3.12 WG 16 - Wide area communications/protocols and interfaces

The scope of WG 16's will be wide area data exchange between control centres and user devices in support of ITS applications. Initially WG 16 will concentrate on message structure and protocol specifications independent of communication medium (e.g., subcarrier technologies, cellular, PCS, satellite, SMR). WG 16 will not define application data elements. WG 16 will serve as a coordinator of message lists provided by the application-oriented working groups, promoting consistent use of data element structures across application messages, as a catalogue of unique message types, and as the definer of the general message structure for wide area communications media appropriate for ITS.

4.6 Related key organizations developing ITS standards worldwide

4.6.1 ISO/TC 204 liaisons

Under the ISO/IEC Directives, a TC /SC in ISO/IEC shall establish and maintain liaison with TC /SCs in ISO/IEC or other international or broadly based regional organizations. ISO/TC 204 has established and maintained liaison with various committees and organizations as follows. This section will serve as introduction to those important liaisons.

Table 4 Liaisons of ISO/TC 204

Internal liaisons	**External liaisons**
<ISO> • TC 8 Ship and marine technologies • TC 22 Road vehicles • TC 104 Freight containers • TC 154 Electronic data interchange • TC 211 Geographic information and geomatics • ISO/IEC JTC 1 Information technology • ISO/IEC JTC 1/SC31 Automatic identification and data capture techniques • TC 122-TC 104 JWG Supply chain applications of RFID <IEC> TC 9 Electrical railway equipment	• ITU-R Working party 6M – Multimedia broadcasting • ITU-R Working party 8A – Intelligent transport systems • CEN/TC 278 - Road transport and traffic telematics • Asia Pacific Economic Cooperation (APEC) • Institute of Electrical and Electronics Engineers (IEEE) • Open Geospatial consortium (OGC) • UN/CEFACT/TBG3 - UN centre for trade facilitation / International trade and business processes – Transport working group • IrDA (Infrared Data Association) • ETSI / TG37 • World Customs Organization(WCO)

4.6.2 CEN TC 278 European ITS standards (formally RTTT)

CEN TC 278 is the European regional organization for ITS standards and basically is interested in all the work of ISO/TC 204. In addition to the general development and provision of standards it has a specific additional role to develop standards to enable the European single market.

Under the Vienna Agreement, ISO/TC 204 and CEN TC 278 have developed and reviewed ITS standards together.

CEN, the European committee for standardization, was founded in 1961 by the national standards bodies in the European Economic Community and EFTA countries. Now CEN is contributing to the objectives of the European Union and European Economic Area with voluntary technical standards which promote free trade, the safety of workers and consumers, interoperability of networks, environmental protection, exploitation of research and development programmes, and public procurement.

CEN TC 278 was formed in 1991 and is working for standardization in the field of telematics to be applied to road traffic and transport, including those elements that need technical harmonization for intermodal operation in the case of other means of transport. It shall support among others: vehicle, container, swap body and goods wagon identification; communication between vehicles and road infrastructure; communication between vehicles; vehicle man machine interfacing as far as telematics is concerned; traffic and parking management; user fee collection; public transport management; user information.

CEN TC 278 has fourteen working groups. Under the Vienna Agreement, ISO/TC 204 and CEN TC 278 are cooperating to develop ITS standards and some of the WG s are CEN led.

Table 5 CEN TC 278 working groups

No	Working group/Sub-group name
1	WG 1 Electronic fee collection
2	WG 3 Public transport
3	WG 4 Traffic and travel information
4	WG 5 Traffic management systems (dormant)
5	WG 7 Geographic data files
6	WG 8 Road databases
7	WG 9 Dedicated short-range communications
10	WG 10 Human-machine interfaces
11	WG 12 Automatic vehicle and equipment identification
12	WG 13 Architecture and terminology
13	WG 14 After theft recovery of stolen vehicles
14	WG 15 eSafety

Source: CEN TC 278 website (www.nen.nl/cen278)

4.6.3 IEEE VTS/ITS for wireless communications for ITS

IEEE VTS/ITS is interested in almost all the activities of ISO/TC 204.

The IEEE is a leading developer of standards that underpin many of today's technologies. IEEE standards are developed in a unique environment that builds consensus in an open process based on input from all interested parties. With nearly 1,300 standards either completed or under development, IEEE is a central source of standardization in both traditional and emerging fields, particularly telecommunications, information technology and power generation

One of the best kept "secrets" is that the "Vehicular Technology Society" (ITS) claims top be the Society for persons engaged in "wireless", also known as, mobile radio, motor vehicles, and transportation electronics. This includes, but is not limited to: 2-way radio, cellular communications, personal communications, multi-media communications, paging, related networks, antennas, propagation, mobile satellite, aeronautical radio, etc. The VTS scope also includes vehicular electronics, including control, navigation, and communication systems. The VTS scope also embraces transportation electronics for railway systems including signalling, and communications.

IEEE-SA VTS/ITS - The group concerns itself with land, airborne and maritime mobile services; portable commercial and citizen's communications services; vehicular electrotechnology, equipment and systems of the automotive industry; traction power, signals, communications and control systems for mass transit and railroads.

*Source: IEEE-SA VTS/ITS website (*http://ewh.IEEE.org/soc/vts/)

4.6.4 ISO/TC 22 Road vehicles

ISO/TC 22 is mainly interested in the areas of ISO/TC 204: WG 4 'Automatic vehicle/equipment identification', WG 14 'Vehicle/roadway warning & control systems' and WG 16 'Wide area communications/protocols and interfaces'.

ISO/TC 22 and TC 204 have agreed to establish a joint working group (JWG) to facilitate collaboration for some of the work items of TC 204 WG 4/14/16 and TC 22 SC13 WG 5/8.

ISO/TC 22 is also working closely with "UNECE WP.29 World Forum for Harmonization of Vehicle Regulations".

The main objectives of ISO/TC 22 are as follows:

- To take full responsibility and ensure a world-wide involvement for handling work items relating to road vehicles and their equipment; produce cost-effective standards, which correspond to user and market needs, in due time.
- To support the technical progress of the sector.
- To maintain the collection of 573 published standards and adapt them to technical progress through a 5-year review process.
- To increase the recognition of the work of ISO and of the ISO/TC 22 within the automobile sector.

The vehicle industry is a world-wide industry and the implementation of international standards should limit the cost of producing vehicles and their parts. In every country the construction of vehicles is widely regulated but the harmonization of regulations is under way at the UN WP.29 whose 1958 agreement is open to every country and paved the way for the 1998 agreement. Some major countries have already signed this agreement and WP.29 is preparing world-wide regulations. International Regulations often need the support of international standards that are prepared and issued by ISO.

In accordance with this statement, the automotive industry contributed through ISO standards to the development of new fuel systems as "Compressed Natural Gas" (CNG), "Liquefied Petroleum Gas" (LPG) and in the future "Hydrogen" without forgetting the electrically propelled vehicles.

The ISO/TC 22 standards have also contributed to attaining/maintaining a high level of safety and protection of the environment according to the scope of its subcommittees. Some examples can be given with the crash testing methods, road handling ability testing methods, emissions testing methods and so on.

In all participating countries there is a general tendency to transfer the ISO/TC 22 standards as national standards following the harmonization of the regulations. Cost saving is at stake, as well as the removal of unjustified barriers to trade.

Source: ISO/TC 22 Business Plan (www.iso.org – business plan for public review)

4.6.5 UNECE WP.29 - World forum for harmonization of vehicle regulations

In order to reduce international trade barriers and to promote the global trade of vehicles and their components, efforts are being made to have harmonized vehicle regulations worldwide. The major forum for this role is the "World Forum for Harmonization of Vehicle Regulations" (WP.29) under the "United Nations Economic Commission for Europe" (UNECE).

UNECE WP.29 is mainly interested in the area of ISO/TC 204 WG 4 ‘Automatic vehicle/equipment identification’, WG 14 ‘Vehicle/roadway warning & control systems’, and WG 16 ‘Wide area communications /protocols and interfaces’.

UNECE WP.29 is also closely working with ISO/TC 22 "Road vehicles".

UNECE WP.29 was established on 6 June 1952 as the "Working Party on the Construction of Vehicles", a subsidiary body of the "Inland Transport Committee" (ITC) of the "United Nations Economic Commission for Europe" (UNECE). In March 2000, WP.29 became the "World Forum for Harmonization of Vehicle Regulations (WP.29)". The objective of the WP.29 is to initiate and pursue actions aimed at the worldwide harmonization or development of technical regulations for vehicles. Providing uniform conditions for periodical technical inspections and strengthening economic relations worldwide, these regulations are aimed at:

- improving vehicle safety;
- protecting the environment;
- promoting energy efficiency; and
- increasing anti-theft performance.

WP.29 currently administers three UNECE agreements, namely:

1. **UNECE 1958 Agreement** concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions;

2. **UNECE 1997 Agreement** concerning the adoption of uniform conditions for periodical technical inspections of wheeled vehicles and the reciprocal recognition of such inspections.

3. **UNECE 1998 Agreement** concerning the establishing of global technical regulations for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles;

Vehicles which are sold and put into service in a country have to meet the regulations and standards of that country. The registration procedure of that country requires the approval of the vehicle and/or its components. The existence of separate national regulations and approval procedures in the different countries requires expensive design modifications, additional tests and duplicating approvals. Thus, there is the need to harmonize the different national technical requirements for vehicles and to elaborate a unique international regulation. Once the vehicle or its equipment and parts are manufactured and approved according to that regulation, they can be internationally traded without further tests or approvals. Furthermore, these regulations have to be continuously adapted to the technical progress and to the new requirements regarding safety and environmental protection.

The organization of the" World Forum" and its subsidiary bodies is shown in the chart below:

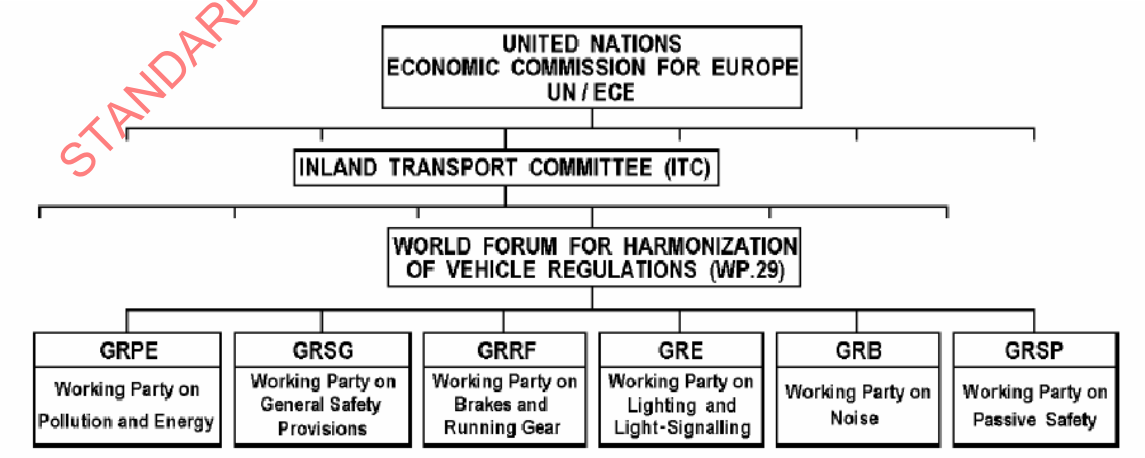

Figure 1 Organization of UNECE WP.29

A UNECE regulation in force binds leally all those contracting parties which signed the same regulation. The date of entry into force of a regulation or an amendment to a regulation is given on the front page of the official document as well as in the status document TRANS/WP.29/343.

The contracting party which signed a regulation may issue type approvals according to that regulation and shall recognize the type approvals issued by all other contracting parties which signed the regulation too. For more information please consult Article 12 of the 1958 agreement at http://www.unece.org/trans/main/wp29/wp29regs.

Source: UNECE WP.29 website (http://www.unece.org/trans/main/welcwp29.htm)

4.6.6 ISO/IEC JTC 1/SC17 – Card and personal identification

ISO/IEC JTC 1/SC17 is mainly interested in the area of ISO/TC 204 WG 5 "Fee & toll collection" and how the SC17 card standards are used in the transportation sector.

ISO/IEC JTC 1/SC17 is also closely working with ISO/IEC JTC 1/SC31 "Automatic identification and data capture techniques", ISO/TC 104 "Freight containers" and ISO/TC 122 "Packaging".

ISO/IEC JTC 1/SC17 is working for standardization in cards and personal Identification. It includes identification and related documents, cards, devices associated with their use in inter-industry applications and international interchange.

SC17 has extended its work cope to test methods, physical characteristics, embossing, magnetic stripe; Integrated circuit cards with contacts, contactless integrated circuit cards; optical memory cards; machine readable travel documents; driver license ID cards and other aspects of personal identification.

Source: JTC 1/SC17 Business Plan (www.iso.org – business plan for public review)

4.6.7 ISO/IEC JTC 1/SC31 - AIDC ("Automatic identification and data capture techniques")

ISO/IEC JTC 1/SC31 is mainly interested in the area of ISO/TC 204 WG 4 'Automatic vehicle/equipment identification', and WG 7 'General fleet management & commercial/freight'.

ISO/IEC JTC 1/SC31 is also closely working with ISO/IEC JTC 1/SC17 'Card and personal identification'.

The initial priority for SC31 work was in the field of linear bar codes. This area continues to be a major work area with new bar code symbologies being developed and standardized. Existing standards have entered the 5-year review period and are undergoing update to protect their visibility.

Interest in RFID technologies is expanding rapidly. The core RFID standard components for data syntax, tag identification and air interface protocols for five different frequencies were completed and published as formal ISO/IEC standards in 2004. In addition, a new air interface protocol for RFID at UHF developed by major Users and Solution Providers through EPCglobal™ was submitted to the ISO process, early 2005 and will be incorporated into ISO/IEC 18000-6. This coming together of the largest user association in distribution and SC31 is a real credit to all those involved and promises to release the constructive energies in both bodies to accelerate the development and implementation of RFID technology for the greater benefit.

SC31 WG 5, the youngest working group, is developing real time locating systems (RTLS), which are used for vehicle manufacturing and tracking, transportation, distribution and logistics, aerospace and defence.

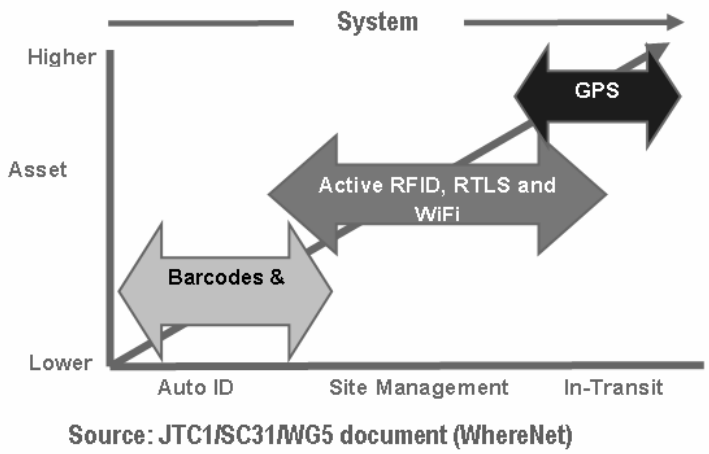

Figure 2 ISO/IEC JTC 1/SC31/WG 5 RTLS - ID and tracking technologies

With the help of its national members, SC31 continues to investigate the business demand for the standardization of other AIDC technologies. Such investigations are being undertaken on a regular basis since needs change quickly. At the SC31 Tokyo plenary in April 2000, a report on "Contact Memory" was given which suggested that there is no current need for standardization. This will be reviewed again in the light of the work being done on direct part marking.

There is growing interest in the use of two dimensional symbologies such as Data Matrix, QR Code and PDF 417, in response to space constraints and the need for expanded data capacity. They are finding a ready place in military, industrial and pharmaceutical applications.

The recent global conflicts and the war on terrorism, has dramatically thrust Auto ID in all its facets, into the forefront of system development. Identification and security at new levels of speed and accuracy are essential technology challenges which must be met.

Source: JTC 1/SC31 Business Plan (www.iso.org – business plan for public review)

4.6.8 ISO/TC 104 Freight containers

ISO/TC 104 is mainly interested in the area of ISO/TC 204 WG 4 "Automatic vehicle/equipment identification" and WG 7 "General fleet management & commercial/freight''.

ISO/TC 104 is also closely working with ISO/TC 122 "Packaging" and ISO/IEC JTC 1/SC31 on RFID issues. ISO/TC 104 has established a joint working group with the ISO/TC 122 on "SCM for RFID".

ISO/TC 104 is working for standardization of freight containers, having an external volume of one cubic meter (35.3 cubic feet) and greater, as with regard to terminology, classification, dimensions, specifications, handling, test methods and marking.

The working scope of ISO/TC 104/SC4 is on Identification and communication - standardization of freight containers visual marks (location, encoding, design and size); identification (identity codes and marks, automatic container identification system, identification transmission protocol); and data elements and their codes for container related communication.

Source: Auto ID website (www.autoid.org – ISO/TC 104)

4.6.9 ISO/TC 104-122 JWG – Supply chain management (SCM) for RFID

ISO/TC 122 is working for standardization in the field of packaging with regard to terminology and definitions, packaging dimensions, performance requirements and tests.

ISO/TC 122 is mainly interested in the area of ISO/TC 204 WG 7 "General fleet management & commercial/freight''.

ISO/TC 104 is also closely working with ISOTC 104 "Freight containers" and ISO/IEC JTC 1/SC31 on RFID issues.

This effort to organize a JWG began in the 1st Quarter of 2002, as an effort to ensure a degree of compatibility for various levels of employing RF tags for item identification, product packaging, shipping containers, small returnable containers, and containers greater than one cubic meter. The ISO committees that must be involved include ISO/TC 104 (Freight containers) and ISO/TC 122 (Packaging). The TC 122 and TC 104 committees have been cooperating to develop standards for SCM RFID. This effort has been expanded to invite ISOTC 204 (Road transport information and control systems) and ISO/TC 8 (Ships and marine technology) to participate. It is expected that the technical standards (data carrier, data structure, and conformance) of ISO/IEC JTC 1/SC31 have been employed in many aspects of this work.

Source: Auto ID website (www.autoid.org – ISO JWG)

4.6.10 ISO/TC 211 Geographic information systems

ISO/TC 211 is mainly interested in the area of ISO/TC 204 WG 3 2ITS Database technology". ISO/TC 211 has established a joint task force (JTF) with the ISO/TC 204 to discuss ITS database standards.

ISO/TC 211 is also closely working with OGC ("Open Geospatial Consortium"). It is observed that TC 211 develops relatively abstract standards while OGC develops application/conformance standards.

ISO/TC 211 Geographic information/geomatics is responsible for the ISO geographic information series of standards. Further information about the committee can be found at http://www.iso.org where it is also possible to make contact with the committee secretariat if you have any queries. You can also obtain a copy of the fact sheets and an overview document from this web site.

Many bodies are actively engaged in the work of ISO/TC 211. These include national standardization bodies, the "Open GIS Consortium" (OGC), international professional bodies, UN agencies, and sectoral bodies.

ISO/TC 211 scope is "standardization in the field of digital geographic information". This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the earth.

These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations.

The work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector-specific applications using geographic data.

ISO/TC 211 is organized by five active WG s, several advisory groups, and joint groups with OGC, TC 204, ISO/IEC JTC 1/SC24 :

- WG 4 Geospatial services
- WG 6 Imagery
- WG 7 Information communities
- WG 8 Location based services

- WG 9 Information management
- Advisory group on strategy
- Advisory group on outreach
- ISO/TC 211 / OGC Joint advisory group (JAG)
- ISO/TC 204 /TC 211 joint task force (JTF)
- ISO/TC 211 - ISO/IEC JTC 1/SC24 task force

Source: ISO/TC 211 website (www.isoTC 211.org)

4.6.11 Open geospatial consortium

OGC ("Open Geospatial Consortium") is mainly interested in the area of ISO/TC 204 WG 3 'ITS Database technology'.

OGC is also closely working with ISO/TC 211 GIS.

OGC is an international industry consortium of 308 companies, government agencies and universities participating in a consensus process to develop publicly available interface specifications. OpenGIS® Specifications support interoperable solutions that "geo-enable" the Web, wireless and location-based services, and mainstream IT. The specifications empower technology developers to make complex spatial information and services accessible and useful with all kinds of applications.

There are three major groups, called committees: the "Technical", "Planning" and the "Strategic Management Advisory" committees.

The technical committee is responsible for all aspects of the formal consensus OGC specification process. The consortium is composed of three committees and one sub-committee. The "Planning Committee" (PC) has ultimate responsibility for approving technical committee recommendations for the adoption and release of specifications, and for specification program planning. The "Strategic Member Advisory Committee" is conceived to be a permanent committee within the OGC organization, designed specifically to provide strategic members the opportunity to participate in the strategic planning processes of the Consortium, and to support consortium operations aimed at achieving the corporation's mission as defined in the bylaws.

Under the "Planning Committee" (PC), there is a subcommittee named "Conformance Testing & Interoperability Evaluation SC" (CTIE SC). The CTIE subcommittee will provide guidance to and advise the OGC staff on the operation of the "Conformance Testing and Interoperability Evaluation Program" (CTIEP) of the consortium. The sub-committee will provide a forum for an open, consensus discussion regarding approaches and issues related to conformance and interoperability testing becoming an integral component in the OGC specification process. Further, the sub-committee can work with members and OGC staff to insure there is a well understood process in place to insure that vendors can achieve OGC certification in a timely, cost effective manner. It will also serve as the portal for members to provide support directly to the CTIE process.

Source: Open Geospatial Consortium (www.opengeospatial.org)

4.6.12 International telecommunications union (ITU)

The "International Telecommunication Union" (ITU) includes the activities under the R-sector, T-sector and "Advisory Panel on Standards Collaboration (APSC)". It is very important to highlight those different working parties in the R-sector, or study groups in the T-sector are interested in specific TC 204 working groups.

ITU-R WP6M is mainly interested in the area of ISO/TC 204 WG 10 'Traveller information systems (broadcasting).

ITU-R WP8A is interested across all communication systems such as the work of WG 15 'Dedicated short range communications for ITS applications' and WG 16 'Wide area communications/protocols & interfaces'.

ITU-APSC is mainly interested in the area of ISO/TC 204 WG 14 'Vehicle/roadway warning & control systems' of ISO/TC 204.

Source: ITU website (www.itu.int)

4.6.12.1 ITU-T is interested in eCall, HMI related standards

The ITU telecommunication standardization sector (ITU-T) is one of the three Sectors of the International Telecommunication Union (ITU). ITU-T's mission is to ensure an efficient and on-time production of high quality standards ("Recommendations") covering all fields of telecommunications.

In the ITU-T-sector, several study groups (SG) deal with network related issues, including network security. Also, there are interests to collaborate with ISO (in general) regarding the work on eCall and HMI(Human Machine Interfaces)-related standards. ITU-T also hosts ITU APSC TELEMOV (see 4.6.12.3 below). More Information can be found at www.itu.int/ITU-T.

Source: ITU-T website (www.itu.int/ITU-T)

4.6.12.2 ITU-R WP6M and WP8A

The ITU radio-communication sector (ITU-R) plays a vital role in the management of the radio-frequency spectrum and satellite orbits, finite natural resources which are increasingly in demand from a large number of services such as fixed, mobile, broadcasting, amateur, space research, meteorology, global positioning systems, environmental monitoring and, last but not least, those communication services that ensure safety of life at sea and in the skies. More Information can be found at www.itu.int/ITU-R.

In WP6M, there are many activities that impact the work in TC 204/WG 10 on TPEG, in cooperation with the European Broadcasting Union. ITU-R WP6M deals with multimedia broadcasting systems.

ITU-R WP8A deals with "Land Mobile Communication Systems". In WP8A, there are many on-going draft working documents and other activities on next generation ITS radio communication services which relate to the work on CALM in ISO/TC 204/WG 16, such as the CALM M5, CALM Millimetre Wave, and CALM broadband.

Other working parties in the R-sector deal with satellite communication issues, GPS and other navigational issues, spectrum management, etc.

Source: ITU-T website (www.itu.int/ITU-R)

4.6.12.3 ITU-APSC TELEMOV for telecommunications standards for motor vehicles

Advisory standards cooperation panel (Advisory Panel for standards Cooperation on Telecommunications related to Motor Vehicles - APSC TELEMOV) is hosted by ITU-T and was created as a result of the "Workshop on Standardization in Telecommunication for Motor Vehicles" and intended as a cooperation group on all aspects of standardization related to telecommunications within and for motor vehicles.

This is meant as an open forum to bring together the leading international standardization organizations as well as industry consortia, as partners engaged in advancing ITS and vehicular telematics standards.

The goal is to strengthen cooperation amongst the SDOs involved in the industry, to improve information exchange between organizations and avoid duplication of efforts as well as to identify open issues in standardization activities and stimulate cooperation on how and where to best address those open issues.

Also, under the auspices of the TSB, an "Advisory Panel on Standards Collaboration" (APSC) coordinates ITS activities among international and regional standards groups.

Source: ITU-APSC (http://www.itu.int/ITU-T/special-projects/apsc/index.html)

4.6.12.4 ITU publishes 'Recommendations' not standards

The ITU publishes RECOMMENDATIONS (not standards), that are “recommended” for implementation by different countries. Under other circumstances, some ITU items are mandated for interoperability reasons within different countries, as the ITU is a TREATY-based organization, unlike ISO. In addition to the list provided in this Technical Report, there are definitely other ITU Recommendations that are not ITS-specific, but that impact the development and deployment of ITS services. For example, ITU "Recommendations" on 3G systems, ITU "Recommendations" on broadcasting services that impact the deployment of ITS travel and traveller information services, etc.

4.6.13 ETSI ERM/TG37 - ITS telecommunication standards

The "European Telecommunications Standards Institute" (ETSI) is an independent, non-profit organization, whose mission is to produce telecommunications standards for today and for the future. Based in Sophia Antipolis (France), ETSI is officially responsible for standardization of information and communication technologies (ICT) within Europe. These technologies include telecommunications, broadcasting and related areas such as intelligent transportation and medical electronics. It develops standards against which European regulators bodies (such as CEPT) can recommend regulations to member countries and those countries can measure and enforce the regulation. As with CEN TC 278, in addition to the general development and provision of standards ETSI has a specific additional role to develop standards to enable the European single market.

The activities of ETSI ERM/TG37 are to develop telecommunications (wireless and wired) standards for intelligent surface transport systems. As ETSI's focus is telecommunications standards, ETSI ERM/TG37 work is mainly involved in the area of ISO/TC 204 WG 15 ‘Dedicated short range communications for ITS applications’ and WG 16 ‘Wide area communications/protocols & interfaces’, however, it is also involved in the development of communications dependent services such as emergency crash notification and road pricing.

ETSI unites 688 members from 55 countries inside and outside Europe, including manufacturers, network operators, administrations, service providers, research bodies and users - in fact, all the key players in the ICT arena. ETSI plays a major role in developing a wide range of standards and other technical documentation as Europe's contribution to world-wide ICT standardization. This activity is supplemented by interoperability testing services and other specialisms. ETSI's prime objective is to support global harmonization by providing a forum in which all the key players can contribute actively. ETSI is officially recognized by the European Commission and the EFTA secretariat.

Source: ETSI website (www.etsi.org)

4.7 Summary

4.7.1 Common interest areas of SDO's

This Technical Report observes that those SDOs could be categorized considering their common interested areas on ITS as follows:

Category I – developing ITS standards in various sectors (many of TC 204 WG s)

- ISO/TC 204 (International)
- CEN TC 278 (Regional; Europe)
- IEEE VTS/ITS (International but with a heavy emphasis on North America region)

Category II – developing ITS standards related to vehicle (TC 204 WG 4, 7, 14)

- ISO/TC 22 (Vehicle in general): International
- ISO/TC 104 (Freight containers): International

- ISO/TC 122 (Fleet management): International
- UNECE WP29 (Vehicle in general): International

Category III – developing ITS standards related to map-database (TC 204 WG 3)

- ISO/TC 211 (GIS in general): international
- OGC (GIS in general): international, private consortium

Category IV – developing ITS standards related to telecommunications (TC 204 WG 15, WG 16)

- ITU-R WP8A (Broadcasting, TC 204 WG 10): international
- ITU-R WP6M (telecommunications): international
- ETSI ERM TG37(telecommunications): European Union plus 30 other countries

Category V – developing ITS standards related to identification (TC 204 WG 4, WG 5)

- ISO/IEC JTC 1/SC17 (smart card identification): international
- ISO/IEC JTC 1/SC31 (RFID, RTLS): international

The following table compares the interested areas of the SDOs with the work scope of ISO/TC 204 WG s.

Table 6 MaTC hing: ISO/TC 204 WG s and relevant SDOs

TC 204	Standardization Area	Relevant SDOs
WG 1	**Architecture, taxonomy , glossaries, data registries**	CEN TC 278, IEEE VTS/ITS
WG 3	**ITS Database technology**	CEN TC 278 ISO/TC 211, OGC
WG 4	**AVI/AEI/ERI**	CEN TC 278 ISO/TC 22, TC 204, TC 122, UNECE WP29 ISO/IEC JTC 1/SC17, JTC 1/SC31
WG 5	**EFC/ETC**	CEN TC 278, IEEE VTS/ITS JTC 1/SC31
WG 7	**General fleet management and commercial/freight**	CEN TC 278, IEEE VTS/ITS ISO/IEC JTC 1/SC31 ISO/TC 22, TC 204, TC 122, UNECE WP29 (ISO/TC 154, UN/CEFACT/TBG3, WCO)
WG 8	**Public transport/emergency**	CEN TC 278, IEEE VTS/ITS JTC 1/SC17
WG 9	**Integrated transport information, management and control**	CEN TC 278, IEEE VTS/ITS
WG 10	**Traveller information**	CEN TC 278, IEEE VTS/ITS, TPEG Forum, (EBU) ITU-R WP6M
WG 11	**Route guidance and navigation systems**	CEN TC 278 ISO/TC 22, UNECE WP29
WG 14	**Vehicle/roadway warning and control systems**	CEN TC 278, IEEE VTS/ITS JTC 1/SC31 ISO/TC 22, UNECE WP29 (ITU-T)
WG 15	**DSRC**	CEN TC 278, IEEE VTS/ITS ITU-R WP8A, ETSI ERM/TG37 (ISO/IEC JTC 1/SC31), (IrDA)
WG 16	**Wide area communications**	CEN TC 278, IEEE VTS/ITS ITU-R WP8A, ETSI ERM/TG37, (IrDA) (ISO/TC 22, UNECE WP29)
Others	**-**	CEN TC 278: After theft, eSafety ISO/IEC JTC 1/SC31: RTLS ISO/TC 8 : Ship and marine IEC TC 9: Electrical railway equipment IEEE: Rail transit

4.7.2 Cooperation between SDOs

Some SDOs have formal liaison arrangements, in other areas the situation is less clear, and in some cases the situation appears almost competitive.

ISO/TC 204 has a unique relation with CEN TC 278 under the Vienna agreement, and several of their WG s are operated as joint working groups (notably Architecture, AVI/ERI, electronic fee collection, traveller information). Other WG s operate separately, but with a very high level of document exchange and interaction on items of common interest.

However, CEN TC 278 WG 14 is for "After Theft" systems has no equivalent WG in ISO/TC 204 or other SDOs. ISO/TC 204 WG 14 “Vehicle/roadway warning and control systems” and WG 16 “Wide area communications”, have no exact counter work programme in CEN TC 278. The recently established CEN TC 278 WG 15 "eSafety" has no direct equivalent in ISO/TC 204, but it is anticipated that the CEN TC 278 WG 15 will deal with safety related communications issues such as "Emergency Crash Notification", or continuous communications with vehicles to support safety systems, which are at the core of ISO/TC 204 WG 16 activities, and will no doubt provide the CEN input to ISO/TC 204 WG 15.

ISO/TC 204 and ETSI have a formal liaison and close working relationship. In respect of continuous communications with vehicles, there are frequent shared meetings in addition to document sharing. ETSI similarly has a formal liaison with CEN TC 278.

There is similarly a formal liaison between ISO/TC 204 and ISO/TC 22, principally to determine which TC deals with which issues. However, ISO/TC 22 and TC 204 have agreed to establish a joint working group (JWG) and collaborate in the area of ISO/TC 204 WG 4/14/16 and ISO/TC 22 SC13 WG 5/8. ISO/TC 204 and TC 211 established a "Joint Task Force" to coordinate any duplicated efforts and to harmonize the standards between TC 211 and TC 204.

Other liaisons tend to work more at a WG level, for example, the liaison between ISO/TC 204 WG 4 and TC 104 in respect of AEI.

Other working relationships are more distant, even where a formal liaison exists, and rely on common membership of both groups. Relationships between IEEE and ISO/TC 204 fall into this category, similarly the links between ISO/TC 204 and UNECE WP29.

It is clear that the relationships between ISO/TC 204 and relevant SDOs could be improved. Particularly, the one between IEEE and ISO/ CEN/ETSI could be better and more efficient. ITU host a cooperation panel between ITS SDOs (APSC TELEMOV) which is largely devoted to information exchange and joint SDO sponsored education and ITS standards promotion events. However ITU-T and ITU-R tend to do their own thing with little attempt to coordinate work programmes with ISO and CEN, although there is a better link with ETSI. The reasons for this are largely historical from the days when telecommunications standards were a completely separate business area from application standards. In these interconnected days, the boundaries are much less clear and there is a need for better cooperation.

5 Objectives and methodology

5.1 Objectives

As expressed in the introduction, the key questions of this Technical Report are:

- How much similar or different when each country approaches to development or deployment of ITS standards?
- Who develops ITS standards nationally, regionally and internationally?
- How many ITS standards have been developed worldwide?
- How many international ITS standards have been adopted or applied worldwide?

- What lessons learned from the experience in development and deployment of ITS standards?
- How could we improve the ITS standards development and application practice?
- What should be done to facilitate universal use of ITS standards?

Based on the questions, the objectives of this Technical Report are:

(1) To survey current status and plan of ITS standards and its deployment in order to increase understanding and boost technology transfer among APEC and ISO/TC 204 members;

(2) To identify common problems which members are facing, if any, particularly related to international standardization activities represented by ISO/TC 204;

(3) To demonstrate an ITS standards policy and collective opinions to improve ITS standardization activities and its implementations.

5.2 Methodology: Two stages of survey

To develop this Technical Report, a joint project group (JPG) between APEC and ISO was organized.

The JPG has agreed to perform a comprehensive international survey based upon a uniform table of contents for comparing each member's experiences, strategies, and policies related to ITS standards. This survey will consider the APEC Region but also other global regions (e.g. Europe) represented by ISO/TC 204 members. Also, The JPG agreed to conduct the survey in two stages.

The target groups are the members of APEC and ISO/TC 204. Particularly, the JPG expected active participation in the survey from ISO/TC 204 P members as they are the group which have been participating in international standards development in ITS.

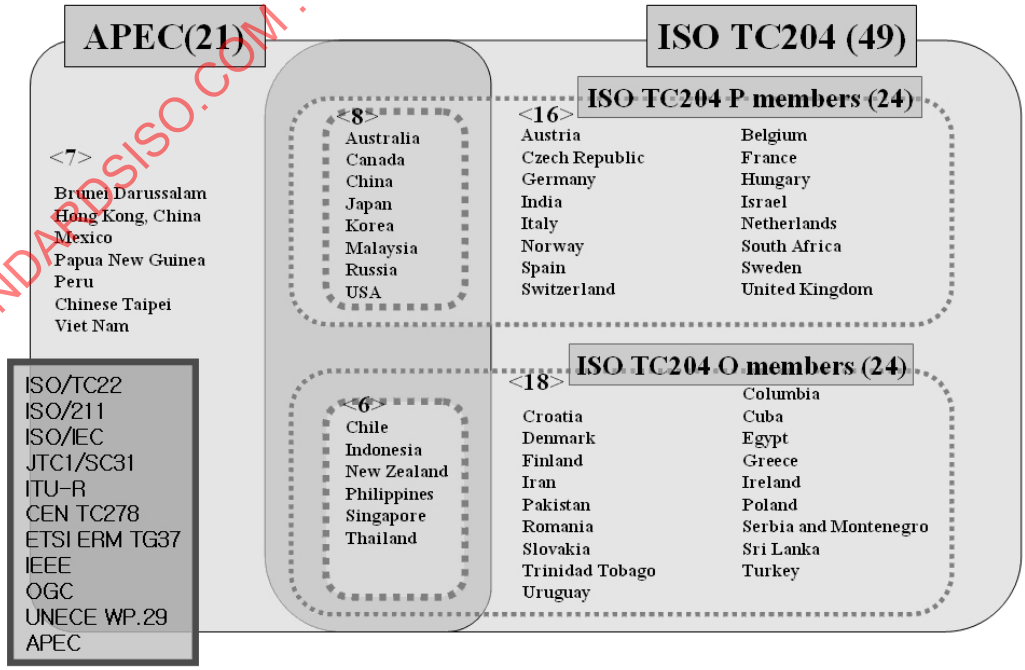

Figure 3 Survey target group: APEC, ISO/TC 204 and its liaisons

The 1st stage is basic survey consisting of an inventory of international and national standards for ITS either published or in development.

The 2nd stage is a more detailed and advanced survey which includes case studies and needs and suggestions on ITS standardization activities.

The JPG collected information with the two stages of survey, meeting discussion as well as reviewing existing information.

5.2.1 *Stage I* survey

The 1st stage is basic survey consisting of an inventory of international and national standards for ITS either published or in development. The fundamental question in *stage I* survey is “How could you help somebody (or group) use the ITS standards you developed (this is the reason why we develop standards)?”.

Therefore, the questionnaire for *stage I* is composed of following three parts

The target groups of *stage I* survey were APEC and ISO/TC 204 members and ISO/TC 204 liaisons

- How do you develop your national ITS standards (approaches)?
  - Standards development /adoption process
  - National law, committee, report related to ITS
- What kinds of standards are existing in the world (development status)?
  - International and regional
  - National and association
- How do I extend possible further questions (contact information)?
  - ISO/TC 204 domestic committee
  - ITS organization, Government, ITS organizations, SDOs.

5.2.2 *Stage II* survey

The 2nd stage is a more detailed and advanced survey which includes case studies and lessons from ITS standardization activities: development and deployment of ITS standards.

The fundamental questions in *stage II* survey are “Which standards are used in ITS projects?", and " Which lessons do you learn from the experience in development or deployment of ITS standards?”

The target groups of *stage II* survey were APEC and ISO/TC 204 members, ISO/TC 204 convenors and liaisons.

- *Stage II* survey - Type A was designed for APEC and ISO/TC 204 members and asked members:
  - To *share experience* on ITS standards development/implementation by providing:
    - List of projects of ITS standards employed
    - Write up lesson learned template
  - To *provide the list of projects* any ITS standards implemented
    - Not asking comprehensive answers, only a few list of projects available
  - To *share your experience* with lessons learned
  - To *clarify* the adoption process of International or regional standards as national standards

- *Stage II* survey - Type B was designed for TC 204 WG convenors and liaisons and asked them:
  - To *assist* users understand what the standard is about
  - To *provide* test methods (needs) of the standard
  - To *share* your experience with lessons learned
  - To *provide* the scope of ITS standards
  - To *explain* the development status of conformance requirements (how to test?)

5.3 Survey responses from APEC and ISO members

In *stage I* survey, twenty one members from APEC and ISO/TC 204 participated in the *stage I* survey and the liaison officers of ISO/TC 211, ITU, CEN, ETSI, IEEE contributed.

In *stage II* survey, seventeen members from APEC and ISO/TC 204 participated. It should be noted that special contribution of the ISO/TC 204 convenors of WG 1, WG 4, WG 5, WG 7, WG 8, WG 10, WG 14, WG 16 of ISO/TC 204, and to the liaison officers of ISO/TC 211 and ETSI who contributed to the *stage II* survey by providing the fact sheets of the standards developed by the working groups or liaisons.

Also, seven members of APEC and ISO/TC 204; Australia, Canada, France, Japan, Korea, Switzerland and USA should take sincere appreciation for their inputs on 'Lessons learned'. In total, twenty lessons were collected from one hundred projects cases which deployed ITS standards.

Table 7 Survey Response Summary

No	Economy	APEC members	ISO/TC 204 members	*Stage* I survey (21)	*Stage* II survey(17)
1	Australia	APEC	TC 204 - P	√	√
2	Austria		TC 204 - P	√	√
3	Brunei Darussalam	APEC			√
4	Canada	APEC	TC 204 - P	√	√
5	China	APEC	TC 204 - P	√	√
6	Chinese Taipei	APEC		√	√
7	Czech Republic		TC 204 - P	√	
8	France		TC 204 - P		√
9	Germany		TC 204 - P	√	
10	Hong Kong, China	APEC		√	√
11	Hungary		TC 204 - P	√	√
12	Japan	APEC	TC 204 - P	√	√
13	Korea	APEC	TC 204 - P	√	√
14	Mexico	APEC		√	
15	Norway		TC 204 - P	√	
16	Peru	APEC		√	√
17	Singapore	APEC	TC 204 - O	√	√
18	Slovakia		TC 204 - O	√	
19	South Africa		TC 204 - P	√	√
20	Sweden		TC 204 - P	√	
21	Switzerland		TC 204 - P	√	√
22	United Kingdom		TC 204 - P	√	√
23	USA	APEC	TC 204 - P	√	√

6 Survey results

6.1 Different approaches to ITS standards development

The different approaches to ITS standards development discussed in this section relate to:

1) How a country or economy develops or contributes to development of ITS standards (through national, regional or international standards development organizations (SDO)) and

2) How a country or economy adopts the ITS standards it needs (automatically or selectively from among the standards development options mentioned in 1) above).

This section reports on the responses received from the *stage I* survey. The results are based on the 20 responses to the *stage I* survey plus 3 additional inputs received as part of the *stage II* survey (Brunei Darussalam, France, Hungary). Note that for the purpose of this section, ITS standards include both SDO developed standards as well as non-SDO developed source materials used as guidance for ITS implementations (see question 3.2 in *stage I* survey in Annex H).

6.1.1 Does your country develop national ITS standards?

The survey results indicate that 14 of the 23 countries responded that they develop national ITS standards or guidance materials. These include 3 very large economies (China, Japan, USA), 6 APEC economies (Australia, Canada, Chinese Taipei, Hong Kong, Korea, Mexico), 4 European economies (Czech Republic, Hungary, Sweden, Switzerland) and South Africa.

The other 9 countries responded they do not develop national standards (or did not respond to the question). These countries included 6 members and associates of the E.U. (Austria, Germany, Norway, Slovakia, Sweden, United Kingdom), and 3 very small economies (Brunei Darussalam, Peru, Singapore). The 6 members of the E.U. cooperate together in the development of ITS standards as part of CEN, the European standards organization. The other 3 countries are relatively small economies for which ITS standards development on their own is uneconomic.

6.1.2 Does your country adopt international or regional ITS standards?

In the *stage I* survey, 9 of 23 countries responded they adopt ITS standards automatically. All 9 of these countries are members of or close neighbours of the E.U. (Austria, Czech Republic, France, Hungary, Norway, Slovakia, Sweden, Switzerland, United Kingdom). The E.U. has a requirement that its member states adopt CEN standards as they are completed. These 9 countries also reported that they adopt CEN standards automatically. This regional cooperation results in region-wide application of ITS standards and economy of effort in the development phase of standards.

There were 8 countries that responded they adopt ITS standards selectively (Australia, Canada, China, Chinese Taipei, Hong Kong, Japan, Korea, USA). This indicates that these countries do not enforce adoption of specific ITS standards but allow flexibility for local discretion. This may be essential for countries with large land areas (Australia, Canada, China, USA) with various climatic, social and economic conditions and for countries with dense populations with a variety of local social and economic conditions (Chinese Taipei, Hong Kong, Japan, Korea). It also enables these countries to selectively adopt ISO International Standards as well as national ITS standards.

Some of the 9 countries that have automatic adoption of CEN ITS standards also have automatic adoption from other standard development organizations. For example, ISO standards are automatically adopted by Czech Republic and Sweden, and ETSI standards are automatically adopted by Norway and United Kingdom.

There are 6 countries that did not respond to the question and additional information is required to determine their position on this issue (Brunei Darussalam, Germany, Mexico, Peru, Singapore, South Africa). They are listed as recognizing ITS standards.

Table 8 Different approaches to ITS standards development

No	Economy	APEC members	ISO/TC 204 members	Develop National's	ITS Std. Auto.	Adoption Selective
1	Australia	APEC	TC 204 – P	√		√
2	Austria		TC 204 – P		CEN	
3	Brunei Darussalam	APEC				
4	Canada	APEC	TC 204 – P	√		
5	China	APEC	TC 204 – P	√		√
6	Chinese Taipei	APEC		√		√
7	Czech Republic		TC 204 – P	√	ISO,CEN	
8	France		TC 204 – P	√	CEN	
9	Germany		TC 204 – P			
10	Hong Kong, China	APEC		√		√
11	Hungary		TC 204-P	√	CEN	
12	Japan	APEC	TC 204 – P	√		√
13	Korea	APEC	TC 204 – P	√		√
14	Mexico	APEC		√		
15	Norway		TC 204 – P		CEN,ETSI	
16	Peru	APEC				
17	Singapore	APEC	TC 204 – O			
18	Slovakia		TC 204 – O		CEN	
19	South Africa		TC 204 – P	√		
20	Sweden		TC 204 – P		ISO,CEN	
21	Switzerland		TC 204 – P	√	CEN	
22	United Kingdom		TC 204 – P		CEN,ETSI	
23	USA	APEC	TC 204 – P	√		√

6.1.3 Summary

A summary of the country responses to the two issues reviewed in this section is presented in the following chart.

The chart shows that there are clearly two clusters of countries representing two quite different approaches to developing and adopting ITS standards. These two approaches are:

1. The European approach of countries who do not develop their own national ITS standards but work together through CEN, a regional standards development organization, and then automatically adopt the regional ITS standards from CEN as their national ITS standards; and
2. The APEC approach, championed by most other countries outside of Europe, that develop national ITS standards, either a limited number or a comprehensive set, and then adopt ITS standards selectively as national ITS standards as required.

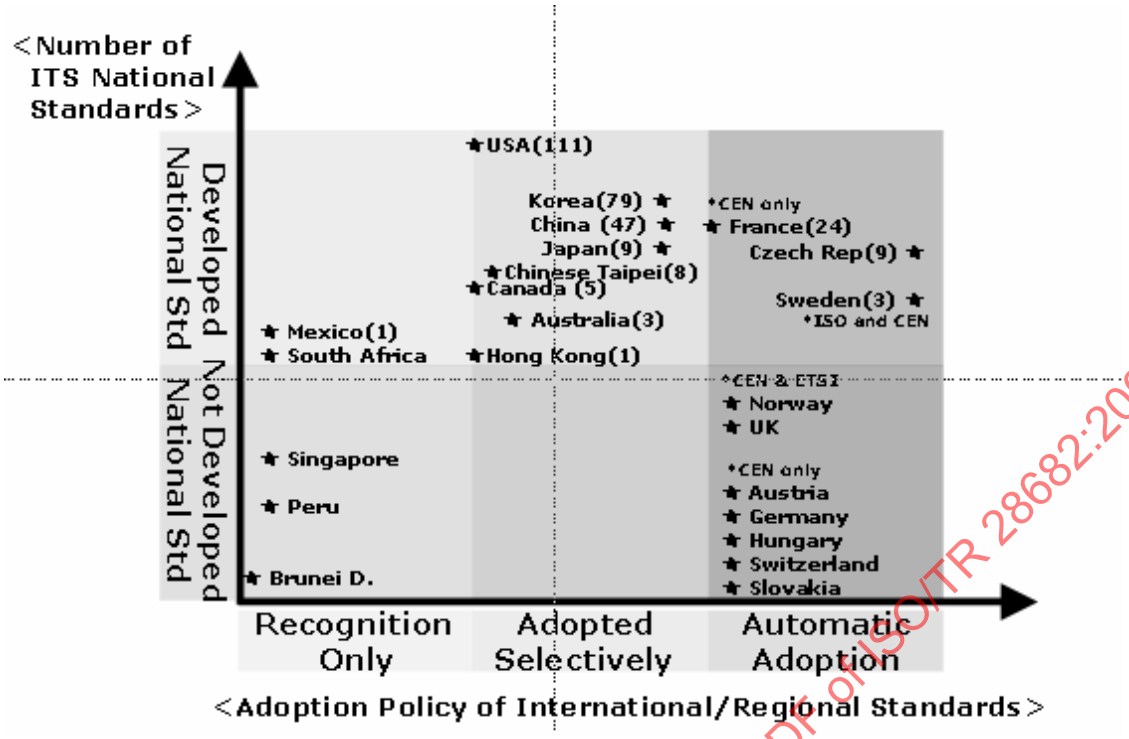

Figure 4 Different approaches to ITS standards development

Notes: Countries are coded according to their responses to two questions (1. Do you develop national ITS standards (including source materials? (No. is shown in parentheses); 2. Do you adopt ITS standards automatically or selectively (with source SDO(s) shown with *mark). Countries that did not answer the second question are listed under “Recognition”.

The existence of two approaches is well known in the ITS standards community. The results of the *stage I* and *stage II* surveys confirm these two approaches apply to ITS standards as well. In particular, the success of the European approach to develop ITS standards and get them introduced into practice quickly is well known and is a model that other regions of the world might find useful to emulate.

However, the countries in the non-European cluster do not have a mechanism like the EU to enforce adoption of standards. Also, they will likely wish to retain the flexibility to adopt ITS standards selectively. One reason is that international standards do not always reflect the particular needs of a country and some adaptation is necessary. Also, there is not a mechanism similar to CEN for non-European countries to use to coordinate closely the joint development of the standards they use. Therefore, these countries should focus on the benefits of closer regional cooperation to develop ITS standards and look for ways to accomplish this. Since all of the countries in the non-European cluster are located in the Asia-Pacific region and are already members of ISO/TC 204, this organization would be an appropriate one to use as a mechanism for greater regional as well as international ITS standards development cooperation.

It should be noted that some countries, most notably the U.S., have no general process for formally adopting ISO International Standards on a national basis. With rare exceptions, all standards usage in the U.S. is voluntary, whether the standards come from ISO or from domestic standards development organizations. In practice, American industry makes considerable use of ISO International Standards, including ISO ITS International Standards, but this use is market driven, and the decision is made individually by each company whether to adopt a standard for its products. In some cases, particular standards will be part of the stated requirements for a system being developed by a government agency or a private company. However, this does not constitute formal adoption of the standard on any larger basis than the project in question. In the U.S., the U.S. Dept. of Transportation has the statutory authority to mandate the use of a particular standard in ITS applications for which it provides funding, but in practice, it has done so only in one case, namely for the RF tags used for commercial vehicle credentials checking and safety clearance.

In Europe, the adoption of CEN standards by EU members is automatic. All CEN standards take precedence over national standards and countries, and in order to facilitate EU single market, any competing national standards must be phased out over a reasonable period of time. Adoption of ISO International Standards is generally voluntary, although most are normally adopted by most countries. In the European context "adoption" means that the national standards bodies publish the standards as ISO/National standards (e.g. IS/BS xxxxxx)

In both cases, unless a "Harmonised" EN standard is developed for a strategic area mandated by the EU (and there are not that many of these), the *USE* of standards, either CEN or ISO is voluntary. To be clear, this means that although a CEN or ISO standard may exist, there is no mandatory requirement to use it (unless it is a "Harmonised" standard).

This equates very much to the situation in USA regarding international standards- they are there and are frequently used but are not required. The closest thing to requirement is that for the tendering of public contracts in Europe "Available relevant standards must be taken into account".

Therefore while European Countries have largely responded "Adopted unless there is a National reason not to do so" , in practice in implementation this means the same as the US response "available but not adopted", because the use is voluntary and not mandated.

In many cases, in the ITS arena and elsewhere, a particular standard can be both a CEN standard and an ISO International Standard, having been developed jointly by both organization under the Vienna Agreement between the two organizations.

6.2 Different environment in ITS standards development

6.2.1 General

ITS standards are developed and adopted within a transportation development and social and economic environment within each country. This context is an important determinant of the standards development decisions as reflected in the responses to the questions in section 6.1. In this section 6.2, the broader context for ITS standards development in each country is explored. The *stage I* survey asked questions about a country's ITS laws, plans, national ITS organizations, standards strategy and ITS reporting. Specifically, the responses to each of the following questions in the *stage I* survey are reviewed:

1) Does your country have a national ITS law or Act?
2) Does your country have a national ITS basic or master Plan?
3) Does your country have a national ITS plan council?
4) Does your country publish a regular report on national ITS implementation?

5) Does your country have a national ITS organization?

6) Does your country have a national ITS standardization strategy?

7) Does your country have an ISO/TC 204 domestic committee?
8) Does your country publish a regular ITS standards report?

6.2.2 ITS law/act directly related to ITS? (4/21 or 19%)

Only 4 countries (Austria, Czech Republic, Korea, USA) or 19% of respondents reported that they have a law or act governing the implementation of ITS in their jurisdiction. Such legislation sets a very high standard for governing the implementation of ITS and imposes requirements on the ITS community. The following example highlights the SAFETEA-LU Act passed by the United States Congress in 2005 illustrates the nature of such legislation.

The "Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU) is an act to govern the federal governments role in the transportation activities of the nation. The funding for the activities under the Act comes from a federal tax collected by the "Highway Trust Fund" from a tax on the sale of gasoline in all states. These funds are quite substantial, amounting to $286.4 billion over the 6-year life of the legislation (2004-2009). An important function of the Act is to allocate funds to states for their use in

transportation investments and operations. Through the Act, Congress is able to influence the expenditure of these funds by the states and has directed that certain funds be used for ITS research, development and deployment purposes. This national focus has enabled the USA to exert a significant role in articulating and implementing ITS as an important element of surface transportation.

This basic law in the United States exists to govern and direct the spending of substantial funds available from the operation of the Highway Trust Fund. It is not clear from the limited information obtained through the *stage I* survey if the legislations or acts in the other 3 countries (Austria, Czech Republic, Korea) are also related to the allocation of funds for ITS.

6.2.3 ITS basic/master Plan? (13/21 or 62%)

Thirteen countries or 62% of respondents reported that they had an "ITS Basic Plan" or "ITS Master Plan" (Canada, China, Chinese Taipei, Czech Republic, Hong Kong China, Japan, Korea, Mexico, Norway, Slovakia, Sweden, Switzerland, USA). This is an essential tool for achieving harmony in the implementation of ITS across the surface transport sector. The three largest countries have an "ITS Basic Plan" (China, Japan, USA) and many mid-sized economies in Asia-Pacific (Canada, Chinese Taipei, Hong Kong, Korea, Mexico) and in Europe (Czech Republic, Norway, Slovakia, Sweden, Switzerland). It is noteworthy that none of the larger European countries (France, Germany, United Kingdom) reported the existence of an "ITS Basic Plan".

6.2.4 ITS plan council? (6/21 or 29%)

Six countries or economies reported that they have an "ITS Plan Council" (China, Chinese Taipei, Japan, Korea, Mexico, Switzerland). These six countries are located mostly in Asia-Pacific except for Switzerland that is in Europe. All 6 of these countries or economies reported that they have an "ITS Basic Plan " or "ITS Master Plan". It is reasonable to assume that their "ITS Plan Councils" are related to the implementation of their ITS Basic or Master Plans.

It is noteworthy that all of the countries or economies that reported they have "ITS Basic Plans" also reported, with one exception (China), that they have a national ITS organization. It is possible that the national ITS organization serve the same purpose as the ITS Plan Council but without dedicated budgets or assigned authorities. For example, in the case of the North American countries (Canada, USA), the national ITS organization are mechanisms for achieving community consensus on issues and for persuading the ITS community to adopt overall strategies and to implement action plans. It would be interesting to explore further if these are, in fact, two approaches and, if so, to assess the relative merits of each approach.

6.2.5 Regular report on ITS implementations? (6/21 or 29%)

Six countries or economies responded that they publish a regular report on ITS implementations (Canada, China, Chinese Taipei, Germany, Japan, USA). The utility of a regular report on ITS implementations is that it can be used to measure progress, for example, in the implementation of ITS plans.

It is noteworthy that the 3 largest countries that reported they have an "ITS Basic Plan" also reported they have regular ITS reports (China, Japan, USA). The scale of the ITS investments in each of these 3 countries is relatively large and they can therefore justify expending resources on regular reports for evaluation purposes.

6.2.6 ITS organizations (e.g. ITS America)? (18/21 or 86%)

National ITS organizations are present in almost every country responding to the *stage I* survey. National ITS organizations are organizations similar to ITS America. Only 3 countries (Austria, China, Peru) did not report the existence of a national ITS organization (although China reported an ITS Council that may accomplish the same purpose). The wide spread existence of these national ITS organizations confirms their usefulness, not only for serving national goals but also for facilitating international cooperation among national partners.

The ITS field is relatively new in the transportation sector and includes participants from the traditional civil engineering discipline as well as new emerging fields such as electronics and telecommunications. In this emerging arena of new ideas and technologies, it is important to seek consensus among the different players and their points of view. The national ITS organizations provide such a mechanism to foster cooperation and collaboration among public, private and academic sectors.

It must be noted that in the case of Europe, the ERTICO trans-national ITS organization serves a similar purpose to the national ITS organizations in individual countries. The existence of this regional ITS organization and its successful operation confirms the value of cooperation among players in the ITS field. Although not the subject of this survey, it is noted that their exist a number of regional ITS organizations to facilitate trans-national cooperation including ITS Asia-Pacific and ITS Pan-America.

6.2.7 ITS standardization strategy: (7/21 or 33%)

Seven countries or economies reported that they have an ITS standardization strategy (China, Chinese Taipei, Czech Republic, Hungary, Korea, Mexico, Switzerland). This is a useful instrument to raise awareness of ITS standards, identify needs and opportunities, and focus national effort on high priority work items and to direct resources, where these are made available. Five of these 7 countries are members of APEC. Their ITS standardization strategies indicate they have a strong commitment to ITS standards.

6.2.8 ISO/TC 204 domestic committee: (16/21 or 76%)

All countries that responded to the *stage I* survey, except the minor economies (Chinese Taipei, Hong Kong, Peru, Singapore) and one other (Mexico), reported that they have a domestic committee to support their participation in ISO Technical Committee 204. ISO is sponsored and supported by the national standards organizations of most countries and it is normal that there is a “mirror” committee for TC 204 in each country surveyed. The active promotion of ISO within the countries and economies of APEC has attracted a number of countries in Asia-Pacific to join ISO/TC 204.

The ISO/TC 204 domestic committees are the starting point for countries to participate in international standards development work. However, they are not effective for promoting adoption of ITS standards and there needs to be other complimentary activities to accomplish wide spread adoption. These activities could be implemented with support from the national ITS organizations. Ensuring that the broader environment for ITS development supports ITS standards is also essential.

6.2.9 Regular ITS standards report: 20% (5/21 or 24%)

Regular reporting on progress to develop ITS standards is one way to attract greater attention to the availability of ITS standards and to promote greater their greater adoption and use. However, only 5 countries that responded to the *stage I* survey reported that they publish a regular report on ITS standards. These include the 3 largest countries (China, Japan, USA) that have large economies and the greatest investments (or potential investments) in ITS. Two other countries (Czech Republic, Hungary) reported they publish a regular report on ITS standards so the size of the country is not an impediment. However, the availability of resources for this activity is no doubt a problem. This will only be rectified when senior decision makers agree to put more resources into ITS standards development.

6.2.10 Summary

This section has explored the environment in which national ITS standardization takes place. The two dimensions that were assessed in the *stage I* survey are the general institutional measures used to promote and guide ITS development in the country or economy and the measures use that are specific to ITS standards development and adoption. A particular interest of the APEC and Korea sponsored WRITSS project

is to establish if there are differences between the APEC countries and other regions of the world an, if so, what are these differences and can the APEC economies learn from the experience of other countries.

The results of the *stage I* survey for the ITS environment are presented in summary form in the table accompanying section 6.2. The 21 countries and their responses are presented in 2 groups of countries – APEC and Europe (CEN) – with one other country that belongs to neither group. The objective is to highlight any significant differences between these 2 groups of countries. The focus on Europe (CEN) countries is because it is a coherent "block" of countries, mainly in the E.U. or in Europe, with a long tradition of cooperation in standards development including ITS standards development. While not telling the whole story, a number of observations can be derived from the table.

A summary of the responses received from the countries in the *stage I* survey is shown in the following table. It highlights similarities/differences between APEC and Europe (CEN) countries/economies.

Table 9 Different environment in ITS standards development

No	Economy	APEC	CEN	ISO TC 204	ITS Law	ITS Plan	ITS Council	ITS Report (reg.)	ITS Org.	ITS Std. Strategy	ISO TC 204 Domestic Comm.	ITS Stds Report (reg.)
1	Australia	√		√-P					√		√	
2	Canada	√		√-P		√		√	√		√	
3	China	√		√-P		√	√	√	?	√	√	√
4	Hong Kong, China	√				√			√		N/A	
5	Japan	√		√-P		√	√	√	√		√	√
6	Korea	√		√-P	√	√	√		√	√	√	
7	Mexico	√				√	√		√	√	N/A	
8	Peru	√									N/A	
9	Singapore	√		√-O					√		N/A	
10	Taipei, Chinese	√				√	√	√	√	√	N/A	
11	USA	√		√-P	√	√		√	√		√	√
12	Austria		√	√-P	√						√	
13	Czech Rep.		√	√-P	√	√			√	√	√	√
14	Germany		√	√-P				√	√		√	
15	Hungary		√	√-P					√	√	√	√
16	Norway		√	√-P		√			√		√	
17	Slovakia		√	√-O		√			√		√	
18	Sweden		√	√-P		√			√		√	
19	Switzerland		√	√-P		√	√		√	√	√	
20	U.K.		√	√-P					√		√	
21	South Africa			√-P					√		√	
	Total	11	9	17	4	13	6	6	19	7	16	5
	- APEC	11	0	7	2	8	5	5	10	4	6	3
	- Europe(CEN)	0	9	9	2	5	1	1	8	3	9	2

Notes: The 21 responses to *stage I* survey are grouped into 11 APEC and 9 Europe (CEN) countries and 1 exception (South Africa). The first column indicates the country's alphabetic order among all 21 responses.

6.2.10.1 ITS development and deployment:

- Almost all countries in both the APEC and Europe (CEN) groups reported they have an ITS plan; these are important building blocks to guide the development and deployment of ITS within a country and economy;
- Almost all countries in both the APEC and Europe (CEN) groups reported they have national ITS organizations; these are important as forums to discuss and resolve issues as the ITS plans are evolved and rolled out in practice;
- Almost all the countries in both APEC and Europe (CEN) are members of ISO/TC 204 with the exception of the "economies" in Asia that do not qualify to join ISO on their own or are too small to participate;

- APEC countries or economies (5 of 11) are more likely to have an ITS Plan Council while only one Europe (CEN) member reported they have an ITS Plan Council; this may indicate a different approach to ITS in Asia, at least, for guiding the roll-out of ITS in their countries;
- More APEC than Europe (CEN) countries (5 versus 1) reported they publish regular national ITS reports;

6.2.10.2 ITS standards development and adoption

- Almost all countries in both the APEC and Europe (CEN) groups reported that they are members of ISO/TC 204; this confirms their collective interest in working together on ITS standards development and also in helping to establish an agree international baseline for ITS standards;
- Only 7 of 21 countries reported they have ITS standards strategies and this sub-group is not closely associated with either the APEC or Europe (CEN) groups; this may indicate there is only limited attention paid to this aspect of standards planning;
- Only 5 of 21 countries reported they publish regular reports on ITS standards and this sub-group is not associated with the APEC or Europe (CEN) groups; this may also indicate a limited attention to measuring progress in ITS standards development at the national level;

6.2.10.3 Sub-groups of countries within APEC

- The 2 North American countries (Canada, USA) with similar economic and social conditions, reported identical responses to all questions except one (USA publishes a regular report on ITS standards); the fact that Mexico, part of the NAFTA trading block, has very different responses may be due to the very different economic and social conditions in that country that influence the approach taken to ITS and ITS standards;
- The responses from the 4 largest countries in APEC (China, Japan, Korea, USA) were also similar in most respects indicating that economies that can afford mature and comprehensive ITS and ITS standards activities arrive at similar conclusions;

6.2.10.4 Europe (CEN group of countries)

- The 27 Europe (CEN) countries share common responses in not having a basic ITS law (2 exceptions), not having ITS plan councils (1 exception), not having regular ITS reports (1 exception), not having national ITS standards strategies (3 exceptions), and only 2 countries reported having regular ITS standards reports; the similarity of the approaches by these countries may be due to the existence of regional institutions such as the E.U. Commission (for planning), ERTICO (for cooperating) and CEN (for standards development) whereby these institutions provide the mechanisms that APEC countries provide on their own.

6.3 Status of ITS standards development worldwide

6.3.1 General

The WRITSS project has documented 662 ITS standards and standards-related work items from around the world (see Annex A for list). These include standards classified as international (ISO, ISO/IEC, ITU-R), regional (CEN, ETSI, IEEE), and national (by country) that have been developed either by national standards development organizations (e.g. AFNOR in France) or by national agencies responsible for aspects of transportation safety and/or productivity (e.g. NPA in Korea). The list in Annex A includes information about the class of each standard or work item, the originator of the standard (i.e. SDO), the work item reference number and status indicator, and the title.

6.3.2 International Standards

There are 208 international standards in Annex A including 166 from ISO, 36 from ISO/IEC, and 6 from ITU-R (that include 2 general work categories rather than specific work items). The list includes work items at all stages of development – preliminary work items (PWI), new proposals (NP), committee drafts (CD), technical reports (TR), draft International Standards (DIS), final drafts (FDIS) and completed International Standards (IS).

The ISO Technical Committee 204 (TC 204) is the focal point in ISO for Intelligent Transportation System (ITS) standards. TC 204 has 131 work items in its work program and they are organized into 12 working groups that cover all vehicle and infrastructure related work areas. There are also important ITS related work items in TC 22/SC13 (Vehicles), TC 211 (GIS), and TC 122/104 JWG (Intermodal Freight?), and TC 104/SC4 (???).

The ISO/IEC work items are cooperative efforts that fall within the purview of the Joint Technical Committee (JTC) 31, working group 4. The most important part of this work relates to radio frequency identification (RFID) that is common to many ITS wireless communication functions.

The ITU-R work items fall under 2 areas – Working Party 6M and WP8A. The ITU is responsible for spectrum allocation globally and between regions.

6.3.3 Regional standards

There are 126 regional ITS standards in Annex A including 104 from CEN, 3 from ETSI, and 24 from IEEE.

The Conseil European de norme (CEN) is a Europe-based standards development organization that has a mandate for developing standards on behalf of the European community. All of the ITS related standards work is conducted in Technical Committee 278 (TC 278). This committee is structured into a number of working groups similar to ISO/TC 204. Many European ITS experts who contribute to CEN/TC 278 also contribute to ISO/TC 204 that achieves economies of effort and expertise..

The ETSI ITS standards relate to roadside units and on-board units for signal exchanges with particular reference to the European context.

The IEEE standards development organization has global recognition but its main audience for rail-related ITS standards is focused in the USA. For this reason, it is classed as a regional standards development organization. However, the IEEE work items related to rail transit makes it a unique contributor to the ITS standards development field.. Note that IEEE also plays a significant role in the development of national standards in the USA (see section 6.3.3).

6.3.4 National and other important standards

There are 326 ITS standards-related work items under development or completed intended for application within national jurisdictions, almost half of the global total. Many of these are formal standards, having been developed by accredited standards development organizations such as AFNOR in France, KATS in Korea, ASTM in USA. Other examples represent national efforts to define requirements and to identify and adapt existing standards from other sources to meet local needs. An example of this is the technical guidelines developed by Canada for road-weather information systems. The summary table in section 6.3.4 provides an overview of the number of national ITS standards work items under development.

6.3.5 ISO/TC 204 standards adopted by national standards bodies

With the strong cooperative relationship, the ISO/TC 204 and CEN TC 278 share common work items 58 standards (39 published and 19 under development) and this reaches about half of work items of ISO/TC 204 or CEN 278. As the majority of European countries automatically adopt CEN TC 278 standards, as described in section 6.1, it is estimated that many of the ISO/TC 204 – CEN TC 278 shared standards are widely recognized or used in European countries.

This Technical Report has identified 33 national standards are adopted from ISO/TC 204 standards and the number is somewhat disappointing. This indicates that the majority of the APEC economies do not adopt ISO/TC 204 standards as national standards yet. The exceptions are China, Japan and Korea. The result revisits the statements of 6.1.3: *One reason is that international standards do not always reflect the particular needs of a country and some adaptation is necessary. Also, there is not a mechanism similar to CEN for non-European countries to use to coordinate closely the joint development of the standards they use. Therefore, these countries should focus on the benefits of closer regional cooperation to develop ITS standards and look for ways to accomplish this.*

Table 10 List of national standards adopted from ISO/TC 204

No	Country	Types	Number	Title	SDO
1	Australia	National Std.	ISO 14817	Transport information and control systems - Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries	SA
2	China	National Std.	ISO TR 14813-1:1999	Transport information and control systems -- Reference model architecture(s) for theTICS sector -- Part 1: TICS fundamental services	ITSC
3	China	National Std.	IS 14817:2002	Transport information and control systems -- Requirements for an ITS/TICS central DataRegistry and ITS/TICS Data Dictionaries	ITSC
4	China	National Std.	IS 14819-1:2003	Traffic and Traveller Information (TTI) -- TTI messages via traffic message coding -- Part1: Coding protocol for Radio Data System -- Traffic Message Channel (RDS-TMC) usingALERT-C	ITSC
5	China	National Std.	IS 14819-2:2003	Traffic and Traveller Information (TTI) -- TTI messages via traffic message coding – Part 2: Event and information codes for Radio Data System -- Traffic Message Channel (RDSTMC)	ITSC
6	China	National Std.	ISO TS 14819-3:2000	Traffic and Traveller Information (TTI) -- TTI messages via traffic message coding -- Part 3: Location referencing for ALERT-C	ITSC
7	China	National Std.	IS 15622:2002	Transport information and control systems -- Adaptive Cruise Control Systems --Performance requirements and test procedures	ITSC
8	China	National Std.	ISO TS 14904:2002	Road transport and traffic telematics -- Electronic fee collection (EFC) -- Interfacespecification for clearing between operators	ITSC
9	Japan	National Std.	14813-5	Reference Model Architecture for the ITS Sector - Requirements for Architecture Description in ITS standards	JISC
10	Japan	National Std.	14813-6	Reference Model Architecture for the ITS Sector - Data Representation Using ASN.1	JISC
11	Japan	National TR	14812	Glossary of ITS terminologies	JISC
12	Japan	National Std.	15622	Adaptive Cruise Control Systems	JISC
13	Japan	National Std.	15623	Forward Vehicle Collision Warning System	JISC
14	Japan	National TR	14813-1	ITSReference Model Architecture for the ITS Sector - ITS Fundamental Services	JISC
15	Japan	National TR	14813-2	Reference Model Architecture for the ITS Sector - Core ITSS Reference Architecture	JISC
16	Korea	National Std.	KS X ISO 14813-6	Transport information and control systems -- Reference model architecture(s) for the TICS sector -- Part 6: Data presentation in ASN.1	KATS
17	Korea	National Std.	KS X ISO 14815	Road transport and traffic telematics -- Automatic vehicle and equipment identification -- System specifications	KATS
18	Korea	National Std.	KS X ISO 14816	Road transport and traffic telematics -- Automatic vehicle and equipment identification -- Numbering and data structure	KATS
19	Korea	National Std.	KS X ISO 14817	Transport information and control systems -- Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries	KATS
20	Korea	National	KS X	Traffic and Traveller Information (TTI) -- TTI messages via traffic	KATS

No	Country	Types	Number	Title	SDO
		Std.	ISO 14819-1	message coding -- Part 1: Coding protocol for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C	
21	Korea	National Std.	KS X ISO 14819-2	Traffic and Traveller Information (TTI) -- TTI messages via traffic message coding -- Part 2: Event and information codes for Radio Data System -- Traffic Message Channel (RDS-TMC)	KATS
22	Korea	National Std.	KS X ISO 14819-3	Traffic and Traveller Information (TTI) -- TTI messages via traffic message coding -- Part 3: Location referencing for ALERT-C	KATS
23	Korea	National Std.	KS X ISO 14827-1	Transport Information and control systems -- Data interfaces between centres for transport information and control systems -- Part 1: Message definition requirements	KATS
24	Korea	National Std.	KS X ISO 14827-2	Transport information and control systems -- Data interfaces between centres for transport information and control systems -- Part 2: DATEX-ASN	KATS
25	Korea	National Std.	KS X ISO 14904	Road transport and traffic telematics -- Electronic fee collection (EFC) -- Interface specification for clearing between operators	KATS
26	Korea	National Std.	KS X ISO 14907-1	Road transport and traffic telematics -- Electronic fee collection -- Test procedures for user and fixed equipment -- Part 1: Description of test procedures	KATS
27	Korea	National Std.	KS X ISO 15075	Transport information and control systems -- In-vehicle navigation systems -- Communications message set requirements	KATS
28	Korea	National Std.	KS X ISO 15622	Transport information and control systems -- Adaptive Cruise Control Systems -- Performance requirements and test procedures	KATS
29	Korea	National Std.	KS X ISO 15623	Transport information and control systems -- Forward vehicle collision warning systems -- Performance requirements and test procedures	KATS
30	Korea	National Std.	KS X ISO 17261	Intelligent transport systems - Automatic vehicle and equipment identification -- Intermodal good transport architecture and terminology	KATS
31	Korea	National Std.	KS X ISO 17262	Automatic vehicle and equipment identification -- Intermodal goods transport -- Numbering and data structures	KATS
32	Korea	National Std.	KS X ISO 17263	Automatic vehicle and equipment identification -- Intermodal goods transport -- System parameters	KATS
33	Korea	National Regulation	MOCT 2004-513	Technical Regulation for Basic Transport Information Exchange (ISO 14827-1, -2 compatible) (ISO 14827 based)	MOCT

6.3.6 Summary

The issue to consider is, if technology is scientific and therefore universal, why is technical ITS standards development being conducted at national, regional and international levels with apparent duplication of effort and cost? It raise the question: is there not one technical solution for each problem and therefore a need for only one standard and one standard development effort? The answer lies in a number of factors – national policy (pride, trade barriers?), language barriers, unique technological choices made in related areas (e.g. broadcasting policies), cost factors (especially travel costs), and other phenomena that influence standards decision making. Even with the finest effort put into developing an international standard, there is still a need to adapt it to local circumstances (e.g. climate, social attitudes). In the other direction, national and regional standards can be developed at lower costs than international standards (especially since distances are shorter and therefore travel costs are lower) and it is easier and quicker to develop them first at this level and then to transfer them to the international level.

The following table summarizes the 662 ITS standards identified by the *stage I* and *II* survey in the categories of international, regional and national.

Table 11 Survey summary: International and regional ITS standards

Class	SDOs	Published	Under Development	Total
International	ISO	60	106	166
	ISO/IEC JTC 1	14	22	36
	ITU-R	4	2	6
	Sub-Total	78	130	208
Regional	CEN	61 (TC 204:39)	43 (TC 204: 15)	104
	ETSI	3	-	3
	IEEE	20	1	21
	Sub-Total	84	44	128
Total		**162**	**174**	**336**

Table 12 Survey analysis: National standards and source materials

Economy	Published		Under development	Total
	National standard (no. adopted from ISO)	TR, TS, Guide, and Association standards		
Australia	3 (TC 204:1)			3
Canada		4	1	5
China	7 (TC 204:7)		40	47
Czech Republic		7	2	9
France	15	1	8	24
Hong Kong, China		1		1
Japan	5	30		35
Korea	28 (TC 204:17) (9 regulations included)	49	2	79
Mexico			1	1
Sweden	1			3
Taipei, Chinese	3 (TC 204:1)			8
USA	111			111
Total	**173 (TC 204:26)**	**99**	**54**	**326**

6.4 Conformance features of ITS standards

Among seventeen responses for the *stage II* survey, fourteen countries explained that there exists no conformance requirements; Australia, Brunei, Canada, China, Chinese Taipei, Hong Kong China, Japan, Peru, Singapore, South Africa, USA. The other three countries, Austria, France and Korea provided short brief of conformance requirements.

Austria described in the survey response that conformance activities are done in parts third party certification, but mostly, self-declaration is applied.

France described that there is certification process for the toll tags for fee collection. This process is operated by a private company on the basis of the European standards. Also, France mentioned that it has a certification process for LCR road equipments which is operated by administration

Korea described several certification requirements for different purposes. Korean Standards Association(KSA) is responsible for certification of the Korean national standard KS. ITS Korea is Also, ITS Korea takes the responsibility for the conformance tests on ITS technical regulations regulated by Ministry of Construction and Transportation (MOCT). There are some certification processes for telecommunications by Telecommunication Technology Association (TTA). Road Traffic Safety Authority (RTSA), a subsidiary organization under National Police Agency (NPA), is chartered to conformance procedures for Traffic control systems operated by NPA. Also, Korea Highway Corporation is conducting some certification activities for ETC for freeway and Freeway Management Systems.

6.5 List of ITS standards applied

Question 1 of the *Stage II* survey asked if any ITS standards were used for project specification or ITS application deployment. If so, then a summary of those standards was requested. Of the respondents, nine Countries/Economies responded with 100 projects in which standards were used. In one a single project was reported while in other cases only a representative sample was reported. Annex B.2 provides a consolidated list of the ITS.

Of all projects reported, 75 % were characterized as High significance. High/Medium was 1%; Medium was 16%; Medium/Low was 4; Low was 3%. There was one blank.

Of all projects reported, 64% were categorized as public type; 22% were joint public/private; 12% were private.

In many cases, projects were allocated multiple subdomains and in some cases only to the domain level. Table y reports the number of projects (of the 100 reported) that make reference to a particular service domain at least once. The highest number of project references were made to service domain 7, transport-related electronic payment.

Table 13 ITS standards applied by category

Service domain	Number of project references
1. Traveller Information	21
2. Traffic management and operations	27
3. Vehicle	0
4. Freight transport	9
5. Public transport	5
6. Emergency	4
7. Transport-related electronic payment	41
8. Road transport-related personal safety	3
9. Weather and environmental conditions monitoring	6
10. Disaster response management and coordination	2
11. National security	1
All domains	2

6.6 Lessons learned

As a follow-on to Question 1 of the *stage II* survey, Question 2 asked respondents to complete a brief report on any insights gained where ITS standards were used for project specification or ITS application deployment. Table x presents a listing of the titles of the lessons learned and Annex C provides a compilation of the responses. Each lesson includes a context, the lesson(s) learned, and a contact for further information on the lesson.

Table 14 Summary of Lessons Learned

Economy (Lesson No.)	Lesson Title	Date Reported	Location
Australia (Lesson 1)	Requirement for a data registry for ITS Harmonization	2002 - 2005	Victoria and Australian Capital Territory, Australia
Australia (Lesson 2)	Requirement for interoperable transit ticketing cards	2003 - 2006	Western Australia, Queensland, Victoria and New South Wales, Australia
Australia (Lesson 3)	Electronic tolling relies on standardization	1997 - 2006	New South Wales, Australia
Canada (Lesson 4)	Use common tag with related ITS Services: Use ITS standards already adopted by related ITS systems to reduce time to implement new ITS services	2004-November (date of acceptance of project proposal)	Nova Scotia, Canada
Canada (Lesson 5)	Reward payment system to ensure data quality from automated ITS traffic recorder stations	2004-September	Alberta, Canada
Canada (Lesson 6)	ITS system integration on 98 B-Line BRT using “standardized” equipment ensures interoperability throughout the network	2000-present	British Columbia, Canada
Canada (Lesson 7)	Ontario "Advanced Traffic Management Systems" - Standards	2006 – 01 - 09 (submission date)	Ontario, Canada
Japan (Lesson 8)	International Standard has secured interoperability of UD communication systems, but need some additional specifications to meet national requirements	2003-10	Japan
Japan (Lesson 9)	DATEX ASN for road information Dissemination Systems	2002-04	Tochigi Prefecture, Japan
Korea (Lesson 10)	Speeding up the deployment of national "Electronic Toll Collection System" (ETCS) by using the standardized communication protocol * KS X 6915 IR DSRC for ITS applications ISO FDIS 15628 DSRC application layer	2004-02	Seoul Metropolitan Areas, Korea
Korea (Lesson 11)	Improving the effectiveness of public transport systems by using the "Standard Numbering System for Public Transit Stops" (SNSPTS) *ISO NP 17685 SNSPTS	2004-12	Seoul Metropolitan Areas, Korea
Korea (Lesson 12)	Improving the compatibility and interoperability of the public transit Information systems by using the technical regulation for the public transit information exchange	2005-08	Seoul Metropolitan Areas, Korea
Korea (Lesson 13)	Building the standard location referencing system for the effectiveness of exchanging traffic information among the various ITS centres	2005-10	Freeway, national and regional highway in Korea

Korea (Lesson 14)	To facilitate use of ITS standards, the standards development organizations (SDO) should consider providing the contents 'How to use a standard' or 'How to certify a standard'.	2005-12	Korea
Korea (Lesson 15)	In ITS/telematics field, there has been increasing needs for more strategic approaches on how to cooperate among standards developers. ISO might consider providing guideline how to effectively cooperate to add value to existing liaison regime.	2005-12	Korea
Switzerland (Lesson 16)	MEDIA Project ("Management of Electronic Fee Collection DSRC Interoperability in Alpine Region"), (ISO and CEN DSRC standards suite)	2005-07	France/Switzerland/Italy/ Austria/Slovenia
United States (Lesson 17)	Recognize that interoperability is becoming an important issue in achieving the vision of a nationwide 511 system. *A national experience with the development and deployment of 511 Systems.*	September 2003	California, Kentucky, Ohio, USA
United States (Lesson 18)	Use public sector workshops to increase awareness of ITS standards. *Minnesota DOT's experiences with a public sector workshop on ITS standards.* (This lesson is collected separately from www.itslessons.its.dot.gov)	May 2000	Minnesota, USA
United States (Lesson 19)	Understand system standards and protocols to save time during the development of an "Advanced Traveller Information System" (ATIS). *Institutional lessons from a test of a wide-area network to communicate traffic conditions in the Seattle area.* (This lesson is collected from the www.itslessons.its.dot.gov)	October 1998	Washington, USA
United States (Lesson 20)	Include significant planning and development time in the overall project schedule to accommodate identifying and addressing the various compatibility issues, to integrate existing legacy system equipment across multiple agencies. *Orlando, Florida's experience with a Field Operational Test (FOT) on using a single smart card for transportation payments at facilities operated by multiple regional agencies.* (This lesson is collected from the www.itslessons.its.dot.gov)	December 2004	Florida, USA

7 Observations and recommendations

7.1 Cooperation between SDOs

In Section 4.6 this Technical Report compares the standardization efforts between the many SDOs that are involved in ITS standardization. The largely successful relationship between ISO/TC 204 and CEN TC 278 provides a model, although there have consistently over the years been problems with the efficient parallel balloting of common deliverables. The evolving relationship between ISO/TC 204, ETSI ERM TG37 and CEN TC 278 show promise of similar efficiency. There are dangers and inefficiencies in the relationships with and between many other SDOs involved in ITS standardization. The ITU TELEMOV initiative is helping to improve cross SDO cooperation, but ITU standardization groups tend to operate remotely without making effort to integrate themselves into the general ITS standards development work. This poses three problems.

Of course the greatest problem are "competing" standards. To some extent the market will work out what it prefers, but where the subject areas are very close, this will create problems. A second problem is that there is evidence of promoters of one technical solution, failing to get their own way in one SDO, re-titling their proposal and going to a different SDO. Finally, and perhaps the biggest problem, is the shortage of resource and budget to attend meetings in multiple SDOs to deal with the same subject, and have to fight the same arguments to consensus several times, often with different result.

This study identifies that there are increasing needs for more strategic approach for cooperation with internal/external SDOs. (ISO/TC 204 - CEN/TC 278, ETSI, TC 22(JWG),TC 211(LBS, uGIS - JTF), SC31(RTLS), TC 104-122(RFID for SCM), APEC(JPG), etc)

Thanks to significant efforts, largely from participants in the working groups, but assisted by the secretariats, ISO/CEN and ETSI have developed good and effective working relationships, although it is true to say that liaison between some individual working groups could be further improved.

7.1.1 Recommendation: Relationships between SDO's

Greater effort should be made between SDOs to improve relationships, particularly ISO/TC 204 with IEEE at CS level, and with ITU at working party levels, and to improve interchange with other liaison SDOs

7.1.2 Recommendation: Teleconferencing

With increased travel and disbursement costs, the increased number of meetings, Joint meetings between SDO WG s and teleconferences should be encouraged

Within the ISO/TC 204 and CEN TC 278 environments, there has generally been good participation with National Member bodies. The relationships have matured and are generally now effective. New country members have been attracted to TC 204 both as P and O members. Where work is led by ISO there still remains a problem for some CEN countries participating. In part this is political, but is principally a cost issue.

7.1.3 Recommendation: VOIP/Video conferencing

There should be greater initiatives to promote VIOP and Video conferencing over the internet as the technology evolves. ISO CS, CEN CS, and ETSI CS should be taking the initative to develop effective means of achieving this. NOTE: Experience from WG s who have experimented with these techniques is that they are most effective is specific subject based teleconferences. General WG progress aspects of meetings are not well catered for by teleconferencing.

A final conclusion that we can draw in this section is that, as technology evolves and the sector reaches maturity and the implementation phases of development, there are increasing needs for Ubiquity oriented ITS standards development, and that further liaisons will be needed both in the telecommunications sector and in other related sectors, such as RFID.

7.1.4 Recommendation: Cooperation with ubiquity oriented community

There should be further cooperation with on ubiquity oriented ITS standards community, such as RFID

7.2 Different approaches

Sections 6.1 and 6.2 show that the approaches to the use of ITS standards differ quite considerably form country to country.

Particularly, there are clearly two clusters of countries representing two quite different approaches to developing and adopting ITS standards. These two approaches are:

1. The European approach of countries who do not develop their own national ITS standards but work together through CEN, a regional standards development organization, and then automatically adopt the regional ITS standards from CEN as their national ITS standards; and
2. The non-European approach, championed by most other countries outside of Europe, that develop national ITS standards, either a limited number or a comprehensive set, and then adopt ITS standards selectively as national ITS standards as required.

In particular, the success of the European approach to develop ITS standards and get them introduced into practice quickly is well known and is a model that other regions of the world might find useful to emulate.

However, the countries in the non-European cluster do not have a mechanism like the EU to enforce adoption of standards. Also, they will likely wish to retain the flexibility to adopt ITS standards selectively. One reason is that international standards do not always reflect the particular needs of a country and some adaptation is necessary. Also, there is not a mechanism similar to CEN for non-European countries to use to coordinate closely the joint development of the standards they use.

Therefore, these countries should focus on the benefits of closer regional cooperation to develop ITS standards and look for ways to accomplish this. Since all of the countries in the non-European cluster are located in the Asia-Pacific region and are already members of ISO/TC 204, this organization would be an appropriate one to use as a mechanism for greater regional as well as international ITS standards development cooperation

While the participation in TC 204 has increased, and some APEC countries, especially Japan and Korea, make significant participation in and contribution to TC 204, this is not widely true for other countries, including those, like China, who have active ITS strategies. This is short-sighted, as participation in WG activity, as well as assisting to produce relevant standards for these countries, also provides an excellent learning opportunity.

7.2.1 Recommendation: APEC participation in ITS standards activities

ALL APEC TPT members are encouraged to more actively participate in international standardization activities, particularly ISO/TC 204.

7.2.2 Recommendation: ITS standards development in a regional context

ALL developing economies should approach ITS standards developments and deployments considering their respective regional, social and economic environment instead of simply following one country's model.

7.3 Standards development worldwide

7.3.1 Review

Section 6.3 identifies that there are 662 ITS standards identified from the survey. It includes 208 international, 126 regional standards, and 326 national standards and source materials under development or completed intended for application within national jurisdictions, almost half of the global total.

This Technical Report observes that there is apparent duplication of effort and cost, and this seems to be due to a mixture of factors. The factors include national policy (pride, trade barriers?), language barriers, unique

technological choices made in related areas (e.g. broadcasting policies), cost factors (especially travel costs), and other phenomena that influence standards decision making and that even with the finest effort put into developing an international standard. There is still a need to adapt it to local circumstances (e.g. climate, social attitudes). The report also notes that it is easier and quicker to develop local standards first and then to transfer them to the international level, however this carries significant risks.

The report demonstrates a wide umber of standards already published and in advanced state of development. There is some concern that pursuing national standards in advance of International Standardization will make the latter more difficult to achieve successfully and may inhibit interoperability.

7.3.1.1 Recommendation: APEC regional harmonization

APEC should identify an appropriate mechanism to improve its regional harmonization of standards and to avoid duplication of efforts and cost in standards development within the region.

7.4 Conformance features

7.4.1 Review

Section 6.4 describes conformance features of ITS standards. In considering the list of achieved standards, and work items under development, it becomes quickly obvious that, although there are many specifications, there are few standards for conformance and performance. This reflects, to some extent the still early stage of implementation of many ITS services, however, it will become a significant omission as the process unfolds. An exception is the work of ETSI where the emphasis is as much on conformance and performance standards and interoperability studies.

Different countries have different views about how standards should be used, but it seems clear that, with the exception of ETSI standards, many standards do not clearly specify how conformance (and in some cases) performance is measured, or point to specific conformance standards where such measurement is defined.

Clearly, "Technical Reports" and generic "Technical Specifications" do not have the same needs to ensure compliance as full International Standards, and deliverables that take the form of "User Guides" do not generally have the same need for compliance procedures. However, in a world where the trend is towards "self certification", the procedures to measure whether or not there is compliance need to be very clearly defined and specified. The absence of adequate conformance specifications will lead to a loss of interoperability- one of the principal objectives of the development of the standards.

7.4.1.1 Recommendation: Compliance

ALL SDOs should re-examine their achieved deliverables and deliverables in progress to establish if there are adequate specified procedures to determine whether something is in compliance with/or out of compliance with the standard.

7.4.2 Trend to open systems

A further point that has cropped up several times in this Technical Report, is that, as the trend to open systems expand, and a trend to self certification progresses, that both vendors and users require clear instruction to enable them to test conformance and measure performance claims in a consistent manner.

We have already made a recommendation that working groups should examine their deliverables to ensure that there are adequate means of measuring and testing conformance to a standard and test performance claims.

However, this alone may be inadequate and the "User Guides" that have been developed by some working groups (e.g. ISO/TC 204 WG 1) provide a good first step but are not enough, and it is noted that the "voluntary effort" of developing standards is not by itself an adequate model in that, while vendors have a business case to agree common standards for interoperability, they find greater difficulty cost justifying such

user guides. One of the weaknesses of developing "timely" standards to enable a market to develop is that there is no great established user base (the normal group that has a business case interest to develop such implementation guidelines) at the time that these implementation guidelines are required in order to stimulate the take up in the market place.

7.4.3 Recommendation:

APEC, EU, National Governments and SDOs are encouraged to sponsor the development of implementation guideline and conformance requirements.

7.5 ITS standards deployments

7.5.1 Review

Section 6.5 describes ITS standards. Even though it will be very helpful for any potential users to have the list of standards applied in the areas where they plan to implement for benchmarking and cooperation purpose, there are limited source or cases to have such data.

With the purpose, *stage II* survey results and section 6.5 provides an indicative summary of standards deployed, but noted that it had proven impossible to provide a detailed and accurate summary because this information was not centralised nor controlled and often the subject of local decision.

7.5.2 Usage and outreach

In drawing our conclusions, we note that the importance of ITS standards deployed was evaluated very high. But have to note that only some international ITS standards are widely referred/adopted and used. This is partly because of timing, most instantiations have yet to be implemented, but needed the standard to move forward, on the other hand, some of the earlier standards are now long in the tooth and technology has moved on since they were approved. It is noted that, in developing standards for ITS, the development and availability of standards is an enabling mechanism for the market to develop, but as they precede widespread implementation, it is only natural that some will wither and die.

Another conclusion that we can draw from the responses is that the outreach activities are widely appreciated and provide valuable experience, training and networking. However the voluntary based development of standards, while it contains the right experts for outreach, has little or no resources to run outreach programmes.

7.5.2.1 Recommendation: Outreach activities

APEC, EU, and National Governments are encouraged to sponsor outreach activities on a regular basis.

7.5.3 Compendiums and publicity material

While there is now an army of experts, advocates, developers and supporters of ITS standards, once we move into the user and implementer community, there is a large body that don't recognize the standards, don't know how to use them.

We conclude that, while some of this is the normal commercial pressures for vendors to try to push their own solutions regardless of the longer term and strategic consequences, much of the responsibility must lie with the complexity of the SDO standardization matrix, and with SDOs vying and competing with each other to the user community.

7.5.3.1 Recommendation: Compendiums and publicity material

APEC, EU, National Governments and all SDOs should work to develop compendiums and publicity material in a cohesive manner to make it easier for users to understand and adopt ITS standards.

7.6 Lessons learned

7.6.1 Review

Section 6.6 provides the summary of lessons learned in ITS standards development and deployment. Underlying themes suggested by the lessons learned in section 6.6 and Annex C include the following recommendations with original sentences submitted by ISO and APEC members in *stage II* survey:

7.6.1.1 Recommendations: Interoperability issues

All ITS system builders should keep in mind that the standards development or interoperability issues should be a part of planning process

- Ensure the standards development process is part of the business planning (Lesson 2- Australia)
- There should be an architecture level standard developed very early and used to explain the business case and to guide the tendering process by the jurisdiction procurements authorities (Lesson 2- Australia 2)
- Government, provincial authorities and other organizations funded by government should consider (the possibility of) standardization and applicable standards prior to the operation of project (Lesson 10 - Korea 1)
- We can not proceed ITS interoperable implementation further without the enabling standard like location referencing standard and so on. It can not overemphasize the importance of critical standards. So let's not waste our time by ignoring the necessity of critical standard (Lesson 11 - Korea 4)
- MEDIA(Management of Electronic Fee Collection DSRC Interoperability in Alpine Region) has the objective to find and implement a concrete solution to enable that tolls for heavy vehicles in the participating fee collection systems can be paid electronically and in an interoperable way (Lesson 16 - Switzerland 1)
- Such concern about standards and protocol would have been reduced if there had been early knowledge of existing standards during the system planning and project definition process (Lesson 19 - USA 3)
- The ORANGES(Orlando Regional Alliance for Next Generation Electronic Payment Systems) experience illustrated that it is necessary to include significant planning and development time in the overall project schedule when a regional system is being implemented. (Lesson 20 - USA 4)

7.6.1.2 Recommendations: Planning

Spending on planning could save twice its cost or more when implementing and operating ITS systems.

- Design times are longer if standards need to be developed but they result in reduced problems and implementation times for follow on projects. Where industry standards exist, implementation times are as short as moving forward without standards and it is much easier to gauge whether the product being delivered will work the way you want it to (Lesson 7 - Canada 4)
- Developing cost and period can be reduced by providing the Message and protocol specification and the duplicate investment was prevented (Lesson 12 - Korea 3)
- As seen in the San Francisco Bay Area case study, working to deploy an interoperable system may have created some early implementation delays, however the advantages of developing a region wide 511 system that has been tested and deployed will reduce the implementation schedule for other agencies as they prepare to implement a 511 system and will help to more equally distribute the development costs among all the system implementers. (Lesson 17 - USA 1)

7.6.1.3 Recommendations: National specifications based on International Standards

International Standards are useful to develop national standards and implement the standards. Just note that sometimes a nation should develop more specifications based on the standards to meet national needs

- We were able to complete our national communication standard by choosing appropriate options and parameters, which are prepared in the international standard ISO 14827 we adopted. We learned that some additional specifications and designations are necessary in order to meet some national requirements and to secure the interoperability between many vendors. (Lesson 8 – Japan 1)

- We thought that we were able to expand the system easily and save the cost and time when we develop the system by using DATEX-ASN(ISO 14827-2) for the national specification, Road Communication standard. We used the communication standard between centres for the communication between centre and roadside because DATEX-ASN is so sophisticated protocol that we could upgrade roadside devices' functions. (Lesson 9 – Japan 2)

- The technical regulation for the Public Transit Information Exchange (draft) defines 7 Message sets and refers to use KS X ISO 14827 for the data interface. KS X ISO 14827 is based on ISO/IEC 14827. Maintenance of centre security was concerned at that time because everyone who knows the username and password will be able to connect with a centre without any restraint according to KS X ISO 14827. (Lesson 12 – Korea 3)

7.6.1.4 Recommendations: Implementation

Standards implementation should be discussed and accepted by stakeholders and related community in advance. Don’t forget to do the marketing

- The business case for ANZIDAR(Australia and New Zealand ITS data registry) should have been developed and approved by stakeholders in advance (Lesson 1 - Australia 1)

- A lesson learned here is that no matter how good it is, how well the standards works, if one doesn't get the community to accept it, the project will fail. Don't forget to do the marketing (Lesson 6 - Canada 3)

7.6.1.5 Recommendation: Business case justification

All ITS Project Managers should identify business case or cost-benefit analysis of standards implementation or interoperability issues.

- There needs to be a business case made at the political level that shows the benefits to all jurisdictions and the community of interoperability (Lesson 2 – Australia 2)

- Identify the benefits of interoperability in financial terms (Lesson 2 – Australia 2)

- The contributing factors for interoperability and the opportunity cost of incompatibility should be assessed as part of the business case for any large infrastructure project (Lesson 3 – Australia 3)

- Ensure interoperability or the lack of it is considered fully in benefit-cost analysis of proposed new projects (Lesson 3 – Australia 3)

7.6.1.6 Recommendation: Mandated development and use of standards

ITS system planners should mandate development and use of standards where necessary.

- Develop and mandate the use of an architecture level standard or framework document (Lesson 2 - Australia 2)

- The compatibility and interoperability of the technologies to be standardized is the compulsory for the expansion of ITS applications nationwide and worldwide as a key infrastructure. (Lesson 10 - Korea 1)
- We cannot proceed ITS interoperable implementation further without the enabling standard like location referencing standard and so on. It cannot overemphasize the importance of critical standards. (Lesson 13 - Korea 4)

7.6.1.7 Recommendation: Common standards with neighbouring countries/regions

ITS system planners should consider using common standards with its neighbouring region to reduce cost and secure interoperability.

- The project was easier to implement, faster to get up and running and required less administrative overhead to set up by using a transponder tag that was already in common use in the region rather than adopting its own tag. (Lesson 4 - Canada 1)

- Looking ahead to future ITS implementations involving SmarTC ards for transit (TransLink) and toll tags for bridge tolls (Golden Ears Bridge), TransLink is preparing to make the case that a common standard is needed so that these ITS systems are both interoperable with each other and with parking services to facilitate the use of public transport services on a region-wide basis. (Lesson 6 - Canada 3)

7.6.1.8 Recommendation: Conformance tests

All SDOs should consider developing conformance test methods and implementation guideline to facilitate the use of their standards.

- It is recommended for standards developing organizations (SDOs) including ISO/TC 204 to extend their activities from developing standards to facilitating market implementation by providing implementation guideline or conformance test methods so that the standards should be properly used as described. (Lesson 14 – Korea 5)

7.6.1.9 Recommendation: Cooperation

Broader Cooperation with strategic approach among related parties is needed.

- We have observed that many committees/organizations have their interest for standardization scope in common, but it seems that no strategic guidelines are available yet. For example, between ISO/TC 204 and ISO/TC 22, there has been useful but long period of communication on how and what to collaborate to develop standards in their common interested areas. (Lesson 15 – Korea 6)

7.6.1.10 Recommendation: Payment reward systems

Payment reward systems found to be a practical solution to improve the accuracy of ITS systems using standards.

- The Alberta experience is that introducing a payment system that rewards adherence to the acceptable deviations from the standard can be a practical solution. (Lesson 5 – Canada 2)

7.6.1.11 Recommendations: Public transport stop numbering

Public transport stop numbering standards facilitate the use of the adoption of computer-based passenger information systems

- Public transport stop numbers are needed to formalize the exchange among public transport components, systems and centres, and between transit management centres and other traffic information centres, wayside and mobile devices (Lesson 11 – Korea 2)

7.7 Reaffirming recommendations in the 2001 ITS standards conference

7.7.1 Review

This section provides a summary of the ouTC omes from the "International Conference on Intelligent Transport Systems – The Road to Future standards" held on June 26, 2001 in Geneva, Switzerland. ISO, in collaboration with IEC and ITU, organized the conference as part of the organization's sector initiatives aimed at improving the interface between the standards needed by the ITS sector and ISO's standards development work programme.

It is interesting to compare the conclusions drawn from the global 2001 conference, and to note that in many areas action has been taken which has, in most, but not all cases, improved the process. However, in addition to the worrying absence of specific performance measurement, there are some areas that still need addressing, indeed in some cases have deteriorated.

Standards are generally progressed by volunteer effort of experts whose companies donate their time, effort and the significant cost of developing standards. SDOs are managed on tight budgets with limited resources, but when the processing of standards or support of standards developers is inadequate, the credibility of the system, and the willingness of organizations to invest in the development of standards is at risk.

A summary of the conclusions of that conference, together with observations as to how the recommendations have been implemented are given in Annex D. Worthy of note here are the following recommendations (For the rationale see Annex D).

8 Summary of recommendations

8.1 Review

A summary of the recommendations from this Technical Report follows. It is not possible to prioritise such a list, although clearly some recommendations are more significant or of greater strategic impact than others. In the following summary of recommendations we have attempted to group the recommendations at their prime targets. However many recommendations impact several targets:

< STRATEGIC SUMMARY >

- ✓ SDOs (e.g. ISO) are encouraged to develop standards in a more "***USER ORIENTED***" manner in order to narrow the gap between developers and users, keeping in mind that standards are not for authors(developers) but for their readers(users)
- ✓ Regional bodies (e.g. APEC, EU) and countries are encouraged to sponsor "***OUTREACH ACTIVITIES***" to increase accessibility to information on existing standards and deployment experiences.
- ✓ Stakeholders in ITS arena should identify "***BUSINESS CASE***" or cost-benefit analysis of standards implementation or interoperability issues.
- ✓ SDOs and regional bodies are encouraged to strive for ***"EFFICIENT COOPERATION/NETWORKING"*** in identifying requirements and in developing standards to avoid duplication and secure harmonization.

8.2 Recommendations primarily to APEC, EU and major countries

8.2.1 Recommendation: Sponsor implementation guideline and conformance requirements

APEC, EU, national governments and SDOs are encouraged to sponsor the development of implementation guideline and conformance requirements.

8.2.2 Recommendation: Sponsor outreach

APEC, EU, and national governments should be encouraged to sponsor outreach activities on a regular basis.

8.2.3 Recommendation: Participate in ITS standards development

APEC TPT members are encouraged to more actively participate in ITS standards activities, particularly ISO/TC 204.

8.2.4 Recommendation: Compendiums and publicity material

APEC and ITU TELEMOV should work to develop compendiums and publicity material in a cohesive manner to make it easier for users to understand and adopt ITS standards.

8.3 Recommendations to SDOs in General

8.3.1 Recommendation: Joint meetings and teleconference

With increased travel and disbursement costs, the increased number of meetings, Joint meetings between SDO WG s and teleconferences should be encouraged

8.3.2 Recommendation: VOIP and video conferencing

There should be greater initiatives to promote VOIP and video conferencing over the internet as the technology evolves. ISO CS, CEN CS, and ETSI CS should be taking the initiative to develop effective means of achieving this.

NOTE Experience from WG s who have experimented with these techniques is that they are most effective is specific subject based teleconferences. General WG progress aspects of meetings are not well catered for by teleconferencing.

8.3.3 Recommendation: Compliance

ALL SDOs should re-examine their achieved deliverables and deliverables in progress to establish if there are adequate specified procedures to determine whether something is in compliance with/or out of compliance with the standard.

8.4 Recommendations to ISO CS

8.4.1 Recommendation: Sentence case

Some readers might find the use of sentence case in ISO standards is detrimental to their understanding; a more flexible approach should be taken regarding the use of capital letters.

8.5 Recommendations to ISO/TC 204

8.5.1 Recommendation: Relationship with IEEE

Greater effort should be made to improve relationships with IEEE at CS level, and with ITU at working party levels, and to improve interchange with other liaison SDOs

8.5.2 Recommendation: Update work programme

It is recommended that ISO/TC 204 review and update its work programme

8.6 Recommendations to standards developers within working groups

8.6.1 Recommendation: Compliance

ALL working groups should re-examine their achieved deliverables and deliverables in progress to establish if there are adequate specified procedures to determine whether something is in compliance with/or out of compliance with the standard.

8.6.2 Recommendation: Interoperability

There should be additional focus on interoperability in the development of standards

8.6.3 Recommendation: Business case analysis

There should be earlier and more comprehensive business case analysis

8.6.4 Recommendation: Collaboration with impacted parties

Broader collaboration among impacted parties is required.

8.6.5 Recommendation: Definition and design process

Earlier attention to standards in the definition and design process is required.

8.6.6 Recommendation: Planning and coordination

More upfront planning and coordination is required

Annex A
(informative)

List of ITS standards

(As of October 2005).

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
1	Int'l	ISO	TC 204	PWI	17562		Navigation system application programme interface (API)
2	Int'l	ISO	TC 204	Deleted	14812	(type 3)	Glossary of standard terminologies for the transport information and control sector
3	Int'l	ISO	TC 204	CD (Draft)	14813	-1:1999 (type 2)	Intelligent transport systems -- reference model architecture(s) for the ITS sector -- Part 1: ITS fundamental services
4	Int'l	ISO	TC 204	TR	14813	-2:2000 (type 2)	Intelligent transport systems -- reference model architecture(s) for the ITS sector -- Part 2: core ITS reference architecture
5	Int'l	ISO	TC 204	TR	14813	3:2000 (type 2)	Intelligent transport systems -- reference model architecture(s) for the ITS sector -- Part 3: example elaboration
6	Int'l	ISO	TC 204	TR	14813	-4:2000 (type 2)	Intelligent transport systems - reference model architecture(s) for the ITS sector -- Part 4: reference model tutorial
7	Int'l	ISO	TC 204	TR	14813	-5:1999 (type 2)	Intelligent transport systems - reference model architecture(s) for the ITS sector -- Part 5: requirements for architecture description in ITS standards
8	Int'l	ISO	TC 204	TR	14813	-6:2000 (type 2)	Intelligent transport systems -- reference model architecture(s) for the ITS sector -- Part 6: data presentation in ASN.1
9	Int'l	ISO	TC 204	FDIS (Draft)	14814		Reference model architecture for generic AVI/AEI
10	Int'l	ISO	TC 204	IS	14815	:2000	Road transport and traffic telematics -- automatic vehicle and equipment identification -- system specifications
11	Int'l	ISO	TC 204	IS	14816	:2000	Road transport and traffic telematics -- automatic vehicle and equipment identification -- numbering and data structure
12	Int'l	ISO	TC 204	IS	14817		Intelligent transport systems - requirements for an ITS/ITS central data registry and ITS/ITS data dictionaries
13	Int'l	ISO	TC 204	IS	14819	-1	Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part 1: coding protocol for radio data system -- traffic message channel (RDS-TMC) using ALERT-C

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
14	Int'l	ISO	TC 204	IS	14819	-2	Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part 2: event and information codes for radio data system -- traffic message channel (RDS-TMC)
15	Int'l	ISO	TC 204	IS	14819	-3:2004	Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part 3: location referencing for alert c (revision of ts 14819-3:2000)
16	Int'l	ISO	TC 204	FDIS (Draft)	14819	-6	Traffic and traveller information (TTI) - TTI messages via traffic message coding. Part 6: encryption and condition access for the radio data system traffic message channel RDS-TMC ALERT-C coding
17	Int'l	ISO	TC 204		14821	-1	Traffic and traveller information message via cellular networks - Part 1: general specifications
18	Int'l	ISO	TC 204		14821	-2	Traffic and traveller information message via cellular networks - Part 2: numbering and adp message header
19	Int'l	ISO	TC 204		14821	-3	Traffic and traveller information message via cellular networks - Part 3: basic information elements
20	Int'l	ISO	TC 204		14821	-4	Traffic and traveller information message via cellular networks - Part 4: service-independent protocols
21	Int'l	ISO	TC 204		14821	-5	Traffic and traveller information message via cellular networks - Part 5: internal services
22	Int'l	ISO	TC 204		14821	-6	Traffic and traveller information message via cellular networks - Part 6: external services
23	Int'l	ISO	TC 204		14821	-7	Traffic and traveller information message via cellular networks - Part 7: performance requirements for on-board positioning
24	Int'l	ISO	TC 204		14821	-8	Traffic and traveller information message via cellular networks - Part 8: GSM-specific parameters
25	Int'l	ISO	TC 204	DTS (Draft)	14822	-1	Traffic and traveller medium range pre-information – Part 1: downlink
26	Int'l	ISO	TC 204	NP (Draft)	14822	-2	Traffic and traveller medium range pre-information – Part 2: uplink
27	Int'l	ISO	TC 204	DTS (Draft)	14823		Stationary dissemination systems for traffic and traveller information using ITS
28	Int'l	ISO	TC 204	IS	14825	:2004	Geographic data files (GDF) v4.0 in ITS communications and systems(revision of ISO/TR 14825:1996)
29	Int'l	ISO	TC 204	N/A on ISO website (Should be checked)	14826		Physical storage for ITS database technology
30	Int'l	ISO	TC 204	IS	14827	-1	ITS data interfaces between centres for intelligent transport systems -- Part 1: message definition requirements

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
31	Int'l	ISO	TC 204	IS	14827	-2	ITS data interfaces between centres for intelligent transport systems -- Part 2: DATEX-ASN
32	Int'l	ISO	TC 204	TS	14904	:2002	Road transport and traffic telematics -- automatic fee collection (afc) -- interface specification for clearing between operators (revision of ISO/TR 14904:1997)
33	Int'l	ISO	TC 204	TR	14906	:1998 (type 2)	Road transport and traffic telematics -- electronic fee collection (EFC) -- application interface definition for dedicated short range communication
34	Int'l	ISO	TC 204	IS	14906	:2004	Road transport and traffic telematics -- electronic fee collection (EFC) -- application interface definition for dedicated short range communication (revision of ISO/TR 14906:1998)
35	Int'l	ISO	TC 204	TS	14907	-1:2005	EFC test procedures for user and fixed equipment -- Part 1: description of test procedures
36	Int'l	ISO	TC 204	DTS (Draft)	14907	-2	EFC test procedures for user and fixed equipment -- Part 2: application interface conformance tests specification
37	Int'l	ISO	TC 204		15074		User services integration for traffic and traveller message lists using ITS
38	Int'l	ISO	TC 204	IS	15075	:2003	ITS communication aspects of in-vehicle navigation system, communications message set requirements
39	Int'l	ISO	TC 204	IS	15622	:2002	ITS communications with road vehicles adaptive cruise control performance requirements - evaluation test methods
40	Int'l	ISO	TC 204	IS	15623	:2002	ITS communications with road vehicles - forward obstacle warning systems -- performance requirements -- evaluation test methods
41	Int'l	ISO	TC 204	TS	15624	:2001	Performance requirements and evaluation test methods for roadside traffic impediment warning systems using ITS
42	Int'l	ISO	TC 204	FDIS (Draft)	15628		Application layer for dedicated short-range communication "DSRC layer 7"
43	Int'l	ISO	TC 204		15662		ITS wide area communication message protocol management information
44	Int'l	ISO	TC 204	NP (Draft)	15784	-1	Data exchange involving roadside modules in intelligent transport systems (ITS) - Part 1: overview
45	Int'l	ISO	TC 204	NP (Draft)	15784	-2	Data exchange involving roadside modules in intelligent transport systems (ITS) - Part 2: profiles
46	Int'l	ISO	TC 204	NP (Draft)	15784	-3	Data exchange involving roadside modules in Intelligent transport systems (ITS) - Part 3: management standards
47	Int'l	ISO	TC 204	NP (Draft)	15784		Data exchange involving roadside modules in intelligent transport systems (ITS)
48	Int'l	ISO	TC 204	PWI (sleeping)	16914		ITS aspects for on board navigation system architecture -- a reference model

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
49	Int'l	ISO	TC 204	TS	17261	:2005	AVI/AEI -- intermodal goods transport architecture and terminology (please nothe that there exists iso is 17261:2005/cor1:2005)
50	Int'l	ISO	TC 204	TS	17262	:2003	AVI/AEI -- intermodal goods transport numbering and data structures
51	Int'l	ISO	TC 204	TS	17263	:2003	AVI/AEI -- intermodal goods transport system parameters
52	Int'l	ISO	TC 204	DTS (Draft)	17264		AVI/AEI -- intermodal goods transport interfaces
53	Int'l	ISO	TC 204		17267		Navigation system application program interface (API) over ITS communications
54	Int'l	ISO	TC 204	DIS (Draft)	17361		ITS communications with road vehicles lane departure warning systems
55	Int'l	ISO	TC 204	PWI (sleeping)	17383		Rules for defining data concepts in ITS systems for information and control
56	Int'l	ISO	TC 204	deleted	17384		ITS requirements for interactive centrally determined route guidance
57	Int'l	ISO	TC 204	IS	17386	:2004	ITS communications with road vehicles maneuvering aid for low speed operation
58	Int'l	ISO	TC 204	deleted	17387		ITS communications with road vehicles side obstacle warning systems (lane change decision aid systems)
59	Int'l	ISO	TC 204	PWI (planned)	17452		Using UML for developing data elements and documenting ITS/ITS interfaces
60	Int'l	ISO	TC 204	NP (planned)	17571		Publishing update for geographic databases in ITS systems
61	Int'l	ISO	TC 204	DTR (Draft)	17572		Intelligent transport systems - location referencing
62	Int'l	ISO	TC 204	TS	17573	:20003	RTTT-EFC – system architecture for vehicle related transport services
63	Int'l	ISO	TC 204	TS	17574	:2004	Security services framework for ETC
64	Int'l	ISO	TC 204	NP (planned)	17575		Electronic fee collection (EFC) - application interface definition for global navigation satellite systems and cellular networks (GNSS/CN)
65	Int'l	ISO	TC 204	PAS	17684	:2003	ITS message set translator to ASN.1 formal definitions
66	Int'l	ISO	TC 204	NP (planned)	17685		Intelligent transport systems -- standard numbering system for public transport stops
67	Int'l	ISO	TC 204		17686		Intelligent transport systems -- public transport communications interface profile (TC IP)
68	Int'l	ISO	TC 204	DIS (Draft)	17687		Intelligent transport systems - data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation
69	Int'l	ISO	TC 204	deleted on ISO Website	18234	-1	Traffic and traveller information (TTI) using ITS- TTI via transport protocol expert group (TPEG) data streams - Part 1: introduction, numbering and versions

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
70	Int'l	ISO	TC 204	deleted on ISO Website	18234	-2	Traffic and traveller information (TTI) using ITS - TTI via transport protocol expert group (TPEG) data streams - Part 2: syntax, semantics and framing structure (SSF)
71	Int'l	ISO	TC 204	deleted on ISO Website	18234	-3	Traffic and traveller information (TTI) using ITS - TTI via transport protocol expert group (TPEG) data streams - Part 3: service and network information (SNI) application
72	Int'l	ISO	TC 204	deleted on ISO Website	18234	-4	Traffic and traveller information (TTI) using ITS- TTI via transport protocol expert group (TPEG) data streams - Part 4: road traffic message (RTM) application
73	Int'l	ISO	TC 204	DTS (Draft)	18234	-5	Traffic and traveller information (TTI) using ITS - TTI via tranport protocol expert group (TPEG) specifications - Part 5: public transport information application
74	Int'l	ISO	TC 204	DTS (Draft)	18234	-6	Traffic and traveller information (TTI) using ITS – TTI via transport protocol experts group (TPEG) data streams – Part 6: location referencing application (TPEG- LOC)
75	Int'l	ISO	TC 204	NP (planned)	20452		requirements and logical data model for a physical storage format (PSF)and an application programming interface used in ITS database technologies; and a logical data organization for a PSF used in ITS database technology
76	Int'l	ISO	TC 204		20561		ITS reference architecture representations and mappings
77	Int'l	ISO	TC 204	PWI (sleeping)	20693		Data concepts for navigation and route guidance services adaptable to message design patterns using ITS
78	Int'l	ISO	TC 204	CD (Draft)	21210		CALM-networking protocols: medium and long range, high speed, air interface parameters and protocols for braodcast, point-point, vehicle-vehilce, and vehicle-point communications in the ITS sector: networking protocols
79	Int'l	ISO	TC 204	CD (Draft)	21212		CALM-2G: long range, medium speed, air interface parameteres and protocols for broadcast, point-point, vehicle-vehicle, and vehicle-point communications in the ITS sector 2nd generation (e.g. using wap and i-mode type protocols).
80	Int'l	ISO	TC 204		21213		CALM-3G: long range, high speed, air interface parameters and protocols for broadcast, point-point, vehicle-vehicle, and vehicle-point communications in the ITS sector using cellular 3G communications.
81	Int'l	ISO	TC 204	IS	21214		CALM-IR: medium and long range, high speed, air interface parameters and protocols for broadcast, point-point, vehicle-vehicle, and vehicle-point communications in the ITS sector using infra red communications at 850 nm., including specifications for mast

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
82	Int'l	ISO	TC 204	NP (planned)	21215		CALM-M5: medium and long range, high speed, air interface parameters and protocols for broadcast, point-point, vehicle-vehicle, and vehicle-point communications in the ITS sector using microwave communications at 5.8GHz-5.9GHz, including specifications fo
83	Int'l	ISO	TC 204	CD (Draft)	21216		CALM-MM: medium and long range, high speed, air interface parameters and protocols for broadcast, point-point, vehicle-vehicle, and vehicle-point communications in the ITS sector using millimetre wave microwave communications, including specifications for
84	Int'l	ISO	TC 204	CD (Draft)	21217		CALM-architecture
85	Int'l	ISO	TC 204	NP (Draft/ Planned)	21218		CALM: common station manager lower level SAPS
86	Int'l	ISO	TC 204		21707		Quality of input data for ITS
87	Int'l	ISO	TC 204	NP (Draft/ Planned)	22178		Low speed following systems
88	Int'l	ISO	TC 204	NP (Draft/ Planned)	22179		Full-speed range adaptive cruise control
89	Int'l	ISO	TC 204	CD (Draft)	22837		Configuration of vehicle probe data for wide area communications
90	Int'l	ISO	TC 204		22838		ITS communications with road vehicles enhanced adaptive cruise control (EACC)
91	Int'l	ISO	TC 204	PWI (planned)	22839		ITS communications with road vehicles forward collision avoidance assistance system (FCAAS)
92	Int'l	ISO	TC 204	DTR (Draft)	22840		ITS communications with road vehicles extended reversing and backing aid (ERBA)
93	Int'l	ISO	TC 204	deleted	22951		Data dictionary and message sets for pre-emption and prioritisation signal systems for emergency and public transport vehicles (PRESTO) in ITS
94	Int'l	ISO	TC 204	NP (Draft/ Planned)	22953		Extended geographic data files (XGDF) in ITS communications
95	Int'l	ISO	TC 204	DIS (Draft)	24014-1		Public transport -- interoperable fare management system -- Part 1: architecture
96	Int'l	ISO	TC 204	PWI (planned)	24097		Using web services (machine-machine delivery) for ITS service delivery
97	Int'l	ISO	TC 204	PWI (planned)	24098		Procedures for developing ITS deployment plans utilising ITS system architecture
98	Int'l	ISO	TC 204	NP (Draft/ Planned)	24529		Using UML in ITS standards

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99	Int'l	ISO	TC 204	DTS (Draft)	24530	-1	Traffic and traveller information (TTI) using ITS -- TTI via transport protocol experts group (TPEG) extensible markup language (XML) Part 1: introduction, common data types and TPEGML
100	Int'l	ISO	TC 204	DTS (Draft)	24530	-2	Traffic and traveller information (TTI) using ITS-- TTI via transport protocol experts group (TPEG) extensible markup language (XML) Part 2: TPEG-LOCML
101	Int'l	ISO	TC 204	DTS (Draft)	24530	-3	Traffic and traveller information (TTI) using ITS -- TTI via transport protocol experts group (TPEG) extensible markup language (XML) - Part 3: TPEG-RTMML
102	Int'l	ISO	TC 204	DTS (Draft)	24530	-4	Traffic and traveller information (TTI) using ITS-- TTI via transport protocol experts group (TPEG) extensible markup language (XML) - Part 4 TPEG-PTIML
103	Int'l	ISO	TC 204		24530	-5	Traffic and traveller information (TTI) using ITS -- TTI via transport protocol experts group (TPEG) extensible markup language (XML) - Part 5 TPEG-PKIML
104	Int'l	ISO	TC 204		24530	-6	Traffic and traveller information (TTI) using ITS-- TTI via transport protocol experts group (TPEG) extensible markup language (XML) - Part 6 TPEG-CTTML
105	Int'l	ISO	TC 204		24531		Using XML (extensible mark up language) in intelligent transportation system standards, data registries and data dictionaries
106	Int'l	ISO	TC 204		24532		Using corba (common object request broker architecture) in intelligent transport system standards, data registries and data dictionaries
107	Int'l	ISO	TC 204	CD (Draft)	24533		Data dictionary and message sets for intermodal transfer and tracking of freight
108	Int'l	ISO	TC 204	CD (Draft)	24534	-1	Automatic vehicle and equipment identification -- electronic registration identification (ERI) for vehicles -- Part 1: architecture
109	Int'l	ISO	TC 204	CD (Draft)	24534	-2	Automatic vehicle and equipment identification -- electronic registration identification (ERI) for vehicles -- Part 2: operational requirements
110	Int'l	ISO	TC 204	CD (Draft)	24534	-3	Automatic vehicle and equipment identification -- electronic registration identification (ERI) for vehicles -- Part 3: vehicle data
111	Int'l	ISO	TC 204	CD (Draft)	24534	-4	Automatic vehicle and equipment identification -- electronic registration identification (ERI) for vehicles -- Part 4: secure communications using asymetric techniques
112	Int'l	ISO	TC 204	NP (Draft/ Planned)	24534	-5	Road transport and traffic telematics -- automatic vehicle and equipment identification -- electronic registration identification (ERI) for vehicles -- Part 5: secure communications using symetric techniques

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
113	Int'l	ISO	TC 204	NP (Draft/ Planned)	24534	-6	Road transport and traffic telematics -- automatic vehicle and equipment identification -- electronic registration identification (ERI) for vehicles -- Part 6: TPEG-cttml - congestion and travel time information, under development and drafting
114	Int'l	ISO	TC 204	DIS (Draft)	24535		AVI/AEI - basic electronic device
115	Int'l	ISO	TC 204	PWI (Planned)	25100		User guide for harmonization of data concepts
116	Int'l	ISO	TC 204	PWI (Planned)	25102		ITS use case pro forma template
117	Int'l	ISO	TC 204	PWI (Planned)	25103		Business justification for ITS architecture
118	Int'l	ISO	TC 204	PWI (Planned)	25104		Training requirements for ITS system architecture
119	Int'l	ISO	TC 204	PWI (Planned)	25106		Procedures and format for ITS glossaries
120	Int'l	ISO	TC 204	PWI (Planned)	25109		Example high level architecture elaboration : emergency call
121	Int'l	ISO	TC 204	PWI (Planned)	24099		Data structures for map data provision and update in ITS applications
122	Int'l	ISO	TC 204	PWI (Planned)	24100		Basic principles for personal data protection in probe vehicle information services
123	Int'l	ISO	TC 204	PWI (Planned)	24101		CALM – application management
124	Int'l	ISO	TC 204	PWI (Planned)	24102		CALM interface manager
125	Int'l	ISO	TC 204	PWI (Planned)	24103		CALM media adapted interface layer (mail)
126	Int'l	ISO	TC 204	CD (Draft)	22837		Configuration of vehicle probe data for wide area communications
127	Int'l	ISO	TC 204	NP (Draft/ Planned)	24977		Wireless telephone based e-call
128	Int'l	ISO	TC 204	NP (Draft/ Planned)	24978		Automatic crash notification using any available wireless media
129	Int'l	ISO	TC 204	PWI (Planned)	25111		CALM MWB – general support
130	Int'l	ISO	TC 204	PWI (Planned)	25112		CALM MWB – wimax
131	Int'l	ISO	TC 204	PWI (Planned)	25113		CALM MWB – existing systems
132	Int'l	ISO	TC 22/SC13	IS	15005		Road vehicles –ergonomic aspects of transport information and control systems - dialogue management principles and compliance procedures
133	Int'l	ISO	TC 22/SC13	IS	15006		Road vehicles -- ergonomic aspects of transport information and control systems - specifications and compliance procedures for in-vehicle auditory presentation

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
134	Int'l	ISO	TC 22/SC13	IS	15007-1		Road vehicles - measurement of driver visual behaviour with respect to transport information and control systems - Part 1 : definitions and parameters
135	Int'l	ISO	TC 22/SC13	IS	15007-2		Road vehicles - measurement of driver visual behaviour with respect to transport information and control systems - Part 2 : equipment and procedure
136	Int'l	ISO	TC 22/SC13	IS	15008		Road vehicles - ergonomic aspects of transport information and control systems - specifications and compliance procedures for in-vehicles visual presentation
137	Int'l	ISO	TC 22/SC13	IS	16951		Road vehicles – ergonomic aspects of transport information and control systems (tics) - procedure for determining priority of on board messages presented to drivers
138	Int'l	ISO	TC 22/SC13	IS	17287		Road vehicles – ergonomic aspects of transport information and control systems - procedure for assessing suitability for use while driving
139	Int'l	ISO	TC 211	CD (Draft)	6709rev		Standard representation of latitude, longitude and altitude for geographic point locations
140	Int'l	ISO	TC 211	TS	19103		Geographic information - conceptual schema language
141	Int'l	ISO	TC 211	Withrawn	19104		Geographic information - terminology (terminology spreadsheets)
142	Int'l	ISO	TC 211	IS	19105		Geographic information - conformance and testing
143	Int'l	ISO	TC 211	IS	19107		Geographic information - spatial schema
144	Int'l	ISO	TC 211	IS	19108		Geographic information - temporal schema
145	Int'l	ISO	TC 211	IS	19109		Geographic information - rules for application schema
146	Int'l	ISO	TC 211	IS	19110		Geographic information - methodology for feature cataloguing.
147	Int'l	ISO	TC 211	DIS (Draft)	19111rev		Geographic information - spatial referencing by coordinates
148	Int'l	ISO	TC 211	DIS (Draft)	19136		Geographic information - geography markup language
149	Int'l	ISO	TC 211	IS	19115		Geographic information - metadata
150	Int'l	ISO	TC 211	WD (Draft)	19115	-2	Geographic information - metadata - Part 2: extensions for imagery and gridded data
151	Int'l	ISO	TC 211	CD (Draft)	19132		Geographic information - location based services - reference model
152	Int'l	ISO	TC 211	IS	19133		Geographic information - location based services - tracking and navigation
153	Int'l	ISO	TC 211	DIS (Draft)	19134		Geographic information - location based services - multimodal navigation
154	Int'l	ISO	TC 211	CD (Draft)	19141		Geographic information - schema for moving features
155	Int'l	ISO	TC 122/104 JWG	CD	17363		Supply chain applications of radio frequency identification (RFID) - freight containers
156	Int'l	ISO	TC 122/104 JWG	CD	17364		Supply chain applications of radio frequency identification (RFID) - returnable transport items

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
157	Int'l	ISO	TC 122/104 JWG	CD	17365		Supply chain applications of radio frequency identification (RFID) - transport units
158	Int'l	ISO	TC 122/104 JWG	CD	17366		Supply chain applications of radio frequency identification (RFID) - product packaging
159	Int'l	ISO	TC 122/104 JWG	CD	17367		Supply chain applications of radio frequency identification (RFID) - product tagging
160	Int'l	ISO	TC 122/104 JWG	IS	10374	.2	Freight containers – RF automatic identification
161	Int'l	ISO	TC 104/SC 4 (WG 2)	DIS	18185	-1	Freight containers — electronic seals — Part 1: communication protocol
162	Int'l	ISO	TC 104/SC 4 (WG 2)	DIS	18185	-2	Freight containers — electronic seals — Part 2: application requirements
163	Int'l	ISO	TC 104/SC 4 (WG 2)	DIS	18185	-3	Freight containers — electronic seals — Part 3: environmental characteristics
164	Int'l	ISO	TC 104/SC 4 (WG 2)	NP	18185	-4	Freight containers — electronic seals — Part 4: data protection
165	Int'l	ISO	TC 104/SC 4 (WG 2)	NP	18185	-6	Freight containers — electronic seals — Part 6: messages sets for transfer between seal reader and host computer
166	Int'l	ISO	TC 104/SC 4 (WG 2)	DIS	18185	-7	Freight containers — electronic seals — Part 7: physical layer
167	Int'l	ISO/IEC	JTC 1/SC17		14443		CALM media adapted interface layer (mail)
168	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	TR	18046		Information technology, automatic identification and data capture techniques – radio frequency identification device performance test methods
169	Int'l	ISO/IEC	JTC 1/SC31 /WG 3		18046	-1	Information technology, automatic identification and data capture techniques – radio frequency identification system performance test methods
170	Int'l	ISO/IEC	JTC 1/SC31 /WG 3		18046	-2	Information technology, automatic identification and data capture techniques – radio frequency identification interrogator performance test methods
171	Int'l	ISO/IEC	JTC 1/SC31 /WG 3		18046	-3	Information technology, automatic identification and data capture techniques – radio frequency identification tag performance test methods
172	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	DTR	18047	-2	Information technology, automatic identification and data capture techniques – radio frequency identification conformance test methods – Part 2: test methods for air interface communications below 135 kHz
173	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	TR	18047	-3	Information technology, automatic identification and data capture techniques – radio frequency identification conformance test methods – Part 3: test methods for air interface communications at 13.56 MHz

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
174	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	TR	18047	-4	Information technology, automatic identification and data capture techniques – radio frequency identification device conformance test methods– Part 4: test methods for air interface communications at 2.45 GHz
175	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	PDTR	18047	-6	Information technology, automatic identification and data capture techniques – radio frequency identification conformance test methods – Part 6: test methods for air interface communications at 860-960 MHz
176	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	DTR	18047	-7	Information technology, automatic identification and data capture techniques – radio frequency identification conformance test methods – Part 7: test methods for active RFID air interface communications at 433 MHz
177	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	NP	2476		Information technology, automatic identification and data capture techniques – real time locating systems (RTLS) — RTLS device conformance test methods
178	Int'l	ISO/IEC	JTC 1/SC31 /WG 3	NP	247		Information technology, automatic identification and data capture techniques – real time locating systems (RTLS) — RTLS device performance test methods
179	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	15961		Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management – data protocol: application interface
180	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	NP	15961	-1	Information technology — radio frequency identification (RFID) for item management — data protocol — Part 1: application interface
181	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	CD	15961	-2	Information technology — radio frequency identification (RFID) for item management — data protocol — Part 2: registration of RFID data constructs
182	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	CD	15961	-3	Information technology — radio frequency identification (RFID) for item management — data protocol — Part 3: RFID data constructs
183	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	15962		Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management – data protocol: data encoding rules and logical memory functions
184	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	15963		Information technology, automatic identification and data capture techniques – radio frequency identification for item management – unique identification for rf tags

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
185	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	18000	-1	Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management - Part 1: generic parameters for air interface communication for globally accepted frequencies
186	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	18000	-2	Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management - Part 2: parameters for air interface communications below 135 kHz
187	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	18000	-3	Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management - Part 3: parameters for air interface communications at 13.56 MHz
188	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	18000	-4	Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management - Part 4: parameters for air interface communications at 2.45 GHz
189	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	18000	-6	Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management – Part 6: parameters for air interface communications at 860-960 MHz
190	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	18000	-7	Information technology, automatic identification and data capture techniques – radio frequency identification (RFID) for item management – air interface Part 7: parameters for an active RFID air interface communications at 433 MHz
191	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	IS	18001		Information technology, automatic identification and data capture techniques - radio frequency identification (RFID) for item management - application requirements profiles
192	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	DTR	24710		Information technology, automatic identification and data capture techniques – radio frequency identification for item management – elementary tag license plate functionality for iso/iec 18000 air interface definitions
193	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	NP	24729		Information technology — radio frequency identification for item management — implementation guidelines
194	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	NP	24729	-1	Information technology — radio frequency identification for item management — implementation guidelines – Part 1: RFID-enabled labels
195	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	NP	24729	-2	Information technology — radio frequency identification for item management — implementation guidelines – Part 2: recyclability of rf tags

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
196	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	NP	24729	-3	Information technology — radio frequency identification for item management — implementation guidelines – Part 3: RFID interrogator/antenna installation
197	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	NP	24752		Information technology – automatic identification and data capture techniques – radio frequency identification (RFID) for item management – system management protocol
198	Int'l	ISO/IEC	JTC 1/SC31 /WG 4	NP	24753		Information technology – automatic identification and data capture techniques – radio frequency identification (RFID) for item management – air interface commands for battery assist and sensor functionality
199	Int'l	ISO/IEC	JTC 1/SC31 /WG 5	DIS	24730	-1	Information technology, automatic identification and data capture techniques – real time locating systems (RTLS) — Part 1: application programming interface (API)
200	Int'l	ISO/IEC	JTC 1/SC31 /WG 5	DIS	24730	-2	Information technology, automatic identification and data capture techniques – real time locating systems (RTLS) — Part 2: 2.4 GHz
201	Int'l	ISO/IEC	JTC 1/SC31 /WG 5	NP	24730	-3	Information technology, automatic identification and data capture techniques – real time locating systems (RTLS) — Part 3: 433 MHz
202	Int'l	ISO/IEC	JTC 1/SC31 /WG 5	NP	24730	-4	Information technology, automatic identification and data capture techniques – real time locating systems (RTLS) — Part 4: global locating systems (gls)
203	Int'l	ITU-R	WP6M		M.1310		Transport information and control systems (tics) - objectives and requirements (10/97)
204	Int'l	ITU-R	WP6M		M.1451		Transport information and control systems: functionalities (05/00)
205	Int'l	ITU-R	WP6M		M.1452		Transport information and control systems – low power short-range vehicular radar equipment at 60 GHz and 76 GHz (05/00)
206	Int'l	ITU-R	WP6M		M.1453-1		Transport information and control systems (tics): dedicated short range communications (drsc) at 5.8 GHz (07/02)
207	Int'l	ITU-R	WP8A				In wp8a, there are many on-going draft working documents and other activities on next generation ITS radiocommunication services which relate to the work on CALM in iso/TC 204/WG 16, such as the CALM m5, CALM millimeter wave, and CALM broadband.
208	Int'l	ITU-R	WP6M	(draft)	N/A		In wp6m, there are many activities that impact the work in TC 204/WG 10 on TPEG, in cooperation with the european broadcasting union. in the itu-t, there are interests to collaborate with iso, in general, regarding the work on ecall and hmi-related standards.

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
209	Reg'l	CEN	TC 278	Preliminary (Draft)			Road transport and traffic telematics - traffic management systems - detection on motorways for traffic information and traffic management applications
210	Reg'l	CEN	TC 278				Electronic fee collection (EFC) - minimum interoperable specification for DSRC-EFC transactions
211	Reg'l	CEN	TC 278	(Draft)			Electronic fee collection (EFC) - conformity evaluation of onboard unit and roadside equipment to "DSRC-mis EFC application transaction requirements"
212	Reg'l	CEN	TC 278	Preliminary (Draft)			Electronic fee collection (EFC) - information flows between operators of EFC systems
213	Reg'l	CEN	TC 278	Preliminary (Draft)			Electronic fee collection - system architecture for vehicle related transport services (review)
214	Reg'l	CEN	TC 278		CEN ISO/TS 14907	-2:2005	Electronic fee collection - test procedures for user and fixed equipment - Part 2: conformance test for the onboard unit application interface
215	Reg'l	CEN	TC 278		CEN ISO/TS 14907	-1:2004	Electronic fee collection - test procedures for user and fixed equipment - Part 1: description of test procedures
216	Reg'l	CEN	TC 278		CEN ISO/TS 17573	:2002	Electronic fee collection - system architecture for vehicle related transport services
217	Reg'l	CEN	TC 278		CEN ISO/TS 17574	:2003	Electronic fee collection (EFC) - guidelines for EFC security protection profiles
218	Reg'l	CEN	TC 278		EN ISO 14906	2004	Electronic fee collection - application interface definition for dedicated short-range communication (review)
219	Reg'l	CEN	TC 278		ENV ISO 14904	2002	Electronic fee collection (EFC) - interface specification for clearing between operators (review)
220	Reg'l	CEN	TC 278	Under review	ENV ISO 14907	-1:1999	Electronic fee collection - test procedures for user and fixed equipment - Part 1: description of test procedures
221	Reg'l	CEN	TC 278	Parallel TC comments received (Draft)	prCEN ISO/TS 17575		Electronic fee collection (EFC) — application interface definition for EFC based on global navigation satellite systems and cellular network (GNSS/CN)
222	Reg'l	CEN	TC 278	Deleted	N739		Freight and fleet management systems - reference architecture and terminology - Part 1: high level architecture and terms
223	Reg'l	CEN	TC 278	Dormant (Draft)			Public transport - interoperable fare management system - Part 2: messaging
224	Reg'l	CEN	TC 278		EN 13149	-1:2004	Public transport - road vehicle scheduling and control systems - Part 1: worldfip definition and application rules for onboard data transmission (review)

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
225	Reg'l	CEN	TC 278		EN 13149	-2:2004	Public transport - road vehicle scheduling and control systems - Part 2: worldfip cabling specifications (review)
226	Reg'l	CEN	TC 278		EN 13149	-4:2004	Public transport - road vehicle scheduling and control systems - Part 4: general application rules for canopen transmission busses (review)
227	Reg'l	CEN	TC 278		EN 13149	-5:2005	Public transport - road vehicle scheduling and control systems - Part 5: canopen cabling specifications (review)
228	Reg'l	CEN	TC 278		ENV 12694	1997	Public transport - road vehicles - dimensional requirements for variable electronic external signs
229	Reg'l	CEN	TC 278		ENV 12796	1997	Public transport - road vehicles - validators
230	Reg'l	CEN	TC 278		ENV 12896	:1997	Public transport - reference data model
231	Reg'l	CEN	TC 278		ENV 13093	1998	Public transport - road vehicles - driver's console mechanical interface requirements - minimum display and keypad parameters
232	Reg'l	CEN	TC 278		ENV 13998	2001	Public transport - non interactive dynamic passenger information on ground
233	Reg'l	CEN	TC 278	Deleted	N/A		Public transport - road vehicles - avms on board equipment - environmental and electrical conditions and limits
234	Reg'l	CEN	TC 278	Deleted	N/A		Public transport - automatic ticket vending machines - traveller interface
235	Reg'l	CEN	TC 278	Deleted	N1256		Public transport - public interactive information terminals - traveller interface
236	Reg'l	CEN	TC 278	Ready for Formal Vote (Draft)	N1399		Public transport - road vehicles - visible variable passenger information devices inside the vehicle
237	Reg'l	CEN	TC 278	Ready for Formal Vote (Draft)	N1628		Public transport - road vehicle scheduling and control systems - Part 3: worldfip message content
238	Reg'l	CEN	TC 278	TC comments received (Draft)	n1747		Public transport - automatic vehicle management systems – standard interface for real-time information
239	Reg'l	CEN	TC 278	Deleted	prEN 12796 review		Public transport - road vehicles - validators (review)
240	Reg'l	CEN	TC 278	Under Formal Vote (Draft)	prEN 12896		Public transport - reference data model (review)
241	Reg'l	CEN	TC 278	Deleted	prEN 13093 review		Public transport - road vehicles - driver's console mechanical interface requirements - minimum display and keypad parameters (review)
242	Reg'l	CEN	TC 278	Under Parallel Enquiry (Draft)	prEN ISO 24014-1	-1	Public transport - interoperable fare management system - Part 1: architecture

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243	Reg'l	CEN	TC 278		TS 13149	-6:2004	Public transport - road vehicle scheduling and control systems - Part 6: can message content
244	Reg'l	CEN	TC 278	(Draft)			Traffic and travel information (TTI) - TTI via transport protocol experts group (TPEG) extensible markup language (XML) – Part 6: TPEG-cttml
245	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-1:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 1: general specifications
246	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-2:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 2: numbering and adp message header
247	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-3:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 3: basic information elements
248	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-4:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 4: service-independent protocols
249	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-5:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 5: internal services
250	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-6:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 6: external services
251	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-7:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 7: performance requirements for onboard positioning
252	Reg'l	CEN	TC 278		CEN ISO/TS 14821	-8:2003	Traffic and travel information (TTI) - TTI messages via cellular networks - Part 8: GSM-specific parameters
253	Reg'l	CEN	TC 278		CEN ISO/TS 14822	-1:2005	Traffic and travel information - medium-range pre-information via DSRC - general specification - Part 1: downlink
254	Reg'l	CEN	TC 278		CEN ISO/TS 18234	-1:2004	Traffic and travel information (TTI) – TTI via transport protocol expert group (TPEG) data-streams – Part 1: introduction, numbering and versions
255	Reg'l	CEN	TC 278		CEN ISO/TS 18234	-2:2004	Traffic and travel information (TTI) – TTI via transport protocol expert group (TPEG) data-streams – Part 2: syntax, semantics and framing structure (SSF)
256	Reg'l	CEN	TC 278		CEN ISO/TS 18234	-3:2004	Traffic and travel information (TTI) – TTI via transport protocol expert group (TPEG) data-streams – Part 3: service and network information (SNI) application
257	Reg'l	CEN	TC 278		CEN ISO/TS 18234	-4:2004	Traffic and travel information (TTI) - TTI via transport protocol expert group (TPEG) data-streams – Part 4: road traffic message (RTM) application

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
258	Reg'l	CEN	TC 278		CEN ISO/TS 18234	-5:2004	Traffic and travel information (TTI) – TTI via transport protocol expert group (TPEG) data-streams – Part 5: public transport information (pti) application
259	Reg'l	CEN	TC 278		CEN ISO/TS 18234	-6:2005	Traffic and travel information (TTI) – TTI via transport protocol expert group (TPEG) data-streams – Part 6: location referencing for applications (TPEG-loc)
260	Reg'l	CEN	TC 278		CEN ISO/TS 24530	-1:2005	Traffic and travel information (TTI) - TTI via transport protocol experts group (TPEG) extensible markup language (XML) – Part 1: introduction, common data types and tpegml
261	Reg'l	CEN	TC 278		CEN ISO/TS 24530	-2:2005	Traffic and travel information (TTI) - TTI via transport protocol experts group (TPEG) extensible markup language (XML) – Part 2: TPEG-locml
262	Reg'l	CEN	TC 278		CEN ISO/TS 24530	-3:2005	Traffic and travel information (TTI) - TTI via transport protocol experts group (TPEG) extensible markup language (XML) – Part 3: TPEG-RTMml
263	Reg'l	CEN	TC 278		CEN ISO/TS 24530	-4:2005	Traffic and travel information (TTI) - TTI via transport protocol experts group (TPEG) extensible markup language (XML) – Part 4: TPEG-ptiml
264	Reg'l	CEN	TC 278		EN ISO 14819	-1:2002	Traffic and travel information (TTI) - TTI messages via traffic message coding - Part 1: coding protocol for radio data system - traffic message channel (RDS-TMC) using ALERT-C
265	Reg'l	CEN	TC 278		EN ISO 14819	-2:2002	Traffic and travel information (TTI) - TTI messages via traffic message coding - Part 2: event and information codes for radio data system - traffic message channel (RDS-TMC)
266	Reg'l	CEN	TC 278		EN ISO 14819	-3:2003	Traffic and travel information (TTI) - TTI messages via traffic message coding - Part 3: location referencing for alert- c (review)
267	Reg'l	CEN	TC 278		ENV 12313	-4:1999	Traffic and travel information (TTI) - TTI messages via traffic message coding - Part 4: coding protocol for radio data system - traffic message channel (RDS-TMC) - RDS-TMC using alert-plus with ALERT-C
268	Reg'l	CEN	TC 278		ENV 12315	-2:1996	Traffic and travel information (TTI) - TTI messages via dedicated short-range communication - Part 2: data specification - uplink (vehicle to roadside)
269	Reg'l	CEN	TC 278		ENV 12315	-1:1996	Traffic and travel information (TTI) - TTI messages via dedicated short-range communication - Part 1: data specification - downlink (roadside to vehicle)
270	Reg'l	CEN	TC 278	Ready for Parallel Formal Vote (Draft)	N1741		Traffic and travel information (TTI) - TTI via transport protocol experts group (TPEG) extensible markup language (XML) – Part 5: TPEG-pkiml

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
271	Reg'l	CEN	TC 278	TC comments received (Draft)	prCEN ISO/TS 14822-2	-2	Traffic and travel information - medium-range pre-information via DSRC - general specification - Part 2: uplink
272	Reg'l	CEN	TC 278	Deleted	prCEN ISO/TS 14823		Traffic and travel information - messages via media-independent stationary dissemination systems - graphic data dictionary for pre-trip and in-trip information dissemination system
273	Reg'l	CEN	TC 278	Ready for Formal Vote (Draft)	prEN ISO 14819	-6	Traffic and travel information (TTI) - TTI messages via traffic message coding - Part 6: encryption and condition access for the radio data system - traffic message channel alert c coding
274	Reg'l	CEN	TC 278		EN ISO 14825	2003	Intelligent transport systems - geographic data files (GDF) - overall data specification
275	Reg'l	CEN	TC 278	Deleted	N/A		Geographic road data - location catalogues
276	Reg'l	CEN	TC 278	Deleted	N/A		Geographic road data - maintenance rules
277	Reg'l	CEN	TC 278	Under review	ENV 13106	2000	DATEX traffic and travel data dictionary (version 3.1.a)
278	Reg'l	CEN	TC 278		ENV 13777	2000	DATEX specifications for data exchange between traffic and travel information centres (version 1.2.a)
279	Reg'l	CEN	TC 278	Deleted	N/A		Data models for structuring DATEX traffic and travel information
280	Reg'l	CEN	TC 278	Deleted	prEN 13106		DATEX traffic and travel data dictionary
281	Reg'l	CEN	TC 278		EN 12253	2004	Dedicated short-range communication - physical layer using microwave at 5.8 GHz (review)
282	Reg'l	CEN	TC 278		EN 12795	2002	Dedicated short-range communication (DSRC) - DSRC data link layer: medium access and logical link control (review)
283	Reg'l	CEN	TC 278		EN 12834	2002	Dedicated short-range communication - application layer (review)
284	Reg'l	CEN	TC 278		EN 13372	2004	Dedicated short-range communication (DSRC) - DSRC profiles for rttt applications (review)
285	Reg'l	CEN	TC 278	Deleted	N/A		Dedicated short range communication - physical integration with the vehicle of on board units (obu) for electronic fee collection (EFC)
286	Reg'l	CEN	TC 278		EN ISO 15005	2002	Road vehicles – ergonomic aspects of transport information and control systems – dialogue management principles and compliance procedures
287	Reg'l	CEN	TC 278		EN ISO 15006	:2003	Road vehicles - ergonomic aspects of transport information and control systems - specification and compliance procedures for in-vehicle auditory presentations
288	Reg'l	CEN	TC 278		EN ISO 15007	-1:2002	Road vehicles – measurement of driver visual behaviour with respect to transport information and control systems – Part 1: definitions and parameters

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
289	Reg'l	CEN	TC 278		EN ISO 15008	2003	Road vehicles - ergonomic aspects of transport information and control systems – specifications and compliance procedures for in-vehicle visual presentation
290	Reg'l	CEN	TC 278		EN ISO 17287	2003	Road vehicles - ergonomic aspects of transport information and control systems - procedure for assessing suitability for use when driving
291	Reg'l	CEN	TC 278	Deleted	ENV ISO 15007	-2:2001	Road vehicles - measurement of driver visual behaviour with respect to transport information and control systems – Part 2: equipment and procedures
292	Reg'l	CEN	TC 278	Deleted	N993		Road vehicles - ergonomic aspects of transport information and control systems - procedure for determining priority of on board messages presented to drivers
293	Reg'l	CEN	TC 278		CEN ISO/TS 17261	2004	Intelligent transport systems — automatic vehicle and equipment identification — intermodal goods transport architecture and terminology
294	Reg'l	CEN	TC 278		CEN ISO/TS 17262	2002	Automatic vehicle and equipment identification - intermodal goods transport - numbering and data structures
295	Reg'l	CEN	TC 278		CEN ISO/TS 17263	2002	Automatic vehicle and equipment identification - intermodal goods transport - system parameters
296	Reg'l	CEN	TC 278		EN ISO 14815	2005	Automatic vehicle and equipment identification - system specification (review)
297	Reg'l	CEN	TC 278		ENV 12314	:1996	Automatic vehicle and equipment identification - Part 1: reference architectures and terminology
298	Reg'l	CEN	TC 278	Under review	ENV ISO 14816	:2000	Automatic vehicle and equipment identification - numbering and data structures
299	Reg'l	CEN	TC 278	Under Parallel TC review (Draft)	prCEN ISO TS 24534	-5	Automatic vehicle and equipment identification – electronic registration identification (ERI) for vehicles - Part 5: secure communications using symmetrical techniques
300	Reg'l	CEN	TC 278	Ready for Parallel Formal Vote (Draft)	prCEN ISO/TS 17264		Automatic vehicle and equipment identification - interfaces
301	Reg'l	CEN	TC 278	Ready for Parallel Formal Vote (Draft)	prCEN ISO/TS 24534	-1	Automatic vehicle and equipment identification – electronic registration identification (ERI) for vehicles - Part 1: architecture
302	Reg'l	CEN	TC 278	Ready for Parallel Formal Vote (Draft)	prCEN ISO/TS 24534	-2	Automatic vehicle and equipment identification – electronic registration identification (ERI) for vehicles - Part 2: operational requirements
303	Reg'l	CEN	TC 278	Ready for Parallel Formal Vote (Draft)	prCEN ISO/TS 24534	-3	Automatic vehicle and equipment identification – electronic registration identification (ERI) for vehicles - Part 3: vehicle data

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304	Reg'l	CEN	TC 278	Ready for Parallel Formal Vote (Draft)	prCEN ISO/TS 24534	-4	Automatic vehicle and equipment identification – electronic registration identification (ERI) for vehicles - Part 4: secure communications using asymmetrical techniques
305	Reg'l	CEN	TC 278	Ready for Formal Vote (Draft)	prEN ISO 14814		Automatic vehicle and equipment identification - reference architecture and terminology (review)
306	Reg'l	CEN	TC 278		prEN ISO 14816		Automatic vehicle and equipment identification - numbering and data structures (review)
307	Reg'l	CEN	TC 278	Deleted			After-theft systems for the recovery of stolen vehicles - Part 6: test procedures
308	Reg'l	CEN	TC 278		CEN TS 15213	-2:2005	After-theft systems for the recovery of stolen vehicles - Part 2: common status message elements
309	Reg'l	CEN	TC 278		CEN TS 15213	-1:2005	After-theft systems for the recovery of stolen vehicles - Part 1: reference architecture and terminology
310	Reg'l	CEN	TC 278	Ready for Formal Vote (Draft)	prCEN TS 15213		After-theft systems for the recovery of stolen vehicles - Part 3: interface and system requirements in terms of short range communication system
311	Reg'l	CEN	TC 278	Ready for Formal Vote (Draft)	prCEN TS 15213		After-theft systems for the recovery of stolen vehicles - Part 4: interface and system requirements in terms of long range communication system
312	Reg'l	CEN	TC 278	Ready for Formal Vote (Draft)	prCEN TS 15213		After-theft systems for the recovery of stolen vehicles - Part 5: messaging interface
313	Reg'l	ETSI	ERM TG37		EN 300 674 Part 1		:General characteristics and test methods for road side units (rsu) and on-board units (obu)
314	Reg'l	ETSI	ERM TG37		EN 300 674 Part 2		Harmonized EN under 3.2 of the r&tte directive; sub-part 1: requirements for the rsu
315	Reg'l	ETSI	ERM TG37		EN 300 674 Part 2		Harmonized EN under 3.2 of the r&tte directive; sub-part 2: requirements for the obu
316	Reg'l	IEEE	VTS/ITS		IEEE Std 11-2000		Standard for rotating machinery for rail and road vehicles
317	Reg'l	IEEE	VTS/ITS		IEEE Std 1473-1999		IEEE standard for communications for communications protocol aboard trains
318	Reg'l	IEEE	VTS/ITS		IEEE Std 1474.1-1999		IEEE standard for communications-based train control (cbTC) performance and functional requirements
319	Reg'l	IEEE	VTS/ITS		IEEE Std 1475-1999		IEEE standard for the functioning of and interface among propulsion, friction brake and train borne master control on rail rapid transit vehicles
320	Reg'l	IEEE	VTS/ITS		IEEE Std 1477-1998		IEEE standard for passenger information system for rail transit vehicles.

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
321	Reg'l	IEEE	VTS/ITS		IEEE Std 1482.1		IEEE standard for rail transit vehicle event recorders.
322	Reg'l	IEEE	VTS/ITS		IEEE Std 11-2000		Standard for rotating machinery for rail and road vehicles
323	Reg'l	IEEE	VTS/ITS		IEEE Std 1476		Standard for passenger train auxiliary power systems interface
324	Reg'l	IEEE	VTS/ITS		IEEE Std 1483		Standard for the verification of vital functions in processor-based systems used in rail transit control
325	Reg'l	IEEE	VTS/ITS		IEEE Std 1404-1998		IEEE guide for microwave communications system development, design, procurement, construction, maintenance, and operation
326	Reg'l	IEEE	VTS/ITS		IEEE Std 1455-1999		IEEE standard for message sets for vehicle/roadside communications.
327	Reg'l	IEEE	VTS/ITS	under review	IEEE Std 1489-1999		IEEE standard for data dictionaries for intelligent transportation systems.
328	Reg'l	IEEE	VTS/ITS		P1616a		Electronic control units (ecu) - brake and transmission input to motor vehicle event recorders
329	Reg'l	IEEE	VTS/ITS		P1609.1		WAVE resource manager
330	Reg'l	IEEE	VTS/ITS		P1609.2		Application services (services moved to p1609.1 and p1609.3 and to be changed to *wave security and privacy*)
331	Reg'l	IEEE	VTS/ITS		P1609.3		Networking services
332	Reg'l	IEEE	VTS/ITS		P1609.4		Multi-channel management
333	Reg'l	IEEE	VTS/ITS		P1556		WAVE security and privacy (to be changed to p1609.2)
334	Reg'l	IEEE	VTS/ITS		802.11p		WAVE, amendment to 802.11
335	Reg'l	IEEE	VTS/ITS		P1634		Standard for common data dictionary for use in intelligent transportation systems
336	Reg'l	IEEE	VTS/ITS		P14817		Transport information and control systems - requirements for an ITS/tics central data registry and ITS/tics data dictionaries (iso14817:2002)
337	Nat'l	Australia		National Std.	ISO 14817		Transport information and control systems - requirements for an ITS/tics central data registry and ITS/tics data dictionaries
338	Nat'l	Australia		National Std.	AS 4721		Personal privacy practices for the electronic tolling industry
339	Nat'l	Australia		National Std.	AS 4962		Electronic toll collection - transaction specification for australian interoperability on the DSRC link
340	Nat'l	Canada		National TS			Commercial vehicle operations network cost-benefit and feasibility studies
341	Nat'l	Canada		National TS			Guidelines for integrating environmental impact evaluation in future ITS deployment studies

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
342	Nat'l	Canada		National TS			Road weather information system(joint federal, provincial and territorial initiative/technical guidelines)
343	Nat'l	Canada		National TS			ITS architecture for canada
344	Nat'l	Canada		Natonal TS (Draft)			Guidelines for implementing the canadian “511” telephone access to road and weather information
345	Nat'l	China			ISO TR14813-1: 1999		Transport information and control systems -- reference model architecture(s) for the tics sector -- Part 1: tics fundamental services
346	Nat'l	China			IS 14817:2002		Transport information and control systems -- requirements for an ITS/tics central dataregistry and ITS/tics data dictionaries
347	Nat'l	China			IS 14819-1:2003		Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part1: coding protocol for radio data system -- traffic message channel (RDS-TMC) using ALERT-C
348	Nat'l	China			IS 14819-2:2003		Traffic and traveller information (TTI) -- TTI messages via traffic message coding – Part 2: event and information codes for radio data system -- traffic message channel (rdstmc)
349	Nat'l	China			ISO TS 14819-3:2000		Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part 3: location referencing for ALERT-C
350	Nat'l	China			IS 15622:2002		Transport information and control systems -- adaptive cruise control systems --performance requirements and test procedures
351	Nat'l	China			ISO TS 14904:2002		Road transport and traffic telematics -- electronic fee collection (EFC) -- interfacespecification for clearing between operators
352	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - terminologies
353	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - architecture - service
354	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - message set template
355	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - requirement of central dataregistry and data dictionaries
356	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - data dictionaries requirements
357	Nat'l	China		(Draft/ Planned)			Geography information on traffic management - classification and code
358	Nat'l	China		(Draft/ Planned)			Geography information on traffic management - coding rules for entity identity codes
359	Nat'l	China		(Draft/ Planned)			Geography information data of road - collection andquality control requirement
360	Nat'l	China		(Draft/ Planned)			Traffic dedicated short range communication - microwave physical layer

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361	Nat'l	China		(Draft/ Planned)			Traffic dedicated short range communication - data linklayer
362	Nat'l	China		(Draft/ Planned)			Traffic dedicated short range communication - application layer
363	Nat'l	China		(Draft/ Planned)			Dedicated short range communication - profile
364	Nat'l	China		(Draft/ Planned)			Dedicated short range communication - outline of equipment general reliability
365	Nat'l	China		(Draft/ Planned)			Dedicated short range communication - test measure of central parameters - physical layer
366	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - electronic toll collection - application interface framework based on DSRC
367	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - electronic toll collection - attribute map and addressing
368	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - electronic toll collection - service primitives
369	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - electronic toll collection - transaction models
370	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - electronic toll collection - framework models of system network application
371	Nat'l	China		(Draft/ Planned)			Intelligent transport systems - electronic toll collection - interface specification for clearing between operators
372	Nat'l	China		(Draft/ Planned)			Traffic information service - information classification and coding
373	Nat'l	China		(Draft/ Planned)			Traffic and traveler information (TTI) - TTI messages via traffic message coding - Part 1: coding protocol for radio data system - traffic message channel(RDS-TMC) using ALERT-C
374	Nat'l	China		(Draft/ Planned)			Traffic and traveler information (TTI) - TTI messages via traffic message coding - Part 2: event and information codes for radio data system - traffic message channel(RDS-TMC)
375	Nat'l	China		(Draft/ Planned)			Traffic and traveler information (TTI) - TTI messages via traffic message coding - Part 3: location referencing for ALERT-C
376	Nat'l	China		(Draft/ Planned)			Traffic information collection - information classification and coding
377	Nat'l	China		(Draft/ Planned)			Traffic information collection - incident message sets
378	Nat'l	China		(Draft/ Planned)			Traffic information collection - microwave traffic flow detector
379	Nat'l	China		(Draft/ Planned)			Traffic information collection - visual traffic flow detector
380	Nat'l	China		(Draft/ Planned)			Legend symbol of traffic monitor tv system
381	Nat'l	China		(Draft/ Planned)			Communication protocol for data exchange between traffic signal controller and upside computer

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382	Nat'l	China		(Draft/ Planned)			Balance data exchange between passenger transport corporations
383	Nat'l	China		(Draft/ Planned)			Ship - automatic identification system require ment
384	Nat'l	China		(Draft/ Planned)			Identification of mobile operation transmitter -receiver on water
385	Nat'l	China		(Draft/ Planned)			Adaptive cruise control system of automobile - performance requirements and test procedures
386	Nat'l	China		(Draft/ Planned)			Lane departure warning system
387	Nat'l	China		(Draft/ Planned)			Overall framework guidance of traffic mutual information platform
388	Nat'l	China		(Draft/ Planned)			Technical requirement and setting guidance of automatic surveillance system of violation of traffic laws
389	Nat'l	China		(Draft/ Planned)			Setting guidance of traffic data collection facility on expressway network in cities
390	Nat'l	China		(Draft/ Planned)			Guidance of traffic inducing sign setting and information promulgation on expressway network in cities
391	Nat'l	China		(Draft/ Planned)			Guidance of technical requirement and setting ofpacking inducing system
392	Nat'l	Czech Republic	ELTODO	National TS	TP 172		Transport information centres
393	Nat'l	Czech Republic	ELTODO	National TS	TP 154		Service & maintenance of road tunnels
394	Nat'l	Czech Republic	ELTODO	National TS	TP 98		Technical conditions for tunnels
395	Nat'l	Czech Republic	ELTODO	National TR			Architecture ITS for prague
396	Nat'l	Czech Republic	FDCVUT	National TR			ITS architecture czech.rep.
397	Nat'l	Czech Republic	FDCVUT	National TR			RDS-TMC implen??
398	Nat'l	Czech Republic	ITS&S	National TR			EFC implementation
399	Nat'l	Czech Republic	ELTODO	National TS (Draft)			Traffic information centres
400	Nat'l	Czech Republic	ELTODO	National TS (Draft)			Road telematics applications
401	Nat'l	France	AFNOR	National Std.	NF P 99-302		Protocol for the transmission of traffic data
402	Nat'l	France	AFNOR	National TR	P 99-301		induction loop sensors
403	Nat'l	France	AFNOR	National Std.	NF P 99-300		Nature and accuracy of traffic data
404	Nat'l	France	AFNOR	National Std.	NF P 99-320		Terminology applicable to road weather data
405	Nat'l	France	AFNOR	National Std.	NF P 99-340		Road command language

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406	Nat'l	France	AFNOR	National Std.	NF P 99-330		Trials of nf p 99-300 - methodology
407	Nat'l	France	AFNOR	National Std.	NF P 99-342		Application of the LCR to cameras
408	Nat'l	France	AFNOR	National Std.	NF P 99-304		LCR - formats of transmitted measurements
409	Nat'l	France	AFNOR	National Std.	NF P 99-341		Application of the LCR to vVMSS
410	Nat'l	France	AFNOR	National Std.	NF P 99-344		Application of the LCR to MPUS
411	Nat'l	France	AFNOR	National Std.	NF P 99-313		Terminology applicable to MPUS, detection units, vVMSS and cameras
412	Nat'l	France	AFNOR	National Std.	NF P 99-305		DUS and induction loop sensors
413	Nat'l	France	AFNOR	National Std.	P 99-321-1		Weather data gathering systems - specifications
414	Nat'l	France	AFNOR	National Std.	P 99-324		Weather stations and the LCR - formats of transmitted measurements
415	Nat'l	France	AFNOR	National Std.	P 99-332		Trials of nf p 99-302 - transmission protocol
416	Nat'l	France	AFNOR	National Std.	P 99-334		Trials of nf p 99-344 - MPUS
417	Nat'l	France	AFNOR	draft	P 99-335		Trials of nf p 99-344 - sensor unites
418	Nat'l	France	AFNOR	draft	P 99-344-1		Application of the LCR to MPUS - multiple-user option
419	Nat'l	France	AFNOR	draft	P 99-345		Application of the LCR to dus
420	Nat'l	France	AFNOR	draft	P 99-321-2		Systems for gathering weather data - trials
421	Nat'l	France	AFNOR	draft	P 99-346		Application of the LCR to road weather stations
422	Nat'l	France	AFNOR	draft	P 99-344-2		Application of the LCR to MPUS - serial du option
423	Nat'l	France	AFNOR	draft	P 99-306		Radar DUS
424	Nat'l	France	AFNOR	draft	P99-345-1		Application of the LCR to radar dus
425	Nat'l	Hong Kong		N/A			NTC IP for traffic control and surveillance systems
426	Nat'l	Japan	JISC	National Std.	14813-5		Reference model architecture for the ITS sector - requirements for architecture description in ITS standards
427	Nat'l	Japan	JISC	National Std.	14813-6		Reference model architecture for the ITS sector - data representation using ASN.1
428	Nat'l	Japan	JISC	National TR	14812		Glossary of ITS terminologies
429	Nat'l	Japan	JISC	National Std.	15622		Adaptive cruise control systems
430	Nat'l	Japan	JISC	National Std.	15623		Forward vehicle collision warning system
431	Nat'l	Japan	JISC	National TR	14813-1		ITS reference model architecture for the ITS sector - ITS fundamental services
432	Nat'l	Japan	JISC	National TR	14813-2		Reference model architecture for the ITS sector - core ITS reference architecture

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433	Nat'l	Japan	JISC	National Std.	JISD0810:2004		Map data physical storage format for car navigation systems
434	Nat'l	Japan	JISC	National TR	TRD-0003:2004		ITS on-board system architecture
435	Nat'l -Others	Japan	ARIB	Association Std.	ARIB-T48		"Millimeter-wave radar equipment for specified low power radio station arib standard"(note) this physical layer is reflected in itu-r recommendation m.1452 "intelligent transport systems - low power short-range vehicular radar equipment at 60GHz and 76GHz".
436	Nat'l -Others	Japan	ARIB	Association Std.	ARIB-T75		"Dedicated short-range communication system arib standard"(note) this physical layer is reflected in itu-r recommendation m.1453-2 "intelligent transport systems - dedicated short range communications at 5.8GHz" this application layer is reflected in iso/fdis 15628 "Transport information and control systems - dedicated short-range communication (DSRC) - DSRC application layer".
437	Nat'l -Others	Japan	ARIB	Association Std.	ARIB-T88		"DSRC application sub-layer arib standard"(note) this application sub-layer is reflected in itu-r recommendation m.1453-2.
438	Nat'l -Others	Japan	ARIB	Association TR	ARIB TR-T16		"Dedicated short-range communication system test items and conditions for mobile station compatibility confirmation arib technical report"
439	Nat'l -Others	Japan	ARIB	Association TR	ARIB TR-T17		"DSRC application sub-layer test items and conditions for mobile station compatibility confirmation arib technical report"
440	Nat'l -Others	Japan	UTMS	Association Std.	B3A08110		Ud-type interface standard
441	Nat'l -Others	Japan	UTMS	Association Std.	B3A08110		Ud-type interface standard
442	Nat'l -Others	Japan	UTMS	Association Std.	B3A08510		Ud-type interface standard for network to transport layers
443	Nat'l -Others	Japan	UTMS	Association Std.	B3A08610		Ud-type interface standard for encoding (presentation layer)
444	Nat'l -Others	Japan	UTMS	Association Std.	B3A08710		Ud-type interface standard for DATEX-ASN application layer protocol
445	Nat'l -Others	Japan	UTMS	Association Std.	B4206320		Infrared communication interface standard for communication with optical vehicle detectors
446	Nat'l -Others	Japan	UTMS	Association Std.	B4224310		DATEX-ASN message standard for communication with u-type present-vehicle detectors with image processing
447	Nat'l -Others	Japan	UTMS	Association Std.	B4224710		DATEX-ASN message standard for communication with traffic flow measurement terminals
448	Nat'l -Others	Japan	UTMS	Association Std.	B4305110		DATEX-ASN message standard for amis for communication with infrared beacons
449	Nat'l -Others	Japan	UTMS	Association Std.	B4A02120		DATEX-ASN message standard for communication with u/uc-type traffic signal controllers

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
450	Nat'l -Others	Japan	UTMS	Association Std.	B4A02220		Shared DATEX-ASN message standard for all types of detectors
451	Nat'l -Others	Japan	UTMS	Association Std.	B6A01110		DATEX-ASN message standard for communication with traffic information boards
452	Nat'l -Others	Japan	HIDO (JH)	Association TS	ETC - A02200P		ETC roadside radio equipment specification
453	Nat'l -Others	Japan	HIDO (JH)	Association TS	ETC - A02210P		ETC obe specification
454	Nat'l -Others	Japan	HIDO (JH)	Association TS	ETC - B02200P		5. 8GHz band DSRC roadside radio equipment specification document
455	Nat'l -Others	Japan	HIDO (JH)	Association TS	ETC - B02210P		5. 8GHz band DSRC obe standard document
456	Nat'l -Others	Japan	HIDO (JH)	Association TS	ETC - B02230P		5. 8GHz band DSRC interface standard document
457	Nat'l -Others	Japan	HIDO (NILIM)	Association TS			Road communication standards
458	Nat'l -Others	Japan	HIDO (Road Association)	Association TR			Charge collection equipment installation criteria (proposal) and this description
459	Nat'l -Others	Japan	HIDO (ORSE)	Reference material			Related data about an etc obe interconnection examination
460	Nat'l -Others	Japan	World Bank & MLIT	Other TR			ITS toolkit for road transport in developing and economic-transition countries
461	Nat'l	Korea	KATS(Korean Agency for Technology and Standards)	National Std.	KS X 6915		Infrared dedicated short range communications(DSRC) standard for intelligent transport applications
462	Nat'l	Korea	KATS	National Std.	KS X 6916		Infrared dedicated short range communications(DSRC) standard for intelligent transport applications - conformance test methods
463	Nat'l	Korea	KATS	National Std.	KS X ISO 14813-6		Transport information and control systems -- reference model architecture(s) for the tics sector -- Part 6: data presentation in ASN.1
464	Nat'l	Korea	KATS	National Std.	KS X ISO 14815		Road transport and traffic telematics -- automatic vehicle and equipment identification -- system specifications
465	Nat'l	Korea	KATS	National Std.	KS X ISO 14816		Road transport and traffic telematics -- automatic vehicle and equipment identification -- numbering and data structure
466	Nat'l	Korea	KATS	National Std.	KS X ISO 14817		Transport information and control systems -- requirements for an ITS/tics central data registry and ITS/tics data dictionaries
467	Nat'l	Korea	KATS	National Std.	KS X ISO 14819-1		Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part 1: coding protocol for radio data system -- traffic message channel (RDS-TMC) using ALERT-C

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
468	Nat'l	Korea	KATS	National Std.	KS X ISO 14819-2		Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part 2: event and information codes for radio data system -- traffic message channel (RDS-TMC)
469	Nat'l	Korea	KATS	National Std.	KS X ISO 14819-3		Traffic and traveller information (TTI) -- TTI messages via traffic message coding -- Part 3: location referencing for ALERT-C
470	Nat'l	Korea	KATS	National Std.	KS X ISO 14827-1		Transport information and control systems -- data interfaces between centres for transport information and control systems -- Part 1: message definition requirements
471	Nat'l	Korea	KATS	National Std.	KS X ISO 14827-2		Transport information and control systems -- data interfaces between centres for transport information and control systems -- Part 2: DATEX-ASN
472	Nat'l	Korea	KATS	National Std.	KS X ISO 14904		Road transport and traffic telematics -- electronic fee collection (EFC) -- interface specification for clearing between operators
473	Nat'l	Korea	KATS	National Std.	KS X ISO 14907-1		Road transport and traffic telematics -- electronic fee collection -- test procedures for user and fixed equipment -- Part 1: description of test procedures
474	Nat'l	Korea	KATS	National Std.	KS X ISO 15075		Transport information and control systems -- in-vehicle navigation systems -- communications message set requirements
475	Nat'l	Korea	KATS	National Std.	KS X ISO 15622		Transport information and control systems -- adaptive cruise control systems -- performance requirements and test procedures
476	Nat'l	Korea	KATS	National Std.	KS X ISO 15623		Transport information and control systems -- forward vehicle collision warning systems -- performance requirements and test procedures
477	Nat'l	Korea	KATS	National Std.	KS X ISO 17261		Intelligent transport systems - automatic vehicle and equipment identification -- intermodal good transport architecture and terminology
478	Nat'l	Korea	KATS	National Std.	KS X ISO 17262		Automatic vehicle and equipment identification -- intermodal goods transport -- numbering and data structures
479	Nat'l	Korea	KATS	National Std.	KS X ISO 17263		Automatic vehicle and equipment identification -- intermodal goods transport -- system parameters
480	Nat'l	Korea	KATS	National Std.	KS X 6923-1		The specifications of purchase SAM on terminal of contactless IC card for electronic money - Part 1 : physical characteristicsand basic structure of purchase sam
481	Nat'l	Korea	KATS	National Std. (Draft)	N/A		Traffic and traveller information (TTI) using ITS- TTI via transport protocol expert group (TPEG) data streams - congestion and travel time information(ctt)

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
482	Nat'l	Korea	MIC (Ministry of Information and Communica-tion)	Regulation	N/A		One regulation is existing on 5.8GHz DSRC
483	Nat'l	Korea	MOCT (Ministry of Construction and Transporta-tion)	Regulation	MOCT 2004-513		Technical regulation for basic transport information exchange (iso 14827-1, -2 compatible)
484	Nat'l	Korea	MOCT	Regulation	MOCT 2005-390		Technical regulation for the public transit information exchange (iso 14827-1, -2 compatible)
485	Nat'l	Korea	MOCT	Guideline (Regula-tory)	N/A		National guideline for node-link ID for ITS digital roadmap
486	Nat'l	Korea	NPA(Natinal Police Agency)	NPA Regulation	N/A		NPA traffic information centre standard
487	Nat'l	Korea	NPA	Regulation	NPA-6310-98-0001-na		Automatic traffic enforcement specification
488	Nat'l	Korea	NPA	Regulation	NPA-6310-97-0001-na		Portable automatic video speed measurement instrument standards
489	Nat'l	Korea	NPA	Regulation	N/A		Automatic traffic accident recording standards
490	Nat'l	Korea	NPA	Regulation	N/A		National traffic controller standards
491	Nat'l	Korea	MOCT	National Guideline	N/A		Guideline for node link id for ITS digital road map
492	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00001		ITS basic data concept and dictionaries standard
493	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00002		Central db of road digital map standard Part 1 - basic concept and scope
494	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00005		Requriement for ITS data registry and data dictionaries standard
495	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00006		Data dictionaries of aITS standard
496	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00007		Data dictionaries of atms standard
497	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00008		Data dictionaries of apts standard

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
498	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00009		Data dictionaries of cvo standard
499	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00010		Messagesets for traveler information service standard Part 1
500	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00011		Messagesets for automated emforcement standard
501	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00012		Messagesets for eelectronic toll collection systems standard
502	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00013		Messagesets for exchange of traffic information service Part 1
503	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00014		Messagesets for incident management standard
504	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00015		Messagesets for traffic control standard Part1
505	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00016		Messagesets for exchange of traffic information service standard Part 2
506	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00017		Messagesets for traffic control standard Part2
507	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00018		Messagesets for traveler information service standard Part 2
508	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00019		Messagesets for vechicle and roadside standard
509	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00020		Messagesets for public transport information standard Part 1
510	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00021		Message sets for application interface of etc s standard
511	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00022		Description of test procedures for etc s standard
512	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00023		Message sets for exchange of traffic information service standard Part 3
513	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00024		Message sets for public transport information standard Part 2
514	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00025		Message sets for traveler information service standard Part 3
515	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00026		Numbering system for public transport stop standard
516	Nat'l -Others	Korea	ITS Korea	Association Std.	ITSK-00027		Basic concept of network(node-link) id standard
517	Nat'l -Others	Korea	ITS Korea	Association TR	ITSK-TR-00003		Data concept of location referencing method (technical report)
518	Nat'l -Others	Korea	ITS Korea	Association TR	ITSK-TR-00004		AVI/AEI for cvo standard (technical report)
519	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0025		Standard of DSRC radio communication between road-side equipment and on-board equipment in 5.8GHz band
520	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0035		Standard of application interface for electronic toll collection systems, which are based on the DSRC

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
521	Nat'l -Others	Korea	TTA	Association Std.	TTAS.IE-P1488		Standard for message set template for ITS
522	Nat'l -Others	Korea	TTA	Association Std.	TTAS.IE-P1489		Umbrella standard for ITS data dictionaries
523	Nat'l -Others	Korea	TTA	Association Std.	TTAS.IS-DIS14825		The standardization of geographic data files(GDF)-k
524	Nat'l -Others	Korea	TTA	Association Std.	TTAS.IE-P1488/R1		Standard for message set template for ITS v2
525	Nat'l -Others	Korea	TTA	Association Std.	TTAS.IE-P1489/R1		Umbrella standard for ITS data dictionaries v2
526	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0050		Message set for commercial vehicle operations
527	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0051		ITS information and communication protocol profile framework
528	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0052		Test standard for layer 2 of DSRC at 5.8GHz
529	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0053		Test standard for layer 7 of DSRC at 5.8GHz
530	Nat'l -Others	Korea	TTA	Associatoin TR	TTAR-0012#		Technical report of resource manager between road-side equipment and on-board equipment
531	Nat'l -Others	Korea	TTA	Association Std.	TTAS.OT-06.0001		ITS message set conversion
532	Nat'l -Others	Korea	TTA	Association Std.	TTAS.IS-DIS15662		Wide area communication protocol management information for ITS
533	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-05.0036		Integrated in-vehicle ITS terminal interfaces
534	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0085		Telematics standard reference model
535	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0084		Telematics terminal software platform stage 1 : architecture
536	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0083		Traffic information service for telematics stage 1 : functional requirements

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
537	Nat'l -Others	Korea	TTA	Association Std.	TTAS.KO-06.0102		Service protocol between telematics terminal and TSP server stage 1: functional requirement
538	Nat'l -Others	Korea	TTA	Associatoin TR	TTAR-06.0001		Telematics services and system
539	Nat'l	Korea	Korean standards Aoosociation	Reference material	N/A		
540	Nat'l	Mexico	SCT	(Draft)			National ITS architecture (under development)
541	Nat'l	Sweden	SS	National Std.	3652		Road traffic informatics - open protocols for interfacing vehicle location subsystems (ovls)
542	Nat'l	Sweden		National Guide			Implementation plan for ITS
543	Nat'l	Sweden		National Guide			SRA's r&d plan
544	Nat'l	Taipei, Chinese		National Std.	IS 21214		Intelligent transport systems -- communications, air interface, long and medium range (CALM) -- infra red systems
545	Nat'l	Taipei, Chinese	Institute of Transportation	National Std.			Communication protocol for urban traffic control, version 3.0
546	Nat'l	Taipei, Chinese	National Expressway Engineering Bureau	National Std.			Communication protocol for national freeway traffic management, version 2.00
547	Nat'l	Taipei, Chinese	Institute of Transportation	National TS			Guide to adopt the standardized control software for urban traffic management
548	Nat'l	Taipei, Chinese	Institute of Transportation	National TR			Implementation of the standardized urban traffic management system
549	Nat'l	Taipei, Chinese	Institute of Transportation	National TR			Guide to implement real time bus location systems
550	Nat'l	Taipei, Chinese	Institute of Transportation	National TR			The strategies to develop the nation traveler information system
551	Nat'l	Taipei, Chinese	Institute of Transportation	National TR			The mechanism and protocol of information sharing for traveler information
552	Nat'l	USA	ANSI	National TS	TS284		Commercial vehicle safety reports - ansi asc x12 ts284
553	Nat'l	USA	ANSI	National TS	TS285		Commercial vehicle safety and credentials information exchange - ansi asc x12 ts285
554	Nat'l	USA	ANSI	National TS	TS286		Commercial vehicle credentials -ansi asc x12 ts286
555	Nat'l	USA	AASHTO	National Std.	1101		NTC IP - simple transportation management framework (stmf) - AASHTO 1101

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
556	Nat'l	USA	AASHTO	National Std.	1102		NTC IP octet encoding rules (oer) - AASHTO 1102
557	Nat'l	USA	AASHTO	National Std.	1103		NTC IP transportation management protocol - AASHTO 1103
558	Nat'l	USA	AASHTO	National Std.	1104		NTC IP - corba naming convention specification - AASHTO 1104
559	Nat'l	USA	AASHTO	National Std.	1201		National transportation communications for ITS protocol (NTC IP) - global object definitions – aAASHTO 1201
560	Nat'l	USA	AASHTO	National Std.	1202		National transportation communications for ITS protocol (NTC IP) object definitions for actuated traffic signal controller units - AASHTO 1202
561	Nat'l	USA	AASHTO	National Std.	1203		NTC IP - object definitions for dynamic message signs - AASHTO 1203
562	Nat'l	USA	AASHTO	National Std.	1204		NTC IP - object definitions for environmental sensor stations -AASHTO 1204
563	Nat'l	USA	AASHTO	National Std.	1205		NTC IP - objects for cctv camera control - AASHTO 1205
564	Nat'l	USA	AASHTO	National Std.	1206		NTC IP - object definitions for data collection and monitoring (dcm) devices - AASHTO 1206
565	Nat'l	USA	AASHTO	National Std.	1207		NTC IP - object definitions for ramp meter control - AASHTO 1207
566	Nat'l	USA	AASHTO	National Std.	1208		NTC IP - object definitions for closed circuit television (cctv) swiTC hes - AASHTO 1208
567	Nat'l	USA	AASHTO	National Std.	1209		NTC IP - data element definitions for transportation sensor systems - AASHTO 1209
568	Nat'l	USA	AASHTO	National Std.	1210		NTC IP - objects for signal system masters - AASHTO 1210
569	Nat'l	USA	AASHTO	National Std.	1211		NTC IP objects for signal control and prioritization - NTC IP 1211
570	Nat'l	USA	AASHTO	National Std.	1212		NTC IP objects for network camera operation
571	Nat'l	USA	AASHTO	National Std.	1213		NTC IP - electrical and lighting mgmt system interoperability & intercommunications std - AASHTO 1213
572	Nat'l	USA	AASHTO	National Std.	1301		NTC IP - weather report message set for ess - AASHTO 1301
573	Nat'l	USA	AASHTO	National Std.	1400		TC IP - framework standard - NTC IP 1400
574	Nat'l	USA	AASHTO	National Std.	1401		TC IP - common public transportation (cpt) business area standard - NTC IP 1401
575	Nat'l	USA	AASHTO	National Std.	1402		TC IP - incident management (im) business area standard - NTC IP 1402
576	Nat'l	USA	AASHTO	National Std.	1403		TC IP - passenger information (pi) business area standard - NTC IP 1403
577	Nat'l	USA	AASHTO	National Std.	1404		TC IP - scheduling/runcutting (sch) business area standard - NTC IP 1404
578	Nat'l	USA	AASHTO	National Std.	1405		TC IP - spatial representation (sp) business area standard - NTC IP 1405

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
579	Nat'l	USA	AASHTO	National Std.	1406		TC IP - onboard (ob) business area standard - NTC IP 1406
580	Nat'l	USA	AASHTO	National Std.	1407		TC IP - control centre (cc) business area standard - NTC IP 1407
581	Nat'l	USA	AASHTO	National Std.	1408		TC IP - fare collection (fc) business area standard - NTC IP 1408
582	Nat'l	USA	AASHTO	National Std.	2001		NTC IP - class b profile - AASHTO 2001
583	Nat'l	USA	AASHTO	National Std.	2101		NTC IP - point to multi-point protocol using rs-232 subnetwork profile - AASHTO 2101
584	Nat'l	USA	AASHTO	National Std.	2102		NTC IP -point to multi-point protocol (pmpp) using fsk modems subnetwork profile - AASHTO 2102
585	Nat'l	USA	AASHTO	National Std.	2103		NTC IP - subnet profile for point-to-point protocol using rs 232 - AASHTO 2103
586	Nat'l	USA	AASHTO	National Std.	2104		NTC IP - subnetwork profile for ethernet - AASHTO 2104
587	Nat'l	USA	AASHTO	National Std.	2201		NTC IP - transportation transport profile - AASHTO 2201
588	Nat'l	USA	AASHTO	National Std.	2202		NTC IP - transport profile for internet (TC p/ip and udp) – AASHTO 2202
589	Nat'l	USA	AASHTO	National Std.	2301		NTC IP - application profile for simple transportation management framework (stmf) - AASHTO 2301
590	Nat'l	USA	AASHTO	National Std.	2302		NTC IP - application profile for trivial file transfer protocol - AASHTO 2302
591	Nat'l	USA	AASHTO	National Std.	2303		NTC IP - application profile for file transfer protocol (FTP) - AASHTO 2303
592	Nat'l	USA	AASHTO	National Std.	2304		NTC IP - application profile for data exchange ASN.1 (DATEX) - AASHTO 2304
593	Nat'l	USA	AASHTO	National Std.	2306		NTC IP application profile for XMLc2c communications
594	Nat'l	USA	AASHTO	National Std.	2801		NTC IP sep for communications profile
595	Nat'l	USA	AASHTO	National Std.	8003		NTC IP - profiles - framework and classification of profiles - AASHTO 8003
596	Nat'l	USA	AASHTO	National Std.	8004		NTC IP structure and identification of management information - NTC IP 8004
597	Nat'l	USA	AASHTO	National Std.	8007		NTC IP testing and conformity assessment documentation within NTC IP standards publications
598	Nat'l	USA	AASHTO	National Std.	9010		NTC IP XML in ITS centre-to-centre communications
599	Nat'l	USA	AASHTO	National Std.	9012		NTC IP testing guide for users
600	Nat'l	USA	APTA	National Std.	TBD		TC IP dialogs
601	Nat'l	USA	ASTM	National Std.	E2158-01		E2158-01 standard specificationfor dedicated short range communication (DSRC) physical layer using microwave in the 902 to 928 MHz band

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
602	Nat'l	USA	ASTM	National Std.	E2213-03		E2213-03 standard specificationfor telecommunications and information exchange between roadside and vehicle systems — 5 GHz band dedicated short range communications (DSRC) medium access control (mac) and physical layer (phy) specifications
603	Nat'l	USA	ASTM	National Std.	E2259-03		Standard guidelines for archiving ITS-generated data - astm e17.54.00.1
604	Nat'l	USA	ASTM	National Std.	WK7592		Standard specifications for metadata content for ITS-generated data - astm wk7592
605	Nat'l	USA	ASTM	National Std.	WK7604		Standard specifications for archiving ITS-related traffic monitoring data - astm wk7604
606	Nat'l	USA	EIA	National Std.	EIA-794		Data radio channel (darc) system - eia/cea eia-794
607	Nat'l	USA	EIA	National Std.	EIA-795		Subcarrier traffic information channel (stic) system - eia/cea eia-795
608	Nat'l	USA	IEEE	National Std.	1404		Guide for microwave communications system development - IEEE std 1404-1998
609	Nat'l	USA	IEEE	National Std.	1455		IEEE standard for message sets for vehicle/roadside communications - IEEE 1455-1999
610	Nat'l	USA	IEEE	National Std.	1488		IEEE standard for message set template for intelligent transportation systems - IEEE std 1488-2000
611	Nat'l	USA	IEEE	National Std.	1489		IEEE standard for data dictionaries for intelligent transportation systems - Part 1 functional area data dictionaries - IEEE std 1489-1999
612	Nat'l	USA	IEEE	National Std.	1512		IEEE standard for common incident management message sets for use by emergency management centres - IEEE std1512-2000
613	Nat'l	USA	IEEE	National Std.	1512.1		Standard for traffic incident management message sets for use by emcs - IEEE p1512.1
614	Nat'l	USA	IEEE	National Std.	1512.2		Standard for public safety incident management message sets for use by emcs - IEEE p1512.2
615	Nat'l	USA	IEEE	National Std.	1512.3		IEEE standard for hazardous material incident management message sets for use by emergency management centres- IEEE 1512.3-2000
616	Nat'l	USA	IEEE	National Std.	1512.4		Standard for common traffic incident management message sets for use in entities external to centres - IEEE 1512.4
617	Nat'l	USA	IEEE	National Std.	1570		IEEE standard for the interface between the rail subsystem andthe highway subsystem at a highway rail intersection - 15702002
618	Nat'l	USA	IEEE	National Std.	1609.1		Standard for dedicated short range communications (DSRC) resource manager - IEEE 1609.1
619	Nat'l	USA	IEEE	National Std.	1609.2		Standard for dedicated short range communications (DSRC) application layer - IEEE 1609-2
620	Nat'l	USA	IEEE	National Std.	1609.3		Standard for ip interface for dedicated short range comunications (DSRC) - IEEE 1609.3

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
621	Nat'l	USA	IEEE	National Std.	1609.4		Standard for dedicated short range communications (DSRC) channelization - IEEE 1609.4
622	Nat'l	USA	IEEE	National Std.	P1556		Standard for security and privacy of vehicle/roadside communication including smart card comm. – IEEE p1556
623	Nat'l	USA	IEEE	National Std.	SH94633-SH94638		The survey and analysis of existing standards and those under development applicable to the needs of the intelligent transportation system (ITS) short range and wide area wireless and wireline technologies - IEEE bks 1-6:
624	Nat'l	USA	ITE	National Std.	Jan-03		Application programming interface (API) standard for the advanced transportation controller (aTC) - ite 9603-1
625	Nat'l	USA	ITE	National Std.	Feb-03		Advanced transportation controller (aTC) cabinet - ite 9603-2
626	Nat'l	USA	ITE	National Std.	Mar-03		Advanced transportation controller (aTC) - ite 9603-3
627	Nat'l	USA	ITE	National Std.	TBD		Advanced transportation controller (aTC) standard specification for the type 2070 controller
628	Nat'l	USA	ITE	National Std.	TM1.03		Standard for functional level traffic management data dictionary (tmdd) - ite tm 1.03
629	Nat'l	USA	ITE	National Std.	TM2.01		Message sets for external tmc communication (ms/etmcc) - ite tm 2.01
630	Nat'l	USA	SAE	National Std.	J1663		SH94633-sh 94638truth-in-labeling standard for navigation map databases - sae j1663
631	Nat'l	USA	SAE	National Std.	J1708		Serial data communications between microcomputer systems in heavy-duty vehicle applications - sae j1708
632	Nat'l	USA	SAE	National Std.	J1746		ISP-vehicle location referencing standard - sae j1746
633	Nat'l	USA	SAE	National Std.	J1757		Standard metrology for vehiculardisplays
634	Nat'l	USA	SAE	National Std.	J1760		ITS data bus data security services recommended practice sae j1760
635	Nat'l	USA	SAE	National Std.	J2266		Location referencing message specification – SAE j2266
636	Nat'l	USA	SAE	National Std.	J2313		On-board land vehicle mayday reporting interface – SAE j2313
637	Nat'l	USA	SAE	National Std.	J2352		Mayday industry survey information report – SAE j2352
638	Nat'l	USA	SAE	National Std.	J2353		Data dictionary for advanced traveler information system (ATIS) – SAE j2353
639	Nat'l	USA	SAE	National Std.	J2354		Message set for advanced traveler information system (ATIS) – SAE j2354
640	Nat'l	USA	SAE	National Std.	J2355		ITS data bus architecture reference model information report – SAE j2355
641	Nat'l	USA	SAE	National Std.	J2365		Calculation of the time to complete in-vehicle navigation and route guidance tasks
642	Nat'l	USA	SAE	National Std.	J2366/1L		ITS data bus - low impedance stereo audio

No	Class I	Class II	SDO TC /SC	Work Item Reference			Title
643	Nat'l	USA	SAE	National Std.	J2366-1		ITS data bus-c - physical layer recommended practice - SAE j2366-1
644	Nat'l	USA	SAE	National Std.	J2366-2		ITS data bus - link layer recommended practice - SAE j2366-2
645	Nat'l	USA	SAE	National Std.	J2366-4		ITS data bus - thin transport layer recommended practice - SAE j2366-4
646	Nat'l	USA	SAE	National Std.	J2366-7		ITS data bus - application message layer recommended practice - sae j2366-7
647	Nat'l	USA	SAE	National Std.	J2369		Standard for ATIS message sets delivered over reduced bandwidth media - SAE j2369
648	Nat'l	USA	SAE	National Std.	J2372		Field test analysis information report - SAE j2372
649	Nat'l	USA	SAE	National Std.	J2373		Stakeholders workshop information report - SAE j2373
650	Nat'l	USA	SAE	National Std.	J2374		Location referencing message specification - SAE j2374
651	Nat'l	USA	SAE	National Std.	J2395		ITS in-vehicle message priority -SAE j2395
652	Nat'l	USA	SAE	National Std.	J2396		Definitions and experimental measures related to the specifications of driver visual behavior using video based techniques - SAE j2396
653	Nat'l	USA	SAE	National Std.	J2399		Adaptive cruise control (acc) human factors: operating characteristics and user interface - j2399
654	Nat'l	USA	SAE	National Std.	J2400		Human factors in forward collision warning systems: operating characteristics and user interface requirements - SAE j2400
655	Nat'l	USA	SAE	National Std.	J2529		Rules for standardizing street names and route ids - SAE j2529
656	Nat'l	USA	SAE	National Std.	J2539		Comparison of gats messages to SAE atis standards information report - SAE j2539
657	Nat'l	USA	SAE	National Std.	J2540		Messages for handling strings and look -up tables in atis standards - SAE j2540
658	Nat'l	USA	SAE	National Std.	J2540-1		RDS (radio data system) phrase lists - SAE j2540-1
659	Nat'l	USA	SAE	National Std.	J2540-2		ITIS phrase lists (international traveler information systems) - SAE j2540-2
660	Nat'l	USA	SAE	National Std.	J2540-3		National names phrase list - SAE j2540-3
661	Nat'l	USA	SAE	National Std.	J2630		Converting atis message standards from ASN.1 to XML - SAE j2630
662	Nat'l	USA	SAE	National Std.	J2xxx		Standard for data dictionary and message sets for dedicated short range communcations (DSRC) - SAE j2xxx

Annex B
(informative)

List of ITS standards deployed (as of October 2005)

B.1 ITS project category: ITS service domains and service groups (ISO 14813-1 rev)

Service domain	Service Group
1. Traveller Information	1.1 Pre-trip information
	1.2 On-trip information
	1.3 Travel services information
	1.4 Route guidance & navigation-Pre trip
	1.5 Route guidance & navigation-On trip
	1.6 Trip planning support
2. Traffic management and operations	2.1 Traffic control
	2.2 Transport-related incident management
	2.3 Demand management
	2.4 Transport infrastructure maintenance management
	2.5 Policing/ enforcing traffic regulations
3. Vehicle	3.1 Transport-related vision enhancement
	3.2 Automated vehicle operation
	3.3 Collision avoidance
	3.4 Safety readiness
	3.5 Pre-crash restraint deployment
4. Freight transport	4.1 Commercial vehicle pre-clearance
	4.2 Commercial vehicle administrative processes
	4.3 Automated roadside safety inspection
	4.4 Commercial vehicle on-board safety monitoring
	4.5 Freight transport fleet management
	4.6 Intermodal information management
	4.7 Management and control of intermodal centres
	4.8 Management of dangerous freight
5. Public transport	5.1 Public transport management
	5.2 Demand responsive and shared public transport
6. Emergency	6.1 Transport related emergency notification and personal security
	6.2 Emergency vehicle management
	6.3 Hazardous materials & incident notification
7. Transport-related electronic payment	7.1 Transport-related electronic financial transactions
	7.2 Integration of transport related electronic payment services
8. Road transport-related personal safety	8.1 Public travel security
	8.2 Safety enhancements for vulnerable road users
	8.3 Safety enhancements for disabled road users
	8.4 Intelligent junctions and links
9. Weather and environmental conditions monitoring	9.1 Weather monitoring
	9.2 Environmental conditions monitoring
10. Disaster response management and coordination	10.1 Disaster data management
	10.2 Disaster response management
	10.3 Coordination with emergency agencies
11. National security	11.1 Monitoring and control of suspicious vehicles
	11.2 Utility or pipeline monitoring

B.2 List of ITS standards deployed in ITS projects (*stage II* survey)

No	Economy	standards Used	Project Title	Type	Year	Project Category	Signific -ance
1	Australia	AS 4962	Electronic Toll Collection	Private	2000 (5 years)	7.1	High
2	Australia	AS ISO 14817	ANZIDAR (Austral-asian ITS Data Registry)	Private	2003-4 (project terminated)	(all)	High
3	Australia	ISO 24014-1	Integrated Ticketing for Public Transport	Public	2004-present	7.2	Medium
4	Austria	Not specified	Multiple projects	Public-Private(Joint)	Not specified	7.x, various applications	High
5	Canada-NS(province of Nova Scotia)	MacPass RFID – AT5100 (Amtech) Canada ITS Architecture 1.1	EDIPORT Halifax Port Authority	Public-Private(Joint)	2005-06 trial	1.2, 2.1, 4.7	High
6	Canada-NS	MacPass RFID – AT5100 (Amtech)	Halifax-Dartmouth Toll Bridge	Private	(?) - present	7.1	High
7	Canada-NS	MacPass RFID – AT5100 (Amtech)	Cobequid Pass/ Highway 104 (E-Pass)	Private	(?) - present	7.1	High
8	Canada-NB (Province of New Brunswick)	MacPass RFID – AT5100 (Amtech)	Confederation Bridge Toll to PEI	Private	(?) - present	7.1	High
9	Canada-NB	MacPass RFID – AT5100 (Amtech)	Saint John Harbour Bridge Toll	Private	(?) - present	7.1	High
10	Canada-NB	NTC IP (commun.) Canada ITS Architecture 1.1	RWIS Road Weather Info System	Public (Joint)	2000-present	9.1, 9.2	High
11	Canada-NB	ASTM E1318-02	Weigh-in-Motion Station	Public-Private(Joint)	(?) - present	4.1, 4.2, 4.3	High
12	Canada-Qub (Province de Québec)	NTC IP	Autoroute 40 Montréal Dynamic Message Signs (DMS)	Public	N/A-present	1.2, 2.1, 2.2, 2.3, 2.4	Medium
13	Canada-Qub	N/A	ATIS Website Montreal Transit "Tous-Azmuth"	Public (Joint)	(?) - present	1.1, 1.6	Low
14	Canada-Qub	Canada ITS Architecture 1.1	Lacolle QC Border X-ing	Public (Joint)	2005	1.2, 2.1, 4.1, 4.2, 4.3, 11.1	High
15	Canada-Qub	Transponder (ASTM E1318-02)	Lacolle QC Border X-ing Weigh-in-Motion Station	Public-Private(Joint)	Proposed	4.1, 4.2, 4.3	High

No	Economy	standards Used	Project Title	Type	Year	Project Category	Signific -ance
16	Canada-Qub	standard (to be selected)	SmarTC ard for Montreal area & Quebec City Transit service	Public (Joint)	Proposed - under developmt	7.2 (Transit)	High
17	Canada-Qub	SAE J2353	ATIS Website using CARS	Private	Proposed w/adjacent States	1.1, 1.3, 1.4	Medium /Low
18	Canada-Qub	SAE J2354	ATIS Website using CARS	Private	Proposed w/adjacent States	1.1, 1.3, 1.4	Medium /Low
19	Canada-Qub	SAE J2540	ATIS Website using CARS	Private	Proposed w/adjacent States	1.1, 1.3, 1.4	Medium /Low
20	Canada-O (Province of Ontario)	(MTO; Ministry of Transportation of Ontario developed specs)	COMPASS (Freeway Traffic Management)	Public	1988-present	2.1, 2.2	High
21	Canada-Ont	NTC IP	VMS, PVMS, CCTV	Public	2003-present	1.2, 2.1	High
22	Canada-Ont	(MTO developed specs)	Advanced Traffic Controllers	Public	1997-present	2.1, 2.2	High
23	Canada-Ont	(Industry developed standard)	Communications (Gigabit Ethernet SwiTC hes)	Public	2003-present	1.2, 2.1, 2.2.	High
24	Canada-Ont	ASTM (DSRC)	AVION (Commercial Vehicle By-pass)	Public-Private(Joint)	1998 - present	4.1, 4.3	High
25	Canada-Ont	ASTM (Draft 6 DSRC)	407 ETR (Toll road)	Public-Private(Joint)	1998 - present	7.1	High
26	Canada-Ont	NTC IP (partial)	RWIS	Public	(?)-present	9.1, 9.2	High
27	Canada-Ont	(MTO developed specs)	RESCU (Toronto Freeway Traffic Management)	Public	1994-present	2.1, 2.2	High
28	Canada-Ont	(MTO developed specs)	QEW Ramp Metering	Public	1975-present	2.3	High
29	Canada-Ont	DATEX (Early NTC IP Centre to Centre)	COMPASS-RESCU Centre to Centre	Public-Private(Joint)	2000 to 2003 (Pilot Project)	2.1, 2.2	High
30	Canada-Sask (Province of SaskaTC hew an)	ASTM E1318-02	Virtual Weigh Station	Public	2005	2.4 , 2.5	High
31	Canada-Sask	FHWA TMG Card Format	Virtual Weigh Station	Public	2005	2.4 , 2.5	High
32	Canada-Sask	National Electrical Code	Virtual Weigh Station	Public	2005	2.4 , 2.5	High
33	Canada-Sask	Canada ITS Architecture 1.1	Virtual Weigh Station	Public	2005	2.4 , 2.5	High

No	Economy	standards Used	Project Title	Type	Year	Project Category	Signific -ance
34	Canada-Alb (Province of Alberta)	NTC IP	Dynamic Message Sign	Public	(?)-present	1.2, 2.1, 2.2, 2.3, 2.4	Medium
35	Canada-Alb	ASTM v6	Automated vehicle identification for commercial vehicles bypassing inspection stations	Public-Private(Joint)	2006-present (operating)	4.1	Medium
36	Canada-Alb	ASTM E2158-01 for DRSC	Automated vehicle identification for commercial vehicles bypassing inspection stations	Public-Private(Joint)	6 months installation starting in spring 2006, 3 years operating	4.1	Medium
37	Canada-Alb	ASTM E1318-02 (WIM)	Automated Traffic Recorder (Weigh in Motion, Size, Speed)	Public-Private(Joint)	Sept 2004 - present	4.1,4.2, 4.4	High
38	Canada-Alb	NTC IP-ESS (data format)	RWIS Road Weather Info System	Public	RFP Nov 2004	9.2	High
39	Canada-Alb	NEMA (cabinet)	RWIS Road Weather Info System	Public	RFP Nov 2004	9.2	High
40	Canada-Alb	Canada ITS Architecture 1.1	RWIS Road Weather Info System	Public	RFP Nov 2004	9.2	High
41	Canada-Alb	Proprietary System	Snowplow Tracking	Private	(?) - present	4.4, 8.1, 9.2	Low
42	Canada-BC (Province of British Columbia)	In-vehicle– Siemens' Transit MasterTMControl Centre– manage & dispaTC h	98 B-Line Bus Rapid Transit (BRT)-Automated Vehicle Location & Schedule Adherence	Public	2000-present	5.1	High/Medium
43	Canada-BC	Vehicle to Intersection - Novax's - Bus PlusTM - DSRC - infrared controller	98 B-Line Bus Rapid Transit (BRT) - Traffic signal priority	Public (Joint)	2000 to present	8.4	High
44	Canada-BC	At Bus Stops - Siemens' OnStreetTM	98 B-Line Bus Rapid Transit (BRT)-Dynamic message signs	Public	2000-present	1.2	Medium

No	Economy	standards Used	Project Title	Type	Year	Project Category	Signific-ance
45	Canada-BC	Canada ITS Architecture 1.1	98 B-Line Bus Rapid Transit (BRT)	Public (Joint)	2000 to present	1.2, 5.1, 8.4	High
46	Canada-BC	ISO 14443	SmarTC ard	Public	Proposed	7.2	High
47	Canada-BC	ISO (proposed)	ATIS Web Portal for 7 Authorities	Public	Proposed–RFP 2005	1.1, 1.2,1.3, 1.6	High
48	Canada-BC	To Be Decided(900MHz vs 5.9GHz)	Golden Ears Bridge Toll - DSRC to interop with SmarTC ards	Public-Private(Joint)	Proposed	7.all	High
49	Chinese Taipei	ISO 14443	Taipei Easy Card	Public-Private(Joint)	2000-	7.all	Medium
50	Chinese Taipei	ISO 14443	Freeway Electronic Toll Collection	Public-Private(Joint)	2003-2023	7.all	Medium
51	Chinese Taipei	ISO/DIS 21214	Freeway Electronic Toll Collection	Public-Private(Joint)	2003-2023	7.all	Medium
52	Chinese Taipei	ISO 14443	Central Taiwan E Card for all Trips	Public-Private(Joint)	2004-	7.all	Medium
53	Chinese Taipei	ISO 14443	South Taiwan Money Card	Public-Private(Joint)	2005-	7.all	Medium
54	France	EN / ISO 14906	EFC (TIS)	Public-Private(Joint)	Since 2002	7.all	High
55	France	EN / ISO 17573	EFC (TIS)	Public-Private(Joint)	Since 2002	7.all	High
56	France	EN 12834	EFC (TIS)	Public-Private(Joint)	Since 2002	7.all	High
57	France	EN 12253	EFC (TIS)	Public-Private(Joint)	Since 2002	7.all	High
58	France	EN 12795	EFC (TIS)	Public-Private(Joint)	Since 2002	7.all	High
59	France	EN 13372	EFC (TIS)	Public-Private(Joint)	Since 2002	7.all	High
60	France	N/A (IFMS on Intercode, Interdic, Interbob)	Public Transport Interoperable Fare Management	Public-Private(Joint)	Since 2002	5.1, 7.all	High
61	France	ENV 13777	DATEX	Public	Since 2001	2.1, 2.2	High
62	France	ENV 13106	DATEX	Public	Since 2001	2.1, 2.2	High
63	France	Various French national standards on LCR/DIASER standards developed by CNEVT08	LCR/DIASER	Public-Private(Joint)	Since 1990	2.1	High
64	France	CEN/ISO 14819-1, 2, 3	RDS-TMC	Private	Since 1999	1.2	Medium
65	Japan	ISO14827	UD	Public	2003	2.1	High

No	Economy	standards Used	Project Title	Type	Year	Project Category	Signific-ance
			Communication Systems				
66	Japan	ISO14827	Road Information Dissemination Systems	Public	2002	1.2, 1.3, 1.6	Medium
67	Japan	ISO 14906	Electronic Toll Collection	Public	Since 2000	7.all	High
68	Japan	ISO/TS 14907-1	Electronic Toll Collection	Public	Since 2000	7.all	Medium
69	Japan	ISO/TS 14907-2	Electronic Toll Collection	Public	Since 2000	7.all	High
70	Japan	ISO/TS 17573	Electronic Toll Collection	Public	Since 2000	7.all	Medium
71	Japan	ISO/TS 17574	Electronic Toll Collection	Public	Since 2000	7.all	High
72	Korea	KS X 6915	ETC (Korea Highway Corporation	Public	2004-present	7.all	High
73	Korea	TTAS.KO.06-0025	ETC (Korea Highway Corporation)	Public	2004-present	7.all	High
74	Korea	ITSK-0021	ETC (Korea Highway Corporation)	Public	2004-present	7.all	High
75	Korea	ITSK-0032	ETC (Korea Highway Corporation)	Public	2004-present	7.all	High
76	Korea	ISO FDIS 15628	ETC (Korea Highway Corporation)	Public	2004-present	7.all	High
77	Korea	ISO 14906:2004	ETC (Korea Highway Corporation)	Public	2004-present	7.all	High
78	Korea	KS X 6923-1	IC Card for ETC (KHC)	Public	2004-present	7.all	High
79	Korea	KS X 6923-1	Seoul Public Transport Card Systems	Public	2004-present	7.all	High
80	Korea	KS X ISO 14443	IC Card for ETC (KHC)	Public	2004-present	7.all	High
81	Korea	Draft KS (TPEG –CTT)	MBC Pilot DMB-TPEG systems	Private	2003	1.all	
82	Korea	ISO NP 17685 SNSPTS	Seoul Metropolitan Bus Information Systems	Public	2004-2005	5.1	Medium
83	Korea	Technical Regulation for the Public Transit Information Exchange	Seoul Metropolitan Bus Information Systems	Public	2004-2005	5.1, 7.all	High
84	Korea	KS X ISO 14817	National ITS Data Registry	Public	2003-present	(all)	High

No	Economy	standards Used	Project Title	Type	Year	Project Category	Signific -ance
85	Korea	KS X ISO 14827-1,2	MOCT and MIC Joint Project for National Traffic Information Centre - Phase I (28 cities - Gwangju, Daegu, Busan, Incheon, Ulsan, Daejeon, Gwangmyoung, Gwangyang, Gyeongju, Gunpo, Bucheon, Suncheon, Siheung, Ansan, Yeosu, Yongin, Jinhae, Pyeongtaek, Goyang, Gwacheon, Gunsan, Sungnam, Suwon, Anyang, Wonju, Jeonju, Jeju, Chungju)	Public	2005-present	1.all	High
86	Korea	MOCT 2004-013	MOCT and MIC Joint Project for National Traffic Information Centre - Phase I	Public	2005-present	1.all	High
87	Korea	National Guideline for Node-Link ID for ITS digital roadmap	MOCT and MIC Joint Project for National Traffic Information Centre - Phase I	Public	2005-present	1.all	High
88	Korea	ISO 18047-6 RFID (860-960MHz)	Seoul Weekday Traffic Management System for Passenger Vehicles (using RFID tags)	Public	2005-present	2.3	High
89	Korea	NPA-6310-98-0001-na	Natonal Automatic Traffic Enforcement Systems	Public	1998-present	2.5	High
90	Korea	NPA-6310-97-0001-na	Portable Automatic Video Speed Measurement Instruments	Public	1997-present	2.5	High
91	Switzerland	ISO 14906:2004	Swiss Heavy Vehicles Fee	public	2000 and 2005	7.1	High

No	Economy	standards Used	Project Title	Type	Year	Project Category	Signific -ance
92	Switzerland	ISO 14907-1:2005	Swiss Heavy Vehicles Fee	public	2000 and 2005	7.1	High
93	Switzerland	ISO/DIS 15628 (we used the CEN DSRC standards suite)	Swiss Heavy Vehicles Fee	public	2000 and 2005	7.1	High
94	USA	NTC IP 1207 (RMC)	Evaluation and Testing of NTC IP 1207 Ramp Meter Control	Public	2005	2.1 2.3	High
95	USA	SAE J2354	511 System Deployment (California, Kentucky, Ohio)	Public	2003	1.all	High
96	USA	ITE TM 1.03	511 System Deployment (California, Kentucky, Ohio)	Public	2003	1.all	High
97	USA	ITE TM 1.03	TRANSCOM	Public	2006	2.2, 2.3 6.1 10.2	High
98	USA	ITE TM 2.01	TRANSCOM	Public	2006	2.2, 2.3 6.1 10.2	High
99	USA	ITE TM 1.03	Virginia DOT Integration of Data from Public Works and Public Safety Agencies	Public	2005	2.2 6.1	Low
100	USA	IEEE 1512-2000	Virginia DOT Integration of Data from Public Works and Public Safety Agencies	Public	2005	2.2 6.1	Low

Annex C
(informative)

Lessons learned

C.1 Lessons learned from Australia (1/3)

Lesson Title	Requirement for a Data Registry for ITS Harmonization
Date Reported	2002 - 2005
Location	Victoria and Australian Capital Territory, Australia

Context:

What: A data registry or data dictionary provides a practical means to manage the development and approval of data concepts for ITS, especially the harmonization of similar concepts from disparate Standards Development Organizations [SDO].

This approach was pioneered in the generic field of metadata management in standards such as *ISO/IEC 11179 Information Technology – Metadata registries [MDR],* and then specialized for ITS in *ISO 14817 Transport information and control systems* (TICS) – *Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries*.

- Australia has been actively involved in the development of ISO 14817 through the involvement of former researcher Dr John Smith, and has therefore made a concerted effort to take a leading role in the implementation of the approach described in ISO 14817, even to the extent of cloning the standard as a national standard AS ISO 14817 (to make it more readily accessible within Australia).

The approach taken was twofold:

1. The national ITS organization ITS Australia Inc. [ITSA] and the national standards organization Standards Australia Limited [SAL] have entered into a memorandum of understanding [MOU] for the collaboration of the development and publishing of standardized data concepts through an ITS data registry
2. A working model of a data registry called ANZIDAR (Australasian (Australia & New Zealand [ANZ])) ITS Data Registry) was built and made available on the ITSA website www.its-australia.com.au and Dr Smith was contracted to develop some proof-of-concept examples of its use, and was preselected as Registrar for full-scale operations

The national ITS standardization committee agreed that the development and use of ITS data registries should be a special function of the committee

What then remained to be done were two main steps:

1. The development of a user-friendly front-end user interface and this required further investment of approximately $AUD200K for which funding has not been sourced

2. The agreement of a practical membership subscription and fee-for-use / royalty basis to cover the income needed to cover the cost of operations. This was progressed and a potential first customer engaged in negotiation. However the savings that would be available to a subscriber were not quantified and hence not made compelling

Recently the significant progress made by the Transport Information Highway Working Group 3 of the UK Highways Agency has surpassed the progress on ANZIDAR and rendered the further development of ANZIDAR unlikely

Why: The business model for the data registry was never articulated and accepted by the stakeholders including ITSA and SAL.

When: This process continued from around 2000 until 2005

Lesson Learned:

What was done right?

1. The benefits of harmonization of data concepts by means of a data registry have been recognized in principle in other areas and regions but were never clearly stated or accepted in Australia or New Zealand
2. The concept of ISO 14817 was proven by the prototype implementation on ANZIDAR
3. The need for commercial and licensing agreements was recognized and progressed, but in isolation form an overall business plan

What would one do differently?

1. The business case for ANZIDAR should have been developed and approved by stakeholders in advance
2. The use of ANZIDAR by a demonstration project should have been a high priority goal

What was the impact of market factors?

- The business benefits of using ANZIDAR were not articulated well enough for the market to take up the new approach

What experience ("lesson learned") would one pass on to others?

1. Don't assume any prior or immediate acceptance of the business case for the use of a data registry for harmonization of ITS data concepts. The case must be made carefully and completely and there is much communication needed with potential customers to explain how it works and why they will benefit
2. Ensure the business case covers the full development of the user interface even if the database aspects are small-scale
3. Engage the regional bodies such as APEC in discussion of and support for harmonization of ITS data concepts and messages

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C.2 Lessons learned from Australia (2/3)

Lesson Title	Requirement for Interoperable Transit Ticketing Cards
Date Reported	2003 - 2006
Location	Western Australia, Queensland, Victoria and New South Wales, Australia

Context:

What: Many of the larger state jurisdictions in Australia have begun to introduce so-called 'smarTC ard' ticketing systems for use on all modes of public transport [PT] (sometimes called 'transit'). The desirability of making these cards interchangeable was recognized at an early stage and a special working group was formed, called the National Ticketing and Tolling Working Group [NTTWG]. This group was comprised of representative from PT authorities with state governments and representatives of suppliers of technology or consultancy services. Overall the NTTWG identified many of the issues but was unable to influence the financial processes of each of the jurisdictions to select any common proprietary system, while also not achieving any formula or standard for interoperability

The group also found significant differences in priority and political importance between tolling on the one hand and ticketing on the other, and so the group was reformed into separate groups for electronic tolling (the subject of another lesson learned) and PT electronic ticketing.

Why: The alternative systems proposed for smarTC and PT ticketing are proprietary and due to a lack of any extant international or national standard for architecture or interoperability, are incompatible in a number of respects

When: This process has occurred over a period of three to four years with a number of key participants and observers working hard to bring a standard into existence in time to provide initial interoperability. This activity continues with the goal to provide a convergence road-map so that interoperability will be achieved in future

Lesson Learned:

What was done right?

1. The issue was identified very early
2. An appropriate working group was formed
3. The ongoing work by a small expert group in Standards Australia sub-committee IT-012-05 and by the Victorian Transport Ticketing Authority has been most effective

What would one do differently?

1. There needs to be a business case made at the political level that shows the benefits to all jurisdictions and the community of interoperability
2. There should be an architecture level standard developed very early and used to explain the business case and to guide the tendering process by the jurisdiction procurements authorities

What was the impact of market factors?

- The additional costs of interoperability were never justified in terms of additional revenue through increased PT patronage or other benefits or in savings in cost-of-ownership through commonality of investment assets and consumables

What experience ("lesson learned") would one pass on to others?

1. Identify the benefits of interoperability in financial terms
2. Develop and mandate the use of an architecture level standard or framework document
3. Ensure the standards development process is part of the business planning

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C.3 Lessons learned from Australia (3/3)

Lesson Title	Electronic tolling relies on standardization
Date Reported	1997 - 2006
Location	New South Wales, Australia

Context:

What: Several toll roads were constructed around Sydney NSW using the build, own, operate, transfer [BOOT] contracting approach. This left the contractor with the responsibility for selecting and operating the electronic toll collection [ETC] equipment. At the time there was no mandated Australian standard for the ETC equipment and there were competing, incompatible standards in the international arena. Inevitably the result was toll roads using incompatible electron tolling systems and motorists faced with the need to purchase multiple toll tags, subsequent toll roads in other states exacerbated the problem with other tolling products that were not interoperable

Why: the approach was taken by the state road authority to reduce risk to the government in an area where it had limited experience

When: the process started in the '90s and continues today as further roads are added

OuTC ome: A retrospective standardization process has resulted in compatible systems and the ability to use a single toll tag anywhere in Australia

Lesson Learned:

What was done right? The standardization process, once started, has proceeded in an exemplary manner, over a ten-year period with governments and all toll-road operators and owners working together to resolve the issue through three principal work programs. These working groups were:

- National Electronic Tolling Committee (management oversight)
- Toll Road Operators MOU Group (business issues primarily payment clearances)
- Standards Australia standards sub-committee IT-023-05

What would one do differently? In future public sector clients should consider the interoperability issues in all publicly funded projects even if performed by the private sector

How could one be more effective in the future? The contributing factors for interoperability and the opportunity cost of incompatibility should be assessed as part of the business case for any large infrastructure project

What was the impact of market factors? Competition among tenderers for the toll roads would have caused them to include a premium for interoperability

What experience ("lesson learned") would one pass on to others? Ensure interoperability or the lack of it is considered fully in benefit-cost analysis of proposed new projects

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C.4 Lessons learned from Canada (1/4)

Lesson Title	Use Common Tag with Related ITS Services: Use ITS standards already adopted by related ITS systems to reduce time to implement new ITS services
Date Reported	2004-November (date of acceptance of project proposal)
Location	Nova Scotia, Canada

Context:

The project applies ITS technology to resolve a growing problem of congestion at the Port of Halifax terminal gates that result in longer waiting times and lost productivity for commercial truck drivers, and to meet increasing demands for improved security. By using vehicle identification systems already in use elsewhere in the region, port operators will be able to track the entry and exit of commercial vehicles from the port's various sites. Sixty-five percent of commercial vehicles accessing the port are already equipped with transponders such as the electronic pass system used by the Halifax-Dartmouth Bridge Commission to collect tolls. Other systems in use in the region use similar communication protocols and are easily interoperable.

The project was launched in November 2004 and is planned to begin operations in late 2005 and will collect data in a pilot demonstration phase for 6 months. The objective is to help alleviate commercial vehicle congestion and reduce vehicle wait times and emissions at the Port of Halifax by using improved traveler information and trip planning capabilities. The data on commercial vehicle movements will be used to accurately measure and report wait and service times in real time for commercial vehicles that enter the Port facilities, and to use these measures to evaluate resulting project success. The accumulated historical wait and service times, in combination with other relevant operational data, will be used to develop gate queuing models to help determine optimal strategies for use in trip planning.

Lesson Learned:

The project was easier to implement, faster to get up and running and required less administrative overhead to set up by using a transponder tag that was already in common use in the region rather than adopting its own tag.

The project required a method to identify and track all commercial vehicles as they entered and exited the Port facilities. The use of a transponder tag on each vehicle and a reader at the entry and exit points would serve this purpose. There were already systems established and operating in the Halifax region that involved the use of RFID tags on vehicles. There were also other nearby toll road and toll bridge services using this RFID tag. The result was that a large number of commercial vehicles were already equipped with this tag thus speeding up the project startup. The mechanism for distributing the tags to vehicles was also already in place so the project avoided that cost. The project organizers included the current user of RFID tag (Halifax-Dartmouth Bridge Commission) as a partner from the beginning to ensure a smooth adoption process.

This arrangement worked well for the relatively small ITS operation at the Port of Halifax. Its success depended on the partnership established with the existing user of the tag and the fact that the commercial vehicles accessing the Port have delivery operations that remain within the region. That is, there is relatively little interaction with other east coast toll operations (e.g. EzPass in New York/New Jersey) or central Canada (e.g. 407 ETR) that use different tags. The relative isolation of the project site was a contributing factor to the success of this strategy.

Source Information(if applicable):

Title	Ediport vehicle access management system
Author	IBI Group
Organization	• Transport Canada
Date	• 28 October 2005
Reference (if any):	• http://www.TC.gc.ca/tdc/projects/its/d/its11.htm

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C.5 Lessons learned from Canada (2/4)

Lesson Title	Reward payment system to ensure Data Quality from automated ITS traffic recorder stations
Date Reported	2004-September
Location	Alberta, Canada

Context:
The Alberta Infrastructure and Transportation Department operates six automated traffic recorder stations that monitor vehicle weight and dimensions for highway planning purposes. These stations are located on provincial highways and measure 10 different variables describing the vehicles as they pass at highway speeds, thus reducing stopping delays, avoiding excess emissions and increasing the coverage of the vehicle fleet at minimal cost.

The 10 variables measured include vehicle classification, speed, 4 weight-related, and 4 dimension-related measures. Piezo-electric sensors collect the weight-related variables, magnetic induction loops measure speeds and dimensions. Vehicle classification is determined by a combination of weight, dimension and number of axles. The weigh-in-motion system uses the ASTM standard E1318-02.

The issue is that the quality of the data from the automated measurement equipment can vary considerably without constant attention to maintain the accuracy of the equipment. This means that the user has less confidence in the output results of the inspection stations leading to poor highway planning and design decisions by the road authority.

Lesson Learned:
The solution adopted by Alberta Infrastructure and Transportation was to enter into a contract with a separate consultant that arranges for regular testing of the weigh in motion system. This consultant makes adjustments to the payments to the weigh in motion contractor (the company that installed and operates the weigh in motion system) contingent on achieving a certain score in the regularly repeated tests conducted at each inspection site. The tests are conducted by a test vehicle that drives over the inspection site, the sensor readings are recorded and the readings are then compared to the vehicle's known characteristics. The measured results must be within an agreed percentage of the actual measurements. The tests cover all 10 variables and are conducted 10 times per month or 120 times per year. The payments for data are based on adherence to the agreed percent variation.

This system has been operating since September of 2004 with some success. The data is used for highway planning and design purposes and is available at no cost to the public.

The lesson is that it is not adequate to rely on the ITS equipment on its own continuing to perform according to the standard. A pro-active approach is needed to ensure adequate levels of data quality. The Alberta experience is that introducing a payment system that rewards adherence to the acceptable deviations from the standard can be a practical solution.

Consider:

- Impact on Project Implementation (if applicable): Cost, Schedule, Performance, etc.
- Impact on ITS Goals (if applicable):
- How can the lesson be repeated or avoided (if applicable)?

(*Guide: up to 1500 words.*)

Source Information(if applicable):

Title	
Author	
Organization	Alberta Infrastructure and Transportation
Date	December 5, 2005
Reference (if any):	

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C.6 Lessons learned from Canada (3/4)

Lesson Title	ITS system integration on 98 B-Line BRT using "standardized" equipment ensures interoperability throughout the network
Date Reported	2000-present
Location	British Columbia, Canada

Context:

The 98-B-Line Bus Rapid Transit service in Vancouver connects the central Multi-modal public transport station in Vancouver to Richmond in the south and the Vancouver Airport. It has been designed and built using the latest ITS technologies to facilitate on-time schedule adherence, traveler information services and bus priority at intersections. The ITS systems include automated vehicle location and tracking (Siemens' Transit Master™), dynamic message signs in the bus vehicles and at the bus stops, communications with the central transit control centre and bus priority at intersections (Novax's Bus Plus™).

Lessons Learned:

The 98 B-Line Bus Rapid Transit (BRT) service is under the operational control of Vancouver's TransLink public transit operator including the buses and the central control centre. The only external link from the BRT system involves the links to the intersection signal controls that are in the jurisdictions of the Cities of Vancouver and Richmond. TransLink was able to set the parameters for

the integration of the various systems within their own control with the result that proprietary systems were selected for implementation with minimal difficulties. The external links to the traffic signals, however, raised many problems in coordinating with the City authorities and with the supplier of the proprietary system. There was also a need to market the new services offered by the ITS systems.

The lessons learned were:

1. ITS systems that are internal to one operator or do not have external links do not have the same imperative to have standards and, with adequate specifications of the requirement, proprietary systems may serve the purpose.
2. ITS systems that involve implementing an interface between 2 jurisdictions can lead to delays and problems if the common interface has not been standardized and well tested in advance.
3. Another lesson apart from the technology and standards is that TransLink did a lot of community work to get "buy in". A lesson learned here is that no matter how good it is, how well the standards works, if one doesn't get the community to accept it, the project will fail. Don't forget to do the marketing.

Looking ahead to future ITS implementations involving SmarTC ards for transit (TransLink) and toll tags for bridge tolls (Golden Ears Bridge), TransLink is preparing to make the case that a common standard is needed so that these ITS systems are both interoperable with each other and with parking services to facilitate the use of public transport services on a region-wide basis.

Source Information(if applicable):

Title	98 B-Line Bus Rapid Transit Evaluation Study
Author	IBI Group and TransLink
Organization	• Transport Canada
Date	• September 2003
Reference (if any):	• http://www.itsbc.ca/main_shell.html

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C.7 Lessons learned from Canada (4/4)

Lesson Title	Ontario Advanced Traffic Management Systems - Standards
Date Reported	2006 – 01 - 09 (submission date)
Location	Ontario, Canada

Context:

Ministry of Transportation Ontario (MTO) Standards Presently in Use

NTC IP is now used for all Variable Message Signs and Portable Variable Message Signs. Other components are using MTO developed standards. For example, the Advanced Traffic Controllers are built to an MTO developed specification. Industry standard Gigabit Ethernet swiTC hes are used for communications.

MTO has always deployed using either industry standards such as NTC IP or standards developed by MTO. This means that we are not limited to single suppliers on any of our equipment nor are we restrained by limitations that result from manufacturer specifications. NTC IP standards vary significantly from device to device. Some, such as the DMS standards are well developed. Others, such as the standard for Ramp Metering field controllers are still quite immature.

Lessons Learned:

What was done right – Use of standards, either industry standards or standards developed by MTO allowed us to be in control and to push industry to provide equipment that suited our needs instead of allowing what the industry had available to modify our objectives

What would be done differently – Nothing

How to be more effective in future: – Speed up adoption of NTC IP and other standards as international standards. Revise the NTC IP standards such as ramp metering that are really just a melting pot of existing manufacturers standards and accordingly are very heavy in overhead. Push industry harder to make changes that allow adoption of streamlined standards.

Impact of Market Factors – Minimal because MTO was willing to push industry by defining standards to be adopted by companies wishing to sell product here. Some small financial penalties may have been seen on individual jobs but overall the approach led to savings and allowed us to get the products we needed to do the job we wanted to do.

Experience to Pass On – Use standards wherever possible and if standards don't exist, then develop them for your agency. Don't be afraid to ask industry to step up to the plate.

Impact on Project Implementation – Design times are longer if standards need to be developed but they result in reduced problems and implementation times for follow on projects. Where industry standards exist, implementation times are as short as moving forward without standards and it is much easier to gauge whether the product being delivered will work the way you want it to.

Impact on ITS Goals – Using standards or developing your own allows the designer to design to meet your ITS goals and operational concept. Using manufacturers off the shelf product may require lessening of goals.

How Can Lessons Learned be Repeated – Use standards for all purchasing.

Consider:

- Impact on Project Implementation (if applicable): Cost, Schedule, Performance, etc.
- Impact on ITS Goals (if applicable):
- How can the lesson be repeated or avoided (if applicable)?

Source Information(if applicable):

Title	Ontario Advanced Traffic Management Systems
Author	Phil Masters
Organization	Ministry of Transportation Ontario
Date	January 2006
Reference (if any):	

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C.8 Lessons learned – Japan (1/2)

Lesson Title	International standard has secured interoperability of UD Communication Systems, but need some additional specifications to meet national requirements
Date Reported	2003-10
Location	Japan

Context:
We developed the UD Communication Systems for the traffic management systems in Japan as a new communication method between center and roadside equipment such as traffic signal controller, information dissemination device, vehicle detector and so on.

Lesson Learned:
We were able to complete our national communication standard by choosing appropriate options and parameters which is prepared in the international standard ISO 14827 we adopted. We learned that some additional specifications and designations are necessary in order to meet some national requirements and to secure the interoperability between many vendors.

Source Information(if applicable):

Title	N/A
Author	
Organization	
Date	
Reference (if any):	

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C.9 Lessons learned from Japan (2/2)

Lesson Title	DATEX ASN for Road Information Dissemination Systems
Date Reported	2002-04
Location	Tochigi Prefecture, Japan

Context:
We adopted DATEX-ASN for the Road Information Dissemination Systems as a communication method between center and roadside.

Lesson Learned:
We thought that we were able to expand the system easily and save the cost and time when we develop the system by using DATEX-ASN for the national specification, Road Communication Standard.
We used the communication standard between centers for the communication between center and roadside because DATEX-ASN is so sophisticated protocol that we could upgrade roadside devices' functions.

Source Information(if applicable):

Title	
Author	
Organization	
Date	
Reference (if any):	

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C.10 Lessons learned from Korea (1/6)

Lesson Title	**Speeding up the deployment of national Electronic Toll Collection System (ETC S) by using the standardized communication protocol** * KS X 6915 IR DSRC for ITS applications ISO FDIS 15628 DSRC application layer
Date Reported	2004-02
Location	Seoul Metropolitan Areas, Korea

◆ **Context:**

Korea Highway Corporation (KHC) initiated national Electronic Toll Collection (ETC) project along Seoul Ring Road in the middle of 2000. The sophisticated system, 'Hi-Pass' has been installed and operated at ten toll plazas (20 lanes) on the road and will be expanded into all highway plazas (approx. 250 plazas) throughout the country by 2007. In terms of in-vehicle unit, about 70,000 units have been diffused in the metropolitan area and KHC anticipates 4.5 millions of units (approx. 30% of the registered vehicles) by 2010 nationwide.

The 'KS X 6915: IR-DSRC (Infrared-Dedicated Short Range Communications) Standard for ITS Application' is the sole Korean national standard dealing with communication protocol for the Intelligent Transport Systems (ITS) sector. This standard specifies wireless communications, between vehicles and the roadside, between vehicles, and between mobile equipment and fixed infrastructure points, using infrared as a medium to provide various ITS applications. The interoperability within ITS applications and the intermodality between different ITS applications are considered as the significant objectives of the standard.

It is prescribed in the RFP for the national ETC project of KHC that the compatibility with the national standard is compulsory.

◆ **Lesson Learned:**

Korean ETC S using passive RF (Radio Frequency) system was firstly introduced in public by KHC in 2000 as a pilot project. However, since active RF system was established as a group standard by TTA (Telecommunications Technology Association) in the same year, the national ETC project had been in trouble between each system providers using different kinds of media.

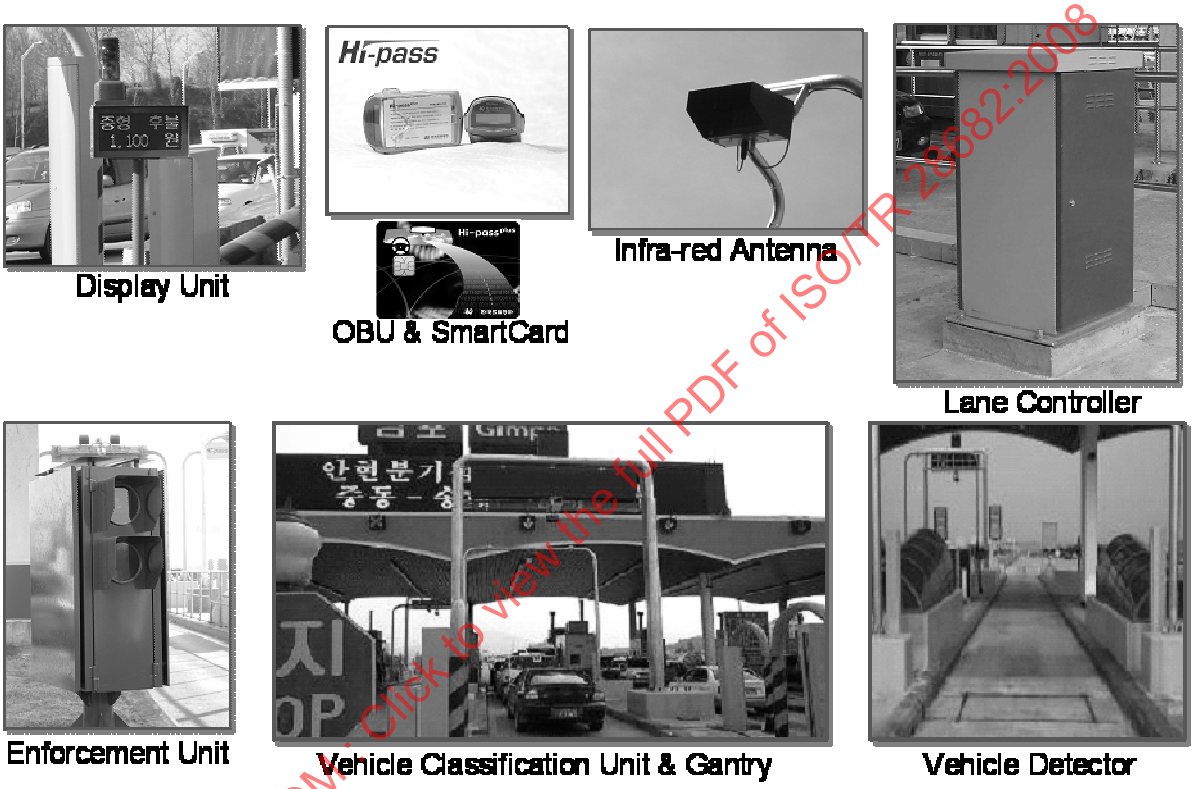
The absence of national standard in the field resulted in heavy loss of time and money. KHC decided to revise 'Hi-Pass' plan over all and the national ETC project had delayed for four years thereafter until the national standard was established in the early of 2004.

As of October, 2005, KHC makes a drive on the expansion of the national ETC project and looks forward to completing the nationwide installation by 2007.

. The two points learned are as follows:

- Government, provincial authorities and other organizations funded by government should consider (the possibility of) standardization and applicable standards prior to the operation of project.

- The compatibility and interoperability of the technologies to be standardized is the compulsory for the expansion of ITS applications nationwide and worldwide as a key infrastructure.



<System Configuration of Korean Electronic Toll Collection System– Hi-Pass>

Source Information(if applicable): N/A

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C.11 Lessons learned from Korea (2/6)

Lesson Title	**Improving the effectiveness of public transport systems by using the Standard Numbering System for Public Transit Stops (SNSPTS)** *ISO NP 17685 SNSPTS
Date Reported	2004-12
Location	Seoul Metropolitan Areas, Korea

◆ **Context:**

Standard Numbering System for Public Transit Stops (SNSPTS) specifies the requirements for numbering public transit stops including bus stops, tram/light rail stops, and/or taxi ranks, etc., by providing standard formats with flexibility to cater for the specific situations in different countries and cities.

SNSPTS describes the numbering framework that utilized by public transport organizations to exchange data elements and messages for the provision of public transport information between internal business areas, and among public transport and other traffic information centers, wayside and mobile units for travelers.

This coding schema applied on the Korean Regional Bus Information System Deployment Project (2004. 10 - 2005. 8) in Seoul Metropolitan Areas including 5 suburb cities was proved being effective on the collection and provision of the public transport information.

◆ **Lesson Learned:**

Public transport stop numbers are needed to formalize the exchange among public transport components, systems and centers, and between transit management centers and other traffic information centers, wayside and mobile devices. The benefits to be anticipated are:

- Numbering of transit stops has been adopted in some cities in Korea and has proven to be a highly useful way of improving the provision of public transport information. For example, people can simply key in their stop number into their mobile phone to find out information on the next available service from that stop. This makes information much easier and faster to access for the public. It also reduces the cost of providing information by allowing many inquiries currently handled by operators to be handled automatically.

- Stop numbers can also be shown on maps, printed timetables and internet – based inquiry systems. This can help make complex networks of bus routes more understandable.

- Numbers are an essentially universal “language” and their use avoids problems with spelling, pronunciation and recognizing names. In addition large cities can have 10,000 or more transit stops, making it difficult if not impractical for them all to be named.

The adoption of a standardized approach will facilitate the adoption of computer-based passenger information systems. It will also make it easier for travelers to understand, and hence use, the public transport system in a new city or country, or even in part of their own city which they are not familiar with.

This gives a good experience to the ITS field in terms of taking lessons to be leaned how the basic data protocol would be designed and applied in the real project deployment, and what is to be considered while interfacing the information.

For your reference, the following summary of the stop numbering scheme applied is composed with 16 digits maximum as follows:

- **Country Code:** those used internationally for identification of each country in the world
- **Administration Code:** those agreed for different administrations within each country
- **Public Transit Mode Code :** those used in the architecture of advanced public transit system (APTS) such as for BIS and/or BMS
- **Stop Code :** those agreed by each Jurisdiction, and are unique for each transit stop within each administration
- **Extension Code :** (extension purpose)

< Overview of Seoul Metropolitan Bus Information Systems –Field Devices>

Source Information(if applicable):

Title	ITS - Public Transport Standards – Activity Report
Author	Young-Jun Moon
Organization	Korean Standards Association
Date	2005-04
Reference (if any):	ITSK-00026 Numbering System for Public Transport Stop Standard

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C.12 Lessons learned from Korea (3/6)

Lesson Title	**Improving the compatibility and interoperability of the public transit Information systems by using the Technical Regulation for the Public Transit Information Exchange**
Date Reported	2005-08
Location	Seoul Metropolitan Areas, Korea

◆ **Context:**

The five Bus Information Systems(BIS) were constructed at Seoul, Kwa-cheon city, An-yang city, Ui-wang city and Su-wan city by business for constructing the Integrated Bus Information linking Systems of Seoul Metropolitan Areas in July, 2005.
And then, the Technical Regulation for the Public Transit Information Exchange (draft) which had been suggested by ITSKorea was applied to these BIS centers as the common technology for exchanging the public transit information and guaranteeing compatibility among BIS Centers.
The Technical Regulation for the Public Transit Information Exchange (draft) defines 7 Message sets and refers to use KS X ISO 14827 for the data interface. KS X ISO 14827 is based on ISO/IEC 14827:2000(E)

◆ **Lesson Learned:**

The common method is needed to exchange public transit information among several or many centers. The Technical Regulation for the Public Transit Information Exchange was provided to construct BIS Centers of Seoul Metropolitan area for this purpose and the benefits to be anticipated are:

- It make the 5 BIS centers can exchange public transit information each others and collect it and provide 5 cities' whole local information to citizens. It also make these are able to connect with other local BIS center which will be constructed hereafter at other city by the same technical regulation and collect it over the whole country

- It turns into possibility to providing with variable and highly useful public transit information over a wide area

- Developing cost and period can be reduced by providing the Message and protocol specification and the duplicate investment was prevented

- It will make it easier for a system manager to take over a duties and prevent monopoly of established constructors by usage of the public technology

Maintenance of center security was concerned at that time because everyone who knows the username and password will be able to connect with a center without any restraint according to KS X ISO 14827.

For your reference, the summary of the Technical Regulation for the Public Transit Information Exchange is as follows:

- **Message Set :** 7 kinds of Message Set defined by ASN.1

Sample : the first message set for bus operating information

```
TRANSITRUNCUT DEFINITIONS AUTOMATIC TAGS ::= BEGIN
OperationPlanning ::= SEQUENCE
{
tpif-RouteIdentityText UTF8String (SIZE(1..255)),
tpif-RouteNameText UTF8String (SIZE(1..255)),
tpif-RouteDescriptionText UTF8String (SIZE(1..255)),
scrn-TimeBeginOffsetQuantity INTEGER (-600..600),
scrn-TimeEndOffsetQuantity INTEGER (-600..600),
tpif-HeadwayTimeOffsetQuantity INTEGER (-600..600),
scrn-AnnouncementDurationTime INTEGER (0..14400) OPTIONAL
}
END
```

- **Encoding rules :** BER

- **Transport and Network layer :** TC P/IP

- **Data interface :** KS X ISO 14827 (based on ISO/IEC 14827:2000(E))

Source Information(if applicable):

Title	Public Transport Standards(draft) – Conformance Test Report
Author	-
Organization	Korea Institute of Construction Technology
Date	2005-08
Reference (if any):	(Draft) Technical Regulation for the Public Transit Information Exchange KS X ISO 14827 Transport information and control systems-Data interfaces between centres for transport information and control systems

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C.13 Lessons learned from Korea (4/6)

Lesson Title	**Building the standard location referencing system for the effectiveness of exchanging traffic information among the various ITS centers**
Date Reported	2005-10
Location	Freeway, national and regional highway in Korea

◆ **Context:**

The demand of reliable traffic information service which is said the killer application of the telematics is growing rapidly. The traffic information which are individually gathered and operated by MOCT, NPA(National Police Agency) and each local governments should be merged and integrated for the effectively serviced to the public.

Thus, in December 2004 MOCT enacted a Technical Regulation for the basic traffic information exchanges among national and local governments' traffic information centers. In addition to this, a guide lines for Node-Link ID for ITS digital road map based on the standard was distributed.

Korean Location Referencing System is based on the pre-coded Node-Link ID System. As illustrated in following tables, each node and link ID is composed of 10 digits which has three codes of area identification, serial number and extended code for the future usage. It is expected that this pre-coded location referencing system would work well considering Korea's isolated national territory and the whole size of roadway networks.

<Table 1> Node ID structure

			Node ID contents
Code system			①②③ ④⑤⑥⑦⑧ ⑨⑩
Code	①②③	Integer	Area code
	④⑤⑥⑦⑧	Integer	Serial Number
	⑨⑩	Integer	Extended code

<Table 2> Link ID structure

			Link ID contents
Code system			①②③ ④⑤⑥⑦⑧ ⑨⑩
Code	①②③	Integer	Area code
	④⑤⑥⑦⑧	Integer	Serial Number
	⑨⑩	Integer	Extended code

◆ **Lesson Learned:**

Since 1999, the necessity of national standard for location referencing has been emphasized by KRIHS and MBC which has traffic information broadcasting system using FM-subcarrier channel. During the last five years, a lot of efforts to realize this system have been tried but the progress has not been remarkable. After the introduction of Telematics service in Korea, government officers started to realize the importance of building national standardized location referencing system. Currently this project is carrying out with one of the top priority. Thus, we have learned that we can not proceed ITS interoperable implementation further without the enabling standard like location referencing standard and so on. It can not overemphasize the importance of critical standards. So let's not waste our time by ignoring the necessity of critical standard.

Source Information(if applicable):

Title	National ITS Standardization Program- Phase V– Final Report
Author	Sang-Keon Lee
Organization	Korea Research Institute for Human Settlements
Date	2004-10
Reference (if any):	ITSK-00024 Node and Link ID Standard (associated standard by ITS-Korea)

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C.14 Lessons learned from Korea (5/6)

Lesson Title	**To facilitate use of ITS standards, the Standards development organizations(SDO) should consider providing the contents 'How to use a standard' or 'How to certify a standard'.**
Date Reported	2005-12
Location	Korea

◆ **Context:**

In Korea, ITS standards community is facing two challenging voices. One is mainly from industry saying that 'it is difficult to understand international or national ITS standards'.(It sounds like a good reason for them to stick to their own specifications). The other is mainly from public authorities mentioning that 'In RFP, we requested to follow a specific ITS standard, but we have no tool to verify if the company product follows a standard described in RFP'

Lesson Learned:

It is recommended for Standards Developing Organizations (SDOs) including ISO/TC 204 to extend their activities from developing standards to facilitating market implementation by providing implementation guideline or conformance test methods so that the standards should be properly used as described.

A good example is ISO/IEC JTC 1/SC31-AIDC which has developed various implementation guidelines and conformance test methods for industry to implement and certify easily. These are some deliverables developed by the SC31:

- ISO/IEC 18046 - RFID Device Performance Test Methods
- ISO/IEC 18047 - RFID Device Conformance Test Methods series;
  - ✓ Part 2 - <135 kHz
  - ✓ Part 3 - 13.56 MHz
  - ✓ Part 4 - 2.45 GHz
  - ✓ Part 6 - 860-960 MHz
  - ✓ Part 7 - 433 MHz
- ISO/IEC xxxxx IT – RFID for item management – Conformance series;
  - ✓ Part 1: Qualification of Design and Manufacture for RFID
  - ✓ Part 2: Verification of RFID tag quality
- ISO/IEC 24729 IT – RFID for item management - Implementation guidelines series;
  - ✓ Part 1: RFID-enabled labels and packaging
  - ✓ Part 2: Recyclability of RF tags
  - ✓ Part 3: RFID interrogator/antenna installation Source

Source Information(if applicable): N/A

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C.15 Lessons learned from Korea (6/6)

Lesson Title	In ITS/Telematics field, there has been increasing needs for more strategic approaches on how to cooperate among standards developers..
Date Reported	2005-12
Location	Korea

◆ **Context:**

Both technically and politically, it is very difficult to answer to such questions as 'Which standards should be used by vehicle identification purpose? Are they ISO/TC 204/WG 4 AVI/AEI standards or ISO/IEC JTC 1/SC31/WG 4 RFID standards?'

◆ **Lesson Learned:**

In ITS/Telematics field, there has been increasing needs for more strategic approaches on how to cooperate among standards developers.

We have observed that many committees/organizations have their interest for standardization scope in common, but it seems that no strategic guidelines are available yet. For example, between

ISO/TC 204 and ISO/TC 22, there has been useful but long period of communication on how and what to collaborate to develop standards in their common interested areas.

In this sense, it will be very useful if international standards organizations, e.g. ISO, develop a guide how to cooperate with related standards developers.

The following list describes common interest areas of ITS standards development

- ISO/TC 204 – TC 22: Road – Vehicle Communication (JWG approved)
- ISO/TC 204 – TC 211 – OGC : ITS Map Database, LBS (JTF approved)
- ISO/TC 204 – ISO/IEC JTC 1/SC31: Vehicle Identification
- ISO/TC 204 – TC 104 – TC 122 : Fleet management, equipment identification
- ISO/TC 204 – ITU – ETSI : ITS telecommunication
- ISO/TC 204 – CEN/TC 278: similar work scope (Vienna agreement)
- ISO/TC 204 – APEC ITS Experts Group : ITS standardization priorities

Source Information(if applicable): N/A

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C.16 Lessons learned from Switzerland (1/1)

Lesson Title	MEDIA Project (Management of Electronic Fee Collection DSRC Interoperability in Alpine Region), (ISO and CEN DSRC Standards Suite)
Date Reported	2005-07
Location	France/Switzerland/Italy/Austria/Slovenia

Context:

MEDIA

Within the MEDIA project, solutions were developed for the interoperability of EFC-systems for heavy vehicles in the alpine area. The European motorway operators ASFiNAG (AT), Autostrade per l'Italia (IT), DARS (SI), Group APRR (FR) and Swiss Customs (CH), together with Rapp Trans as the project coordinator, have jointly developed a concept for achieving interoperability. The motorway operators aim to introduce interoperability between their networks based on the findings of this Technical Report within short time.

Lesson Learned:

Successful interoperability project. The motorway operators aim to introduce interoperability between their networks based on the findings of this Technical Report within short time.

Source Information(if applicable):

Title	MEDIA Project (Management of Electronic Fee Collection DSRC Interoperability in Alpine Region),
Author	Bernhard Oehry
Organization	**Rapp Trans Ltd**
Date	**22 March 2005**
Reference (if any):	www.**rapp**.ch/news/**media**.html

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C.17 Lessons learned from USA (1/4)

Lesson Title	**Recognize that interoperability is becoming an important issue in achieving the vision of a nationwide 511 system.** *A national experience with the development and deployment of 511 Systems.*
Date Reported	September 2003
Location	California, Kentucky, Ohio, USA

Context:

In March of 1999, the U.S. Department of Transportation (USDOT) petitioned the Federal Communications Commission (FCC) to designate a nationwide three-digit telephone number for traveler information. In July 2001, the FCC designated 511 as the national traveler information number. As of July 2003, nineteen 511 services across the country are operational and many have learned valuable lessons on deploying and operating systems.

In early 2001, the American Association of State Highway and Transportation Officials (AASHTO), the American Public Transportation Association (APTA), and the Intelligent Transportation Society of America (ITS America) with the support of the USDOT established a 511 Deployment Coalition. The goal of the Coalition is that 511 will be a "customer driven multi-modal traveler information service, available across the United States, accessed via telephones and other personal communications devices, realized through locally deployed interoperable systems, enabling a safer, more reliable and efficient transportation system." In September 2003, the Coalition published the Implementation and Operational Guidelines for 511 Services, Version 2.0 to assist implementers in developing quality systems and increasing the level of operational knowledge among the 511 community. The lesson below is gathered from this guide, which has captured the experiences from many of the existing 511 services nationwide.

Lesson Learned:

511 system deployers should recognize that interoperability is becoming an important issue in achieving the vision of a nationwide 511 System and consider ways to achieve interoperability in their system. Interoperability deals with how 511 services with adjacent operating borders provide seamless information to the system users. A growing number of 511 systems share boundaries and / or have significant travel in-between them. This is also true along major travel corridors throughout the country. Callers in one metropolitan area may wish to dial 511 to find information not just for their local travels, but for their entire trip, which might include traveling through other metropolitan areas or regions and crossing state borders. As the number of 511 services available increase in many areas of the country, it is believed that users will have an expectation that information relating to areas outside of their region will be available in a single call.

Currently, interoperability is being approached in different ways by deployers. This will help provide the 511 services still in the planning stage with insight and lessons as to the best, most applicable, solution given a certain set of technical and financial circumstances. As an example since December 2002, the metropolitan Cincinnati system (ARTIMIS) has been successfully passing Kentucky suburban incident information into the Kentucky statewide Condition Acquisition Reporting System (CARS-511) using Traffic Management Data Dictionary (TMDD) ITS standards, implemented in Traveler Information Markup Language (TIML) / eXtensible Markup Language (XML). Kentucky traffic events reported in ARTIMIS are imported to the CARS-511 system for fully automated reporting without any manual data re-entry. Although the two 511 systems were developed at different times and independently, the standards are allowing seamless data exchange as no call transfers or manual processing are necessary [1].

The following general system design considerations from the Implementation and Operational Guidelines for 511 Systems Version 2.0 are provided as issues to consider.

- **Identify travel corridors.** Consider local, regional and corridor travel that require information presentation on their 511 system.
- **Maintain coordination with bordering jurisdictions.** Recognize that your neighbors will also be dealing with the same issues and their cooperation and coordination is essential to implementing a successful system.
- **Use standards when developing system.** The SAE ATIS (J2354) standard has many important components for 511 systems, including transit information and vehicle routing. The example provided above in metropolitan Cincinnati showed how two systems developed at different times were able to provide seamless data exchange because standards were implemented.
- **Examine and understand wireless calling areas.** Develop a plan for dealing with mis-routed calls at the boundary of your system.
- **Encourage telecommunications carriers to develop service offerings for 511 access that can be implemented in multiple jurisdictions.** Implementing in multiple jurisdictions will ease the task of 511 deployment by communities other than the “early implementers.” An example of this was presented in the San Francisco 511 Case Study: MTC 's efforts to implement 511 access swiftly have been frustrated to some extent by the understandable need of Pacific Bell to develop its plans for offering 511 access in tandem with planning by its parent company, SBC, and its sister telecommunications carriers within the SBC corporate family. While SBC's measured approach to developing a system wide "preferred solution"

has undoubtedly been a source of frustration for MTC , it offers a potential advantage for local governments outside the San Francisco Bay Area that are served by Pacific Bell or other SBC affiliates. By the time those governments are ready to implement 511 access for their traveler information services, SBC's preferred solution will have been tested and deployed and any start-up problems likely will have been cured. It makes sense for government agencies, at local, state, and federal levels, to encourage telecommunications carriers to develop 511 access solutions that can be replicated throughout their service areas, and to find ways to distribute the cost of developing those solutions fairly among the "early implementers" like MTC and those local agencies that are slower to put 511 access in place[2].

As seen in the San Francisco Bay Area case study, working to deploy an interoperable system may have created some early implementation delays, however the advantages of developing a region wide 511 system that has been tested and deployed will reduce the implementation schedule for other agencies as they prepare to implement a 511 system and will help to more equally distribute the development costs among all the system implementers.

This lessons suggests that callers will have an expectation that information relating to areas outside of their region will be available in a single call, therefore 511 developers need to recognize the importance of interoperability and look beyond their borders to make 511 a success with the traveling public. Without system operability there is numerous independent 511 systems scattered throughout the country and this is not what the Federal Communications Commission (FCC) or the 511 Deployment Coalition envisioned. It fails to meet the national vision and the Coalition's goals of providing a safer, more reliable and efficient transportation system. For the vision to become a reality, callers need to be able to get information from areas outside the local 511 system requiring interoperability of systems at the local level.

[1] Deployment Assistance Report #4 511 Regional Interoperability Issues, March 2003

[2] San Francisco 511 Case Study

Source Information(if applicable):

Source Title:	Implementation and Operational Guidelines for 511 Services, Version 2.0
Source Link:	http://www.its.dot.gov/511/511ver2.htm
Author:	511 Deployment Coalition
Publishing Agency:	AASHTO, APTA, ITS America, USDOT
Publication Date:	USA September 2003

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C.18 Lessons learned from USA (2/4)

Lesson Title	**Balance project goals against the constraints and capabilities of project partners.** *Virginia DOT's experience integrating data from public works and public safety agencies.*
Date Reported	January 2005
Location	Virginia, USA

Context:

This lesson is learned from the experiences encountered while integrating the Transportation Management System (OpenTMS) deployed at the Virginia Department of Transportation (VDOT) Richmond District Smart Traffic Center (STC) with real-time data from the Virginia State Police (VSP) computer-aided dispaTC h (CAD) system. This project had two thrusts: first, integrating data arriving from the VSP into the OpenTMS Traffic Control System, and second, updating and customizing the OpenTMS' Incident Management subsystem to utilize this integrated data more effectively.

The project began with a concept study, which found a significant benefit to integrating the VSP Division 1 CAD system and the Richmond STC. The study recommended sharing data from the VSP CAD system. On the VSP side, some software modifications and a modest amount of hardware would deliver near real-time data to the Richmond STC. The data would contain up–to-the-minute status of events dispaTC hed to the police. On the STC side, more significant software modifications were required. The changes would allow VSP data to be tightly integrated into OpenTMS at a detailed level, allowing Richmond STC staff to use VSP-initiated traffic incidents as an integrated part of STC operations.

Lessons learned related to multi-partner cooperation, early deployment and prototyping, last-minute technical gliTC hes, and post-deployment training.

Lesson Learned:

Balance project goals against the constraints and capabilities of project partners.

One of the primary lessons gleaned from this project was the necessity of balancing project goals against the constraints and capabilities of project partners. The following examples demonstrate how VDOT and the VSP worked together to resolve various technical, budgetary and data constraints on the part of the VSP.

Standards for Data Exchange

One of the goals of this project was to develop a standards-based interface between VSP and VDOT. Benefits of using standards include:

- They allow developers to build upon an established knowledge base developed during the creation and maintenance of the standard
- They extend the overall longevity of a system
- They facilitate the expansion of additional inputs and outputs into and from the system

The goal of the project was to develop an interface that would support the needs of the Richmond STC and also serve the needs of other state agencies and STC s. This necessitated an open and standard interface that would be easily integrated into other systems. Because of VSP budgetary constraints, it was realized early that the VSP could not be expected to make significant changes to the CAD system to support current ITS standards. This key discovery affected many later technical decisions. Identify constraints such as this as early as possible in the design process. In VDOT's case, identifying this constraint early saved significant time by eliminating options early that would have not been viable in the long run. Because of this constraint, an alternate means was required to deal with accepting data from the VSP CAD. Because of this, the standard needed for the interface between the VSP and VDOT had to efficiently represent the data received from the CAD system.

A review was made of other National CAD-TMC integration efforts around the United States. Special attention was paid to their protocol selection and their success with implementation. Three standards were considered:

- TMDD Message Sets
- IEEE 1512 Standards
- Oasis CAP Standard

As part of the analysis of these standards, sample CAD messages were mapped to each standard and the resulting XML message was generated and evaluated. The first two standards did not provide for an intuitive mapping between the CAD message and the resulting XML message. While these standards excel at the exchange of incident information between management centers, and even provide for the cooperative management of incidents, they did not "fit" for the exchange of dispaTC h data from the VSP CAD system to VDOT's STC system. This does not preclude their use at a later date, if and when VSP upgrades their CAD system to natively support one of these protocols. For this effort, however, they were not viable options.

The working model where the VSP was sending VDOT alerts received from the dispaTC hers and the troopers in the field was adopted. The alerts were not classic incidents as defined within the Intelligent Transportation System (ITS) field, but these "alerts" could eventually become an STC "incident" if the STC operator recognized the alert as an incident that needed to be managed. Choosing an alert protocol (CAP) would also allow VDOT to distribute other alerts that could affect traffic using the same interface, such as weather alerts, flood alerts, and AMBER alerts.

Publish/Subscribe Service

While the scope of the initial project was a connection between the VSP CAD system and the Richmond STC system, VDOT anticipated the desire to distribute the CAD data to other VDOT offices. These offices might include other VDOT Smart Traffic Centers, the Transportation Emergency Operations Center, and the interim and future 511 system. Because staff and budgetary resources at VSP were limited, it was decided that future users of the CAD data should be able to be added without having to require changes to the system from the VSP side. VSP should be able to send their data to a single receiver that would be responsible for forwarding these data to the interested end users. Also, it was envisioned that those end users would be other computer systems as well as humans.

Prior to the agreement on the exact protocol to be used for sharing data between VSP and VDOT, it was observed that all the considered protocols had a few things in common. First, they were all based on the XML standard. Second, they were all message based. In other words, each of the standards

defined a set of XML messages to be used in the data exchange. Therefore, it became logical to search for a publish/subscribe system that was optimized for the passing of XML-based messages. These systems are often referred to as Message Oriented Middleware (MoM). Various commercial and open source MoM systems were investigated. The goal was to select an existing MoM system that could be easily deployed and meet the needs of the project. MoM systems that could operate in a Publish/Subscribe (P/S) mode were desired. In this mode, the VSP CAD system would "publish" their messages to the MoM server and the Richmond STC would "subscribe" to those messages. The MoM would then forward the published messages to the subscribed users. In the future, when other agencies wanted access to the CAD data, they would simply become another subscriber to the MoM. The decision to use an existing MoM Publish/Subscribe system eliminated the need to develop a custom P/S system to support the exchange of XML data. It also provides a platform that is portable across multiple hardware and OS platforms as well as multiple languages. This reduces the cost of integrating the VSP CAD data into other systems.

Data Availability Issues

When sharing data between two systems, anticipate the possibility that data formats may not be compatible. One of the key issues regarding the available data from VSP was the lack of geo-location data. Location information is entered into the VSP CAD system as a free form text. While there is somewhat of a standard pattern of how the location data are entered into the incident, it is not consistent across all operators.

This is not an issue for VSP, since their CAD system is not GIS based, but it did become an issue for the Richmond STC since their central system software is GIS based. During discussions with VSP about the ability to get geo-location data from their CAD system and the effort required to provide the data, it quickly became clear that the changes required to the VSP side would be prohibitive and beyond the scope of this project.

It was therefore decided that, though not currently populated, the current latitude/longitude fields from the CAD system would be sent to VDOT in the case that, at some later time, VSP would be able to provide such data. Investigation was also made of what could be done on the VDOT side to translate the free form location field to obtain the incident's GIS location. In the interest of not delaying the project's schedule, it was decided that any effort to translate the free form location field would be left for a separate project.

Sensitive Data Issues

Devise a plan to deal with sensitive data. Early on in the project, the team discussed and decided on what type of information should be shared between VSP and VDOT and how sensitive information contained in those incidents would be handled. There are many activities of the Virginia State Police that do not directly impact the motoring public, and as such, are not of interest to VDOT. For example, a ‘warrant served dispaTC h’ does not impact the roadways and does not concern VDOT or their operators. It was decided that VSP CAD incidents would be first filtered by their “10-Code” (the 10-Code defines the VSP incident type).

Additionally, most of the textual data regarding an incident was contained in the incident's Miscellaneous (MISC) segments. Some of this textual information contained information deemed "sensitive" by VSP. Such data included the names and description of individuals and vehicle license plate numbers. To separate out the textual data that would be important to VDOT from data that was sensitive in nature and of not great importance to VDOT, a new incident segment type, the "ROADI"

segment type, was added to the VSP CAD system. This new segment type was intended to be used by the CAD dispaTC hers to record textual information regarding the incident that would be of interest to VDOT managers and operators. The ROADI segment gave operators two options for entering textual data, the MISC segment and the ROADI segment. The primary difference being that the ROADI segment would be passed onto VDOT operators while the MISC segment would not. The two segment types did not require the operator to double-enter the data, but rather to chose if the textual data being entered was of interest to VDOT operators or not. Thus the MISC segments would be filtered, thereby protecting any sensitive information, while the ROADI segment would be sent with information of specific interest to VDOT.

Source Information(if applicable):

Source Title:	Challenges Faced and Tactics Used to Integrate Real-Time State Police CAD Data with the VDOT Richmond District Smart Traffic Center: Lessons Learned Document
Source Link:	http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/14115.htm
Author:	Open Roads Consulting, Inc. (David Robison, Matt Sargent, Steve Beckwith)
Publishing Agency:	Virginia DOT/FHWA USA
Publication Date:	January 2005

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C.19 Lessons learned from USA (3/4)

Lesson Title	**Use public sector workshops to increase awareness of ITS standards.** *Minnesota DOT's experiences with a public sector workshop on ITS standards.* (This lesson is collected separately from www.itslessons.its.dot.gov)
Date Reported	May 2000
Location	Minnesota, USA

Context:

The ITS Joint Program Office of U.S. DOT has initiated a program to document lessons learned by first-time users of ITS standards. The program helps users of ITS standards to build on the successes, and avoid the problems, that early users have experienced. The reports are short, written in a non-technical style, and targeted to state and local public transportation audiences.

This lesson learned report describes a workshop held at Minnesota DOT (MnDOT) training facility in November 1999. The purpose of the workshop was to increase the awareness of the development process for ITS standards and for the potential impact that ITS standards will have on ITS deployments. The target audience for the workshop was public sector ITS staff.

Lesson Learned:

Communicate information about ITS standards to public sector ITS staff by holding workshops. Keep in mind the following guidelines when planning and implementing the workshop:

- **Establish a small committee to plan the ITS standards workshop.** Good candidates for committee members are those who already have some knowledge of ITS standards, have a stake in standards deployment, or have ties to key audiences targeted for the workshop. MnDOT started with several participants from an earlier workshop and added members who brought additional strengths to the committee.
- **Gear the agenda to audience interests in ITS standards.** The agenda should provide a comprehensive introduction to ITS standards and respond to the needs of the target audience of the locale. MnDOT started with a set of questions it wanted addressed and made sure that the agenda would provide answers.
- **Structure the workshop to support the learning experience.** To absorb the technical material in the presentations and apply it in interactive breakout sessions, a one-day workshop proved very effective. In fact, MnDOT held two one-day workshops, with the first workshop devoted to NTC IP standards. NTC IP proved to be a valuable first topic because it laid the groundwork for the second workshop by preparing participants to discuss the subject with a common base of knowledge and language.
- **Recruit the right ITS standards speakers to add value to the workshop.** MnDOT staff most familiar with ITS standards activities at the national level used their contacts to identify speakers who could effectively address the workshop topics. Standards development organizations such as ITE and IEEE, have committees devoted to ITS standards. Early deployers of ITS standards (e.g., state and local transportation agencies, product vendors, and system integrators) are another group of potential speakers.
- **Allow for breakout sessions during the workshop.** Breakout sessions provide important opportunities for agency staff to share their perspectives and react to the material provided in the presentations. In MnDOT's workshop, the breakout sessions led to recommendations that were used as the basis for a migration plan proposal.
- **Make sure the target audience and audience recruitment efforts are aligned.** MnDOT successfully used its internal network to get appropriate MnDOT staff to attend. However, it had difficulty attracting city and county people to the workshop. A county traffic engineer attending the workshop explained that local jurisdictions need to understand the benefits of ITS and ITS standards before they will send staff to workshops. If that is a key barrier, workshop organizers will need a strategy to overcome it or a redefinition of the target audience.

- **Find ways to reinforce the knowledge about ITS standards gained at the workshop.** MnDOT provided a workbook to each participant. However, more reinforcement may be needed to drive the message home. As one attendee stated, "I would like to see a follow-up workshop as we progress to help carry ideas one step further." Other ideas might include regular communication with participants about progress in ITS standards development and the experience of their peers in deploying standards.

Source Information(if applicable):

Source Title:	ITS Standards Lessons Learned from Deployment: Raising ITS Standards IQ with a Public Sector Workshop
Source Link:	http://www.itsdocs.fhwa.dot.gov//JPODOCS/BROCHURE/9R701!.PDF
Author:	Carol Zimmerman, Peggy Tadej
Publishing Agency:	ITS JPO Washington, District of Columbia, USA
Publication Date:	May 2000

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C.20 Lessons learned from USA (4/4)

Lesson Title	**Include significant planning and development time in the overall project schedule to accommodate identifying and addressing the various compatibility issues, to integrate existing legacy system equipment across multiple agencies.** *Orlando, Florida's experience with a Field Operational Test (FOT) on using a single smart card for transportation payments at facilities operated by multiple regional agencies.* (This lesson is collected from the www.itslessons.its.dot.gov)
Date Reported	December 2004
Location	Florida, USA

Context:

In 2000, the US DOT awarded a Field Operational Test (FOT) grant to a group of public sector agencies located in the Orlando region. The project was titled Orlando Regional Alliance for Next Generation Electronic Payment Systems, or ORANGES. The US DOT was interested in identifying and evaluating issues associated with establishing partnerships between public transportation service providers and other transportation agencies, in developing and using multiple-application electronic payment systems that included smart card technology. The FOT requirements were specifically designed to test a payment system that could support a variety of payment applications, at a minimum including transit fare collection, parking payment and electronic toll collection.

As part of the national ITS program, the USDOT requires that each FOT have an independent evaluator. The evaluation is separately funded and has independent goals, objectives, schedules and deliverables. The USDOT evaluations also provide useful feedback to the local FOT participants, as well as other interested transportation stakeholders.

The FOT demonstrated the technical feasibility of implementing a regional smart card with a centralized clearinghouse for multimodal regional transportation payments, where a card issued by any participating agency could be used for payments with (and revalued at) smart card accepting equipment operated by any of the partner agencies.

Lesson Learned:
The ORANGES experience illustrated that it is necessary to include significant planning and development time in the overall project schedule when a regional system is being implemented. Given the multiplicity of agencies involved, this extra time is needed to accommodate identification of and accommodation for the various compatibility issues across existing legacy system equipment.

The ORANGES project experience provides the following guidance.

- **Plan on development time to identify and resolve system integration issues with existing legacy equipment, which include:**
    - Integration with existing field equipment such as transit fareboxes, toll road equipment (e.g., plaza lane equipment, in-vehicle transponders) and parking equipment (e.g., garage entry/exit, parking meters, pay-by-space, pay-and-display);
    - Integration with agency point of sale locations, to support smart card issuance and revaluing;
    - Integration with existing revenue management systems at each agency;
    - Integration with the third party clearinghouse system that will settle prepaid funds to each agency based on the card payment and revaluing transactions completed at each agency; and
    - Development and strict adherence to Interface Control Documentation (ICD's), so development work among vendors is properly directed.

Previous regional smart card systems in the US have been primarily limited to supporting multiple transit agencies in a region (e.g., San Francisco TransLink), or to supporting the combination of transit and transit-related parking (e.g., Washington (WMATA) SmarTrip®). The ORANGES FOT was successful in demonstrating that it is technically feasible to extend the underlying operational concept to encompass transit, tolls and parking. In addition, the toll usage successfully demonstrated the feasibility of infrared transponders that accept smart cards.

- **Do not to underestimate the complexity of integration and interoperability issues.**

The implementation team required considerably longer than originally planned to complete the system design and implementation. Most of the systems integration challenges centered around (1) determining the correct type of smart card and compatible readers, and (2) retrofitting the various types of existing field equipment (i.e., smart card readers in all the agency equipment needed to support the communications protocol used by the selected smart card). It is important to note that some equipment was provided "in-kind" by vendors in exchange for visibility in a high profile project. In addition to cost considerations, another reason for the use of “in-kind” vendor equipment was in some cases the need to use equipment from a foreign source when there was insufficient time to pursue a Buy America waiver. Quantities of equipment, customization and integration support providing by these vendors was typically limited. Agencies should document the system requirements and the vendor roles in addressing these requirements at the time of vendor selection. This will help identify any system requirements that will not be met by the vendors.

- **Ensure that the integrator develops detailed system testing checks for the proper handling of error conditions and other operational scenarios.**

  Examining the clearinghouse transaction activity reports revealed an important error in how the overall system handled one case where a transaction amount exceeded the stored value balance (e.g., a $3 transaction when the balance was $1). Apparently, when attempting to store a negative value, a "roll under" condition with a large positive number (approaching $43 million) was recorded by the card as the balance rather than the negative. Business rules indicated that negative balances were not allowed, but the technology needed to ensure that enforcement of this rule did not cause undesired effects.

  The smart card or card reader needs to include software logic to prevent such a transaction from being completed. Barring that, the clearinghouse software should include logic to detect/report such occurrences to the agencies. None of this preventative or detection logic was in place in the FOT system. To detect this or a similar type of problem in future projects of this type, the system response to error conditions should be explicitly addressed through the testing and ongoing monitoring of the clearinghouse transaction activity reports. It should be recognized that developing a comprehensive testing program to capture every conceivable error condition could be a very expensive proposition for the project partners. It should also be noted that there is still a chance of missing an error condition as testing cannot reasonably expect to replicate every conceivable condition that will be experienced in the operational environment.

The ORANGES experience also provides this additional guidance.

- **Identify a smart card that will pose the least difficulties in integrating a compatible smart card reader with each partner's legacy equipment.**
- **Secure technical support for integration, from the smart card reader vendor and the legacy equipment vendors.**

Developing a regional smart card payment system is related to the ITS Goal of improving customer satisfaction, through making payments for multimodal travel easier by establishing acceptance of a regional payment method. Measures to achieve effective systems integration contribute to this goal by ensuring that the system functions in a planned and predictable manner for its users.

The overall project was completed behind schedule. The resolution of systems integration issues contributed significantly to these delays.

The participating cardholders generally expressed a positive opinion about the technology, with concerns focusing primarily on the limited scale of deployment. The fact that the system was successfully integrated to allow payment across three distinct legacy systems contributed to this result, since this allowed cardholders to use the same card for multimodal trips.

The examples and lesson elements above illustrate the need to include significant planning and development time in the overall project schedule, when a regional system is being implemented. This extra time is needed to identify and accommodate various compatibility issues when implementing the system across existing legacy system equipment. Additionally, this guidance focused on strategies to lessen the impact of compatibility issues, deal with error conditions, and to secure adequate technical support. While this experience suggests strategies for handling integration and compatibility issues of smart card technology, the same vast majority of the guidance could be applied to other ITS technologies and systems.

Source Information(if applicable):

Source Title:	Orlando Regional Alliance for Next Generation Electronic Payment Systems (ORANGES) Evaluation Final Report: Electronic Payment Systems Field Operational Test
Source Link:	http://www.itslessons.its.dot.gov/its/benecost.nsf
Author:	Leisa M. Moniz, et al Volpe National Transportation Systems Center
Publishing Agency:	Federal Transit Administration Washington DC, District of Columbia, USA
Publication Date:	December 2004

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Annex D
(informative)

2001 ISO ITS conference ouTC omes

The conference, 'Intelligent Transport Systems - The Road to Future standards', provided the perfect opportunity to exchange experiences and share visions for the future of ITS standardization," said Guido Gürtler, the European Co-Chair of the Industry Cooperation on standards and Conformity Assessment (ICSCA).

Some 80 experts from private sector corporations such as Motorola, Siemens, and General Motors and, from the public sector, representatives of governmental organizations such as the United States Department of Transportation, the European Commission, and the United Nations Economic Commission for Europe (UN/ECE) helped bring out some of the common objectives as well as differing perspectives underlying ITS standards efforts in the US, Europe, and Japan.

Through a discussion of key industries such as automotive manufacturers, electronics, telecommunications, and navigational services, speakers at the conference expressed the ever-growing need for the development of International Standards for the ITS industry.

"Industry delegates confirmed the importance of the development of ISO standards as the most effective way to achieve wider global markets for its products," said Martin Rowell, chairman of ISO/TC 204, *Transport information and control systems*. "The conference provided important pointers and stepping stones towards meeting the increased ISO focus on market and consumer-driven activities within the ITS sector."

While acknowledging the challenges of developing International Standards for the ITS sector - among them the sector's range of national, regional and de facto industry standards as well as the short ITS product life-cycle - conference participants confirmed that harmonizing current standards and developing new industry International Standards could provide ITS with that compatibility and interoperability vital for the creation and continuance of compatible technologies worldwide.

"ISO could act as the driver for the ITS standardization process in view to creating consensus between the public, enterprises and administrations. Driving this process is a difficult task and a body like ISO is suited to take the initiative to move the process and maintain the speed on the process," said Dr. Gerd Teepe, Head of Motorola Automotive Systems Architecture Laboratory. "However, ISO needs to find an effective way to make adequate representation of parties possible and thus increase its acceptance and leadership in standards creation."

Among the recommendations to emerge from the debate were standardization priorities for the ITS sector and calls for closer cooperation between the leading standardization organizations. The International Organization for Standardization (ISO), International Electrotechnical Commission (IEC) and ITU (International Telecommunication Union) were encouraged to take new and more efficient routes in interdisciplinary and cross-organizational work. In order to respond to ITS market requirements, conference participants also recommended modifying voting procedures and simplifying and speeding up the standards development process.

ISO is inviting members of the public and special interest groups to review the ISO/TC 204 business plan to help ensure the broadest possible input into the technical committee's standardization work. ISO/TC 204 will incorporate all proposals generated from the conference in its business plan to make sure that their work is fully aligned with ITS market requirements. It is envisaged the ISO/TC 204 business plan, along with the ITS Industry Forum, will provide the route forward for future standardization work for the ITS sector.

In the ISO/TC 204 business plan, the Technical Committee pledged to:

: form an ITS Coordination Group composed of ITS-involved ISO/TC s, notably including ISO/TC 204 and ISO/TC 22, but inviting the participation as well of ISO/TC 104 (“Freight Containers”) and ISO/TC 211 (“Geographic Information Systems”). This group will meet at least annually to discuss and improve inter-Committee coordination and cooperation.

Rationale: The relationship between ISO/TC 204 and other standards bodies needs to be revisited and updated, especially the relationship with ISO/TC 22 (“Road Vehicles”). At present, ISO/TC 22 has responsibility for ITS-related standards related to technology and human factors completely self-contained in road vehicles, and ISO/TC 204 has responsibility for all other ITS related standards within ISO, including system level concerns and overall time frames. In practice, this subdivision has sometimes proved problematic. The relationship should be regularly reevaluated, especially since industry trends toward portable technology, multimedia, the internet, and multi-user approaches are so rapidly evolving.

Observation: This liaison has improved because of significant efforts by the TC 204 chair and secretariat to steer a better relationship with TC 22.

2. ISO/TC 204 will revisit its relationship with CEN/TC 278 (“Road Transport and Traffic telematics”) under the Vienna Agreement between ISO and CEN. This important relationship, historically sometimes contentious, has greatly improved and a liaison between the TC s is ongoing. The respective Chairs and Secretariats have agreed to meet between each Plenary Meeting of ISO/TC 204 to address common concerns and other issues in the ISO/TC 204 - CEN/TC 278 relationship.

Observation: This relationship has been the subject of considerable efforts by all parties and is now functioning well, although administrative problems in the dual balloting of documents persist.

3. ISO/TC 204 will re-charter its Ad Hoc Planning Group as a permanent Strategic Planning Group to guide the TC ’s activities in line with market needs, industry trends, and economic impacts. The Strategic Planning Group will also become the mechanism for leading the identification of system level concerns and overall time frames for ITS standardization within ISO. (This mirrors the practice of CEN/TC 278.)

Observation: The TC 204 SPC has now operated consistently and effectively as a support to assist the Chair to guide the strategy of the committee for a number of years. By comparison, the TC 278 Strategy committee experienced problems and has been dissolved.

4. ISO/TC 204 will regularly re-examine its programme of work and cancel work items that are not well-supported and making suitable forward progress. ISO/TC 204 will review the timing and frequency of its plenary meetings with respect both to ISO-CS guidelines and the needs of its programme of work.

Observation.: TC 204 last reviewed its programme of work in 2003, and it is probably time that it reviewed and updated this document

5. ISO/TC 204 will work toward the maximum use of electronic document development and circulation at both the TC and working group level to advance work as rapidly as possible while decreasing the requirement for personal travel wherever possible.

Observation: Electronic media is now the principle means of communication.

6. ISO/TC 204 will consider restructuring its working groups to better focus resources on high priority needs and to maintain as simple and transparent a working structure as possible. This will be done in close consultation with CEN/TC 278 in consideration of the joint working group structure between the two TC s.

Observation: This occurred, but no significant changes were made until TC 278 created a new working group "eSafety" towards the end of 2005. There is now a clear CEN policy only to develop Standards where there is a Euro-specific interest.

7. A market-focused Sector Workshop, planned for the June 2001, will provide this Business Plan with additional inputs and critiques. The speakers at the industry-led, market-growth oriented event are expected to provide a series of additional goals that will be incorporated into this Business Plan.

Observation: This comment is a hangover from a previous critique. See comments on the workshop above.

8. The new ISO/TC 204 Strategic Planning Group will reassess the TC ’s Business Plan soon after the Sector Workshop, as well as conduct an annual review of the TC ’s and the Secretariat’s performance.

Observation: See comment 4 above

9. The TC will instruct its working groups to consider the use of ISO Fast Track mechanisms and to employ them whenever appropriate.

Observation: TC 204 has worked hard with the ISO Central Secretariat to streamline and improve the speed of processing documents once consensus is achieved. For example ISO 14817 was processed from approval of the NP to final ballot in 2 years 1 month. The reorganization within ISO CS has also assisted in this process.

10. The Strategic Planning Group and the relevant working groups of ISO/TC 204 (WG s 9, 15, 16) will track and review the evolution of the wireless internet, propose relevant work items, and establish appropriate liaisons with external bodies active in this sector.

Observation: This has occurred, and, particularly, WG 16 has a very close working relationship with IETF, which has borne significant fruit within the CALM (continuous communications with vehicles) initiative.

Annex E
(informative)

ITS standards fact sheet

E.1 ISO/TC 204 – Intelligent Transport Systems

E.1.1 ISO/TC 204 WG 1 – Architecture

**** Submitted by (please contact following person for further information):***

Name	Bob Williams
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WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**		
Number	**ISO TR 14812**		
Status	**WITHDRAWN**		
Title	**Glossary of standard terminologies for the transport information and control sector**		
Scope	Provided a glossary of terms for the sector. Withdrawn because it is significantly out of date. Will be replaced by a web based data registry/dictionary. See below		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		NO
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements		NO
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		NO

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**		
Number	**ISO 14813-1**		
Status	**Approved TR, Now revised and successfully balloted as CD. In ballot for DIS**		
Title	**Reference architecture(s) for the ITS/TICS sector- Fundamental services**		
Scope	This document provides a definition of the primary services and application areas that can be provided to ITS Users. Those with a common purpose can be collected together in “'ITS service domains'” and within these there can be a number of “'ITS service groups'” for particular parts of the domain. This document identifies 11 service domains, within which numerous Groups are then defined. Within this framework, there are varying levels of detail related to definition of different services. These details differ from nation to nation, depending on whether the specific national architecture building blocks are based directly upon services or on groups of functions. Thus, the intent here is to address groups of services and the respective domains within which they fit in. As these domains and service groups evolve over time, it is intended that this document shall be revised to include them. This document is applicable to the working groups of ISO/TC 204 and other TC s who are developing International Standards for the ITS sector and associated sectors whose boundaries cross into the ITS sector (such as some aspects of urban light railways, intermodal freight and fleet). This document is designed to provide information and explanation to those developing ITS International Standards and to those developing specifications, implementations and deployments for ‘Intelligent transport systems'. This document is in itself, by its nature, advisory and informative. It is designed to assist the integration of services into a cohesive reference architecture, assist interoperability and common data definition. Specifically, services defined within the service groups will be the basis for definition of 'use cases' and the resultant reference architecture functionality, along with definition of applicable data within data dictionaries, as well as applicable communications and data exchange standards.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**
Number	**ISO 14813-2**
Status	**Approved TR**
Title	**Reference architecture(s) for the ITS/TICS sector-Core TICS reference architecture**
Scope	The architecture of an information and control system merges hardware and software considerations into a coordinated and integrated system view. The system architecture is a high level abstraction, or model, of the system. A system architecture should embrace both today's applications and the applications that are expected in the future. Architecture begins with the definition of the conceptual services (e.g. Part 1 - TICS fundamental services). There are several identifiable stages of system architecture development: —1. Reference architecture —2. Logical architecture —3. Physical architecture A reference architecture is the first of all architectures. It is a concise generic framework which guides the development of more concrete system architectures. It is large enough that distinct concepts are not merged out of necessity and small enough that it does not become unwieldy. A most significant example of a reference architecture in information systems is the Reference Model of Open Systems Interconnection (often called the seven layer model) developed by ISO in the 1970's. This model has underpinned the development of all modern computer networks, allowing services such as global networking, of which the prime example is the Internet, to become a reality. A reference architecture is generic and non-prescriptive and captures the concepts of the system. A logical architecture elaborates the conceptual behaviour, and in so doing it provides more detail about the modularity. A physical architecture is reached when the actual distribution of the system modules is defined, thus leading to important implications for communications. There is no firm demarcation between a reference architecture and a logical architecture. Thus the essence of behaviour and modularity is present in a reference architecture. The TICS Reference Architecture developed by WG 1 shows important inter-relationships that arise in the provision of the services of the sector. However the TICS Reference Architecture is more abstract than, for example, the logical architecture of the US National Architecture. It is envisioned that the TICS Reference Architecture will be used by the TC 204 working groups to develop their own logical and physical architectures in a cohesive manner. Some TICS Fundamental Services are already well developed by the industry, while others are less mature. Therefore the TICS Reference Architecture does not have a uniform granularity across all services. This characteristic is a direct result of the fore mentioned requirement that architecture embrace the applications that are intended in the future. This suggests one of the ways in which the architecture will undergo change in the future.

	Architectures may present only static characteristics or both static and dynamic characteristics. Dynamic characteristics may be seen as belonging solely to the design/implementation stages of system development. However by including dynamic characteristics at the reference architecture stage one gains important insights into the static architecture. Thus two orthogonal views of architecture are presented: —1. static relationship view (class diagram) —2. dynamic interactive view (sequence diagram) This part of ISO/TR 14813 develops a core reference architecture. The static scope is determined by deriving the system boundary and the use cases from an analysis of the TICS fundamental services (part 1 of ISO/TR 14813). The Core reference architecture is a reference for the development of national architectures. Part 3 of ISO/TR14813 elaborates the core reference architecture by refinement of two orthogonal views. The elaboration calls upon domain expertise that would be provided by other TC 204 working groups in the development of ISO standards or by national groups developing national architectures and standards. The core reference architecture is described in clauses 5 to 8. Clause 5 introduces the architecture at a highly abstract level. Clause 6 defines all the actors. Clause 7 derives all the use case from the TICS fundamental services and develops eight use case diagrams. Clause 8 defines an abstract collection of classes and develops a set of sequence diagrams, one per use case diagram. Readers should refer to Part 4 of ISO/TR 14813 (Tutorial) for an introduction to the modelling views used in this part and the methodology applied. The methodology is repeated in Annex A.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**
Number	**ISO 14813-3**
Status	**Approved TR**
Title	**Reference architecture(s) for the ITS/TICS sector– Example elaboration**
Scope	The architecture of an information and control system merges hardware and software considerations into a coordinated and integrated system view. The system architecture is a high level abstraction, or model, of the system. A system architecture should embrace both today's applications and the applications that are expected in the future. Architecture begins with the definition of the conceptual services (e.g. Part 1 - TICS Fundamental Services) There are several identifiable stages of system architecture development. a) Reference architecture b) Logical architecture c) Physical architecture A reference architecture is the first of all architectures. It is a concise generic framework which guides the development of more concrete system architectures. It is large enough that distinct concepts are not merged out of necessity and small enough that it does not become unwieldy. A most significant example of a reference architecture in information systems is the "Reference Model of Open Systems Interconnection" (often called the seven layer model) developed by ISO in the 1970's. This model has underpinned the development of all modern computer networks, allowing services such as global networking, of which the prime example is the Internet, to become a reality. A reference architecture is generic and non-prescriptive and captures the concepts of the system. A logical architecture elaborates the conceptual behaviour, and in so doing it provides more detail about the modularity. A physical architecture is reached when the actual distribution of the system modules is defined, thus leading to important implications for communications. There is no firm demarcation between a reference architecture and a logical architecture. Thus the essence of behaviour and modularity is present in a reference architecture. The TICS Reference Architecture developed by WG 1 shows important inter-relationships that arise in the provision of the services of the sector. However the TICS Reference Architecture is more abstract than, for example, the logical architecture of the US National Architecture. It is envisioned that the TICS Reference Architecture will be used by the TC 204 working groups to develop their own logical and physical architectures in a cohesive manner.

Some TICS Fundamental Services are already well developed by the industry, while others are less mature. Therefore the TICS Reference Architecture does not have a uniform granularity across all services. This characteristic is a direct result of the fore mentioned requirement that architecture embrace the applications that are intended in the future. This suggests one of the ways in which the architecture will undergo change in the future.

Architectures may present only static characteristics or both static and dynamic characteristics. Dynamic characteristics may be seen as belonging solely to the design/implementation stages of system development. However by including dynamic characteristics at the reference architecture stage one can gain important insights

into the static architecture. Thus two orthogonal views of architecture are presented:

a) static relationship view (class diagram)
b) dynamic interactive view (sequence diagram)

Part 2 develops a Core TICS Reference Architecture. The static scope is determined by deriving the system boundary and the use cases from an analysis of the TICS Fundamental Services (Part 1).

The Core Reference Architecture is a reference for the development of national architectures.

This Part elaborates the core by refinement of the two orthogonal views. The elaboration calls upon domain expertise which would be provided by other TC 204 working groups in the development of ISO standards, or by national groups developing national architectures and standards.

The Core Reference Architecture is elaborated in Clauses 6 to 8. Clause 5 introduces the elaboration method employed. Clause 6 elaborates the classes. Clause 7 elaborates the sequence diagrams. Clause 8 describes the elaborated packages. Clauses 9 and 10 identify some of the main dependencies between the packages.

Readers should refer to Part 4 (Tutorial) for an introduction to the modelling views used in this Part and the overall methodology.

Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**		
Number	14813 Part 2,3		
Status			
Title	**Reference architecture(s) for The ITS/TICS sector**		
Scope			
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**		
Number	**ISO 14813-4**		
Status	**Approved TR**		
Title	**Reference architecture(s) for the ITS/TICS sector - Reference model tutorial**		
Scope	The architecture of an information and control system merges hardware and software considerations into a coordinated and integrated system view. The system architecture is a high level abstraction, or model, of the system. A system architecture should embrace both today's applications and the applications that are expected in the future. Architecture begins with the definition of the conceptual services (e.g. Part 1 - TICS Fundamental Services). There are several identifiable stages of system architecture development: a) Reference architecture b) Logical architecture c) Physical architecture The reference architecture is generic and non-prescriptive and captures the concepts of the system. A logical architecture elaborates the functions which will provide the conceptual behaviour, and in so doing it provides some detail about the modularity. A physical architecture is reached when the actual distribution of the system modules is defined, thus leading to important implications for communications. This technical report develops a TICS Reference Architecture. The objective in defining a TICS Reference Architecture is to provide a concise reference point which is both educational and a framework for the standards process. The Reference Architecture will be used by the working groups to develop their own logical and physical architectures in a cohesive manner. This Part introduces the model which is applied in developing the Reference Architecture in Parts 2 and 3. A tutorial on the application of the model is provided using examples from the TICS sector.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**		
Number	**ISO 14813-5**		
Status	**Approved TR (Currently under revision, revised version submitted for ballot as CD.)**		
Title	**Reference architecture(s) for the ITS/TICS sector - Requirements for architecture description in TICS standards**		
Scope	A TICS architecture is a framework for TICS deployments. It is a high level description of the major elements and the interconnections among them. It provides the framework around which the interfaces, specifications and detailed TICS systems designs can be defined. A TICS Architecture is not a product design, nor a detailed specification for physical deployment, and it is not specific to any one location. The title 'Systems Architecture' is perhaps the closest general terminology, but that term is sometime too specific to include the conceptual aspects included in the terminology 'TICS Architecture' and also often implies a location specific solution. The purpose of a TICS Architecture is to maximise efficiency, interoperability and multimodality of multiple interacting TICS systems in a complex and developing sector. This Technical Report defines a) Terminology to be used when documenting or referencing aspects of architecture description in TICS standards. b) The form in which aspects of System Architecture are to be documented and described in TICS standards. In compiling this standard, the authors have assumed that contemporary systems engineering practices are used. Such practices are not defined within this standard.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**		
Number	**ISO 14813-6**		
Status	**Approved TR. Currently under revision, revised version submitted for ballot as CD.)**		
Title	**Reference architecture(s) for The ITS/TICS sector - Data presentation in ASN.1**		
Scope	This document is designed to provide an 'enabling' structure for use in the ITS sector. It provides a formal means to enact the ISO/TC 204 decision by resolution to use ASN.1 for data definitions within ITS International Standards. This provides a common message form to enable interoperability and reuse. It provides consistency of use so that where other aspects of ASN.1 (defined within ISO 8824 & ISO 8825), such as transfer rules etc. are selected to be used, they are used in a common and consistent way in order to maximise interoperability and reuse. It is important to be clear that this International Standard does not require the use of ASN.1 for anything other than providing a common and flexible form of data definition and this document makes specific provision for the support of use of other extant standardised syntax notations (such as EDIFACT, XML etc.) whilst maintaining interoperability and reuse by defining these practises within an ASN.1 data definition. Specific implementation requirements, other than those determined in the syntax notations identified above, are beyond the scope of this document. This document also provides a means where particular ITS sector requirements, or existent International Standards, that require particular message forms and procedures that are expressed in other notations (e.g. EDIFACT, XML etc), may be referenced and reused by other ITS applications. Thus it presents an unambiguous system for identifying all the different data types and describing them in ITS International Standards in a common way.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 1 / CEN TC 278 WG 13** **System architecture, taxonomy, and terminology, including data modelling**
Number	**ISO 14817**
Status	**Approved International Standard**
Title	**Data modelling for transport information and control systems (TICS) sector (Data dictionary) – Data registry**
Scope	This International Standard specifies the framework, formats, and procedures used to define information exchanges within the Intelligent Transport System / Transport Information and Control Systems (ITS/TICS) sector. It defines the content of the ITS/TICS central Data Registry and data dictionaries, the registration process to enter data concepts into the Data Registry. Throughout the text, the Data Registry should be taken to mean the ITS/TICS central Data Registry. Specifically, this International Standard specifies: — framework used to identify and define all information exchanges; — framework used to extend standardized information exchanges to support local customizations and combinations; — information modelling method for defining ITS/TICS data concepts, when used; — meta attributes used to describe, standardize and manage each of the data concepts defined within this framework; — requirements used to record these definitions; and — formal procedures used to register these definitions within the Data Registry. The Data Registry described herein supports, and is designed to include, data concepts using alternative International, Regional or National System Architecture methodologies or techniques. A common Data Registry will ease migration and interoperability between such approaches.

Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

E.1.2 ISO/TC 204 WG 3 – ITS Database technology

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WG /Organization	**ISO/TC 204/WG 3** **ITS Database Technology**		
Number	**PWI 24099**		
Title	**Data Structure for map data provision and update in ITS applications**		
Scope	This project will define data structures for provision and update of map-related data from data centres to navigation systems used in ITS applications		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 3** **ITS Database Technology**		
Number	**PWI 17267**		
Title	**Navigation System API standard**		
Scope	This standard will define an application program interface (API) for navigation and other location-based services targeted at transportation and mobile applications.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

WG /Organization	**ISO/TC 204/WG 3** **ITS Database Technology**		
Number	**NP 22953**		
Title	**eXtended Geographic Data Files**		
Scope	To specify a standard for the modeling and exchange of geographic data enabling ITS applications and services. The standard may also serve application requirements beyond ITS.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

WG /Organization	**ISO/TC 204/WG 3** **ITS Database Technology**		
Number	**CD 17572**		
Title	**Location Referencing**		
Scope	This International Standard specifies Location Referencing Methods (LRM) that will be used to assign (semantics) and code (syntax) Location References to objects in geographic databases, and more particularly in ITS databases. The standard defines what is meant by such objects, and describes the reference in detail, including whether or not components of the reference are mandatory or optional, and their characteristics.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

<table>
<tr><td>WG /Organization</td><td colspan="3">ISO/TC 204/WG 3
ITS Database Technology</td></tr>
<tr><td>Number</td><td colspan="3">IS 14825</td></tr>
<tr><td>Title</td><td colspan="3">Geographic Data File</td></tr>
<tr><td>Scope</td><td colspan="3">This International Standard specifies the conceptual and logical data model and the exchange format for geographic data bases for Intelligent Transportation Systems (ITS) applications. It includes a specification of potential contents of such data bases (Features, Attributes and Relationships), a specification of how these contents shall be represented, and of how relevant information about the database itself can be specified (meta data).

The focus of this International Standard is on ITS applications and emphasizes road and road related information. ITS applications, however, also require information in addition to road and road related information.

EXAMPLE 1 ITS applications need information about addressing systems in order to specify locations and/or destinations. Consequently, information about the administrative and postal subdivisions of an area is essential.

EXAMPLE 2 Map display is an important component of ITS applications. For proper map display, the inclusion of contextual information such as land and water cover is essential.

EXAMPLE 3 Point-of-Interest (POI) or service information is a key feature of traveller information. It adds value to end-user ITS applications. The Conceptual Data Model has a broader focus than ITS applications. It is application independent. This allows for future harmonization of this International Standard with other geographic database standard</td></tr>
<tr><td rowspan="4">Relevance of conformance requirements</td><td>Category</td><td>Yes</td><td>No</td></tr>
<tr><td>(a) Objective of this standard is to define conformance requirements</td><td></td><td>X</td></tr>
<tr><td>(b) (If no in question (a)) This standard includes some clauses on conformance requirements</td><td>(clause no:)</td><td>X</td></tr>
<tr><td>(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future</td><td></td><td>X</td></tr>
</table>

WG /Organization	**ISO/TC 204/WG 3** **ITS Database Technology**		
Number	**TS 20452**		
Title	**Requirements and a Logical Data Model for a Physical Storage Format(PSF) and an Application Program Interface used in ITS Database Technologies and Logical Data Organization for a PSF used in ITS Database Technology**		
Scope	This Specification describes the functional requirements and Logical Data Model for PSF and API and the Logical Data Organization for PSF that were completed under ISO/NP 14826. It dose not specify a Physical Data Organization.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no;)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

E.1.3 ISO/TC 204 WG 4 – AVI/AEI

Submitted by (please contact following person for further information):

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WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**ISO 14814**		
Status	**Approved ENV 1996, approved EN IS 2006**		
Title	**AVI/AEI - Reference Architectures and Terminology**		
Scope	This standard establish a common framework to achieve unambiguous identification in ITS/RTTT: AVI/AEI applications. This scheme and Reference Architecture Model is designed to be an 'enabling' structure to allow interoperability between different commercial systems, and not prescriptive in determining any one system. It is not frequency nor air interface protocol specific, provides maximum interoperability, has a high population capability, and provides the possibility of upwards migration to more capable systems. This standard provides a reference structure which enables an unambiguous identification and also identifies the data construct as an ITS/RTTT message. This is particularly important within an EDI environment. The construct also identifies which ITS/RTTT data structure is contained in the message.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X Not appropriate for this type of standard

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**ISO 14815**		
Status	**Approved ENV/TS 1999/2000, approved EN IS 2005**		
Title	**AVI/AEI - System Specification**		
Scope	This standard define generic AVI/AEI System specification for nominal AVI/AEI to provide an enabling standard, which, whilst allowing the system specifier to determine the performance levels and operating conditions, provides a framework for nominal interoperability. This part standard only refers to AVI/AEI in the road environment. Multimodal and intermodal exchanges of AVI/AEI are outside the scope of this standard. Where AVI/AEI applications are part of a larger system, and where no standardised application specific test requirements exist, these test requirements shall apply. The Scope of this standard is confined to Generic AVI/AEI System specification for systems that have the following 'core' components: a) A means of communication between the vehicle/equipment and the reading station (e.g. a DSRC link, reference ISO 17264) b) Operation within a reference architecture which enables compatible systems to read and interpret the identification (See EN ISO 14814) c) Compliance to commonly understood data structures that enable meaningful interpretation of the data exchanged in the identification sequence (See EN ISO 14816) d) The provision of operating and environmental parameters (or classes of operating parameters) within which such systems must successfully function without impairing interoperability. This to ensure that the System specifier can state his requirements clearly to Implementation Designers and Integrators, and measure the performance of such systems (This standard, EN ISO 14815)		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**ISO 14816**		
Status	**Approved ENV/TS 1999/2000, approved EN IS 2005**		
Title	**AVI/AEI - Numbering and Data Structures**		
Scope	This standard establishes a common framework data structure for unambiguous identification in RTTT/ITS systems. This standard defines data structures based on the ISO 8824-1 ASN.1 UNIVERSAL CLASS types that may be directly IMPORTED to other application standards that would need only subsets of the full APPLICATION CLASS types. These UNIVERSAL CLASS and APPLICATION CLASS types are uniquely defined as an ASN.1 module in Annex B. This module may be directly linked into an application data definition. This standard defines default encoding for simple AVI/AEI applications where no other relevant application standard exists. This definition forms Clause 4. The principal registered schemes for AVI/AEI are determined in Clause 4.7 and 4.8 of this standard. Other relevant and interoperable schemes are detailed in the subsequent Clauses. The structures defined in this standard provides interoperability, not only between simple AVI/AEI and more complex RTTT/TICS functions, but also with pre-existing standards (e.g. ISO 10374 Freight containers Coding, identification and marking) Annex A defines one global registration authority that administers the AVI Numbering Scheme according to the rules of CEN and ISO.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**ISO TS 17261**		
Status	**Approved ISO TS 2004**		
Title	**AVI/AEI - Intermodal goods transport - Architectures and Terminology**		
Scope	This Technical Specification describes the conceptual and logical architecture for automatic vehicle and equipment identification (AVI/AEI) and supporting services in an intermodal/multimodal environment. This Technical Specification presents a high level view of AEI intermodal and multimodal system Architecture. The Technical Specification describes the key sub systems, their associated interfaces and interactions and how they fit into System wide functions such as Management, Security and Information Flow. The Architecture is product independent, e.g. individual modules within sub systems e.g. the data tag module within the data capture sub system will be described in terms of system parameters not in terms of a defined or named product specification. The Technical Specification identifies the context of intermodal/multimodal AEI within the overall AVI/AEI context and key external inter-dependencies and interfaces to the intermodal/multimodal Sector IT infrastructure. These include interfaces to the external and internal users of the Intermodal/multimodal System services and their associated IT systems, interfaces to Intermodal/multimodal management systems, existing Intermodal/multimodal networks and System Operations, and specifically interfaces to item identification and the domain of ISO/IEC SC31, item logistics standards. As an architecture it is designed to be complementary and interlocking to that domain. This Specification extends the conceptual and communication AVI architecture determined in ISO 14814 and is neither frequency nor air interface protocol specific. It provides maximum interoperability, has a high population capability, and provides the possibility of upwards migration to more capable systems. NOTE This Technical Specification presents a number of views to describe the intermodal/multimodal environment. Other organizations, such as UN/CEFACT, and other ITS standards, may use views that are based on different methodologies.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X not relevant

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**ISO TS 17262**		
Status	**Approved ISO TS 2002**		
Title	**Intermodal goods transport - Numbering and Data Structures**		
Scope	It is the Scope of this Technical Specification to define generic numbering and data structures for unambiguous identification of equipment used for Intermodal goods transport. These data are known as Intermodal Goods Transport Numbering and Data Structures. This Technical Specification defines data independently of the data carrier. The modelling of data is based on Abstract Syntax Notation One (ASN.1) as defined in ISO8824. This Technical Specification excludes any physical aspects such as interfaces, dimensions etc. Data that form part of transmission or storage protocols (headers, frame markers and checksums) are excluded. Data defined in this Technical Specification require a system for control and distribution of number series independent of the different AVI/AEI systems. This is required in order to avoid ambiguity and to provide the necessary level of security where appropriate. For this reason the registration authority defined in ISO14816 applies for this Technical Specification. This Technical Specification enables the use of optimised encoding schemes such as ASN.1 Basic Packed Encoding Rules (PER). This Technical Specification relates to AVI/AEI units, but not to smaller containers and units being transported. For smaller units (pallet loads, trays, parcels etc.) please refer to ISO/IEC SC31 standards, ISO 18000 series. The Numbering Structure defined in this standard is designed to enable combinations with the data definitions from ISO 18000xxx series. This combination is covered in prENV 17264. This Technical Specification provides the capability to carry application data, associated with the identification, to be carried as part of the AVI/AEI message. Within this Technical Specification this is provided as a “black box” facility. The definition of the structure and contents of such messages are outside the scope of this Technical Specification (examples are shown in ENV ISO 17264).		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**ISO TS 17263**		
Status	**Approved ISO TS 2002**		
Title	**AVI/AEI - Intermodal goods transport - System Parameters**		
Scope	This International Standard establishes an AEI-System based on radio frequency technologies. This system is intended for general application in RTTT/TICS. It allows the transfer of the identification codes and further information about equipment and vehicles used in intermodal trans-port into such RTTT/TICS and information systems related to Intermodal Transport processes. Within the intermodal context of the RTTT/TICS Sector, AEI systems have the specific objective of achieving an unambiguous identification of an ITU or related equipment or vehicle or item used in intermodal transport, and to make that identification automatically. Vehicles will be considered and handled under Intermodal aspects as „Intermodal Equipment“. Therefore a differentiation between AEI and AVI systems under the purpose of this standard is not required. The aim of this standard is to define, describe and specify the System Parameters related to an intermodal AEI system to provide an enabling standard, which, whilst allowing the system specifier to determine the performance levels and operating conditions, provides a framework for interoperability. Therefore this International Standard specifies: a) parameters and requirements of the identification system itself b) performance criteria necessary to ensure consistent and reliable operation of AEI systems within international transport processing c) requirements of the performance and the position of the electronic devices (TAG) when in-stalled on intermodal equipment d) requirements for the installation of readers, and performance data related to these components. NOTE 1: These parameters of an AEI system shall be identical, compatible or interoperable world-wide in respect of systems complying to this Pre-standard. Yet it is recognised that, at the implementation level, there may be requirements for regional or operational differences in the performance levels achieved against these parameters. Any system to read identity and related data has to be based on a standardised system to allocate an unambiguous identity to each item, vehicle, load unit or equipment as defined in EN ISO 17262 – AVI/AEI Numbering and Data Structures.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**ISO DIS 17264**		
Status	**FDIS Launched March 2006**		
Title	**AVI/AEI - Intermodal goods transport - Interfaces**		
Scope	The scope of this European standard / ISO Technical Specification is to provide the specifications of: • common AVI/AEI transaction requirements, which define the common steps of any AVI/AEI transaction; • AVI/AEI application interface to standardised wireless protocols (referered to as the 'Air Interface') supporting the AVI transaction requirements, so as to enable interoperability. The conceptual architecture model is shown for AVI transactions between On Board Equipment and Fixed Equipment. The Air interface concerns the reference point DELTA in ISO14814. This is an interface standard, adhering to the open systems interconnection (OSI) philosophy (ISO/IEC 7498-1), and it is as such not concerned with the implementation choices to be realised at either side of the air interface between the Fixed Equipment and OBE.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**CEN ISO TS 24534-1**		
Status	**FDIS Launched March 2006**		
Title	**AVI/AEI - ERI - Architecture**		
Scope	This international standard provides the requirements for Electronic registration that is: • based on an identifier assigned to a vehicle (e.g. for recognition by national authorities) • suitable to be used for : o electronic identification of local and foreign vehicles by national authorities o vehicle manufacturing, in-life-maintenance and end-of-life identification (vehicle life cycle management) o adaptation of vehicle data (e.g. for international resales) o safety related purposes o crime reduction o commercial services • adhering to privacy and data protection regulations This International Standard, ISO 24534, Part 1, is informative. It provides an overview of the ERI system concept, in terms of the onboard vehicle components and the external off-vehicle components required for an operational system. The detailed requirements are defined in the Parts 2, 3, 4 and 5 of this International Standard 24534 and for the more limited, relevant provisions of ISO 24535.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**CEN ISO TS 24534- 2**		
Status	**FDIS Launched March 2006**		
Title	**AVI/AEI - ERI - Operational Requirements**		
Scope	This international standard provides the requirements for Electronic registration that is: • based on an identifier assigned to a vehicle (e.g. for recognition by national authorities) • suitable to be used for : o electronic identification of local and foreign vehicles by national authorities o vehicle manufacturing, in-life-maintenance and end-of-life identification (vehicle life cycle management) o adaptation of vehicle data (e.g. for international resales) o safety related purposes o crime reduction o commercial services • adhering to privacy and data protection regulations This International Standard, ISO 24534 Part 2, defines the operational requirements for the remaining parts of ISO 24534 and the more limited, but relevant provisions of ISO 24535. Whilst the definition of the organizational framework required to implement, operate and maintain an ERI system is outside the scope of this standard, a list of potential stakeholders in the public and private sector, has been included.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**CEN ISO TS 24534- 3**		
Status	**FDIS Launched March 2006**		
Title	**AVI/AEI - ERI - Vehicle Data**		
Scope	This international standard provides the requirements for Electronic registration that is: • based on an identifier assigned to a vehicle (e.g. for recognition by national authorities) • suitable to be used for : o electronic identification of local and foreign vehicles by national authorities o vehicle manufacturing, in-life-maintenance and end-of-life identification (vehicle life cycle management) o adaptation of vehicle data (e.g. for international resales) o safety related purposes o crime reduction o commercial services • adhering to privacy and data protection regulations This part defines the vehicle identification data. This data is called the ERI data and includes: ¾ the vehicle identifier and ¾ possible additional vehicle related information (as typically included in a vehicle registration certificate) All additional vehicle data elements are defined as optional. It is left to local legislation and/or the discretion of a registration authority to use or not to use a particular data element. And, if used, the value is assumed to be the one registered by the registration authority in accordance with local legislation. This International Standard only provides the syntax for all these data elements. NOTE The secure application layer interfaces for the exchange of ERI data with a ERI reader or writer are specified in part 4 and 5 of this International Standard.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**CEN ISO TS 24534- 4**		
Status	**FDIS Launched March 2006**		
Title	**AVI/AEI - ERI - Secure Application Layer using Asymmetric Techniques**		
Scope	This international standard provides the requirements for Electronic registration that is: • based on an identifier assigned to a vehicle (e.g. for recognition by national authorities) • suitable to be used for : o electronic identification of local and foreign vehicles by national authorities o vehicle manufacturing, in-life-maintenance and end-of-life identification (vehicle life cycle management) o adaptation of vehicle data (e.g. for international resales) o safety related purposes o crime reduction o commercial services • adhering to privacy and data protection regulations This part of this International Standard specifies the interfaces for a secure exchange of data between an ERT and an ERI reader or ERI writer in or outside the vehicle using asymmetric encryption techniques. The specification includes: ¾ the application layer interface between an ERT and a onboard ERI reader or writer ¾ the application layer interface between the onboard ERI equipment and external ERI readers and writers ¾ security issues related to the communication with the ERT NOTE The vehicle identifiers and possible additional vehicle data (as typically contained in vehicle registration certificates) are defined in part 3 "Vehicle Data".		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**CEN ISO TS 24534- 5**		
Status	**FDIS Launched March 2006**		
Title	**AVI/AEI - ERI - Secure Application Layer using Symmetric Techniques**		
Scope	This international standard provides the requirements for Electronic registration that is: • based on an identifier assigned to a vehicle (e.g. for recognition by national authorities) • suitable to be used for : o electronic identification of local and foreign vehicles by national authorities o vehicle manufacturing, in-life-maintenance and end-of-life identification (vehicle life cycle management) o adaptation of vehicle data (e.g. for international resales) o safety related purposes o crime reduction o commercial services • adhering to privacy and data protection regulations This part of this International Standard specifies the interfaces for a secure exchange of data between an ERT and an ERI reader or ERI writer in or outside the vehicle using symmetric encryption techniques. Symmetric encryption techniques are based secret keys shared by a particular community of users. I.e. in closed user groups in which it is trusted that keys are not revealed to outsiders. The specification includes: ¾ the interface between an ERT and an onboard ERI reader or writer ¾ the interface between the onboard ERI equipment and (road side) reading and writing equipment ¾ security issues related to the communication with the ERT		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204 WG 4 / CEN TC 278 WG 12** **Automatic Vehicle and Equipment Identification**		
Number	**CEN ISO TS 24535**		
Status	**FDIS Launched January 2006**		
Title	**AVI/AEI - ERI - Basic Electronic Registration Identification**		
Scope	This International Standard supports simple systems for 'basic electronic registration identification' ('basic ERI) for use in intelligent road transport applications. This International Standard 'basic ERI' defines the: • Specification of a unique vehicle identifier (using an International Standard, or non standard, data concept) • 'Basic ERI' functional capabilities, selectable for different 'basic ERI' applications • Minimum data interoperability requirements between 'basic ERT's and ERRs This International Standard is consistent with the ERI architecture defined in ISO 24534 Part 1 and data concepts defined in ISO 24534 Part 3, but is not necessarily interoperable with, the more capable and ISO 24534 Part 4 or part 5 'fully featured' ERI communication systems to be defined in ISO 24534 Part 4 or part 5. ISO 24535 (this International Standard) defines a 'basic ERI' system with security adequate for information that is currently available manually (such as licence plate and/or VIN etc.) but this International Standard does not purport to provide the high levels of security required for some administrative requirements, and those requiring high security are advised to follow ISO 24535. Although not part of this International Standard, the employed technologies supporting ISO 24535 may enable additional non-standard security measures to be added for specific applications This International Standard requires the use of an air interface communication that complies with an international or regional standard whose protocols are publicly defined and available in that standard, but this International Standard does not define such an air interface, nor specify which standard air interface is used for any particular implementation. This International Standard limits its scope to: a) The requirement that a standard air interface with publicly available protocols is used b) The use of data concepts consistent with ISO 24534 Part 3 c) The ability to additionally use private data concepts		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

ISO/TC 204 WG 5 – EFC/ETC

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WG /Organization	**ISO/TC 204/WG 5 on Fee and Toll Collection and CEN/TC 278/WG 1 on Electronic Fee Collection**
Number	**CEN ISO/TS 14907-1: 2004**
Title	**Road transport and traffic telematic - Electronic fee collection - Test procedures for user and fixed equipment - Part 1: Description of test procedures**
Scope	This Technical Specification specifies the test procedures of EFC road-side equipment (RSE) and on-board equipment (OBE) with regard to the conformance to standards and requirements for type approval and acceptance testing which is within the realm of EFC application specifically. The scope of this Technical Specification is restricted to systems operating within the radio emission, EMC regulations, traffic and other regulations of the countries in which they are operated and it is therefore a requirement that all required equipment approvals from an authenticated and accredited test house have been obtained in order to claim compliance. This Technical Specification identifies a set of suitable parameter and provides test procedures to enable the proof of a complete EFC system as well as components of an EFC system e.g. OBE related to the defined requirements of an application. The defined parameter and tests are assigned to the following groups of parameter: — Functionality; — Quality; — Referenced pre-tests. An overview of the tests and parameters provided by this Technical Specification is given in 5.1 and 5.2. OBU conformance testing against EN ISO 14906 (EFC-Application interface definition for DSRC) is covered by CEN ISO/TS 14907-2 (Part 2 of this Technical Specification).

The Technical Specification describes procedures, methods and tools and a test plan which enables to show the relation between all tests and the sequence of these tests. It lists all tests which are required to measure the performance of EFC equipment. The Technical Specification describes which EFC-equipment is covered by the test procedures; the values of the parameters to be tested are not included. It describes also how the tests are to be performed and which tools and pre-requisites are necessary before this series of tests are undertaken. It is assumed that the security of the system is inherent in the communications and EFC functionality tests and are thus not addressed specifically here. All tests in this Technical Specification provide instructions to evaluate the test results.

The test procedures can be used for prototype testing, type approvals, test of installations and periodic inspections. Thus this Part 1 is a Technical Specification that defines only the test and test procedures, not the benchmark figures that these are to be measured against.

Related to a conceptual model of an EFC system this Technical Specification relates only to the equipment of the user and the service provider as illustrated in Figure 1. Any other entities are outside the scope of this Technical Specification.

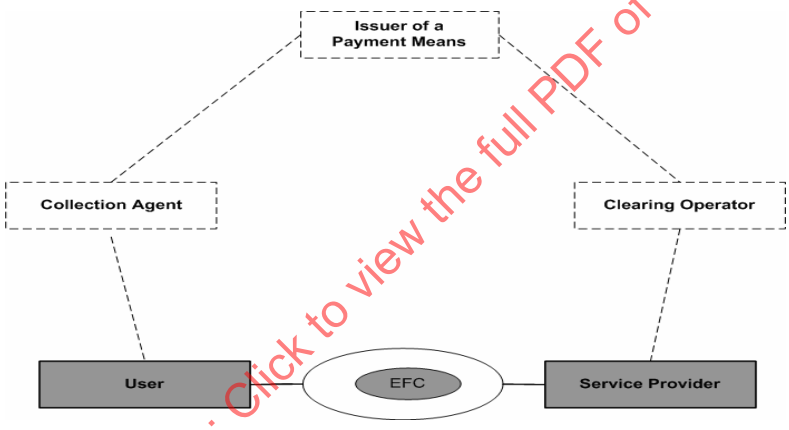
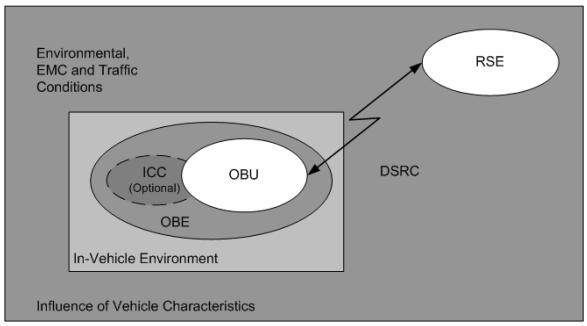


Figure 1 — Conceptual model of EFC

EFC systems for DSRC consist, in principle, of a group of technical components, which in combination fulfil the functions required for the collection of fees by electronic automatic means. These components comprise all or most of the following:

— on-board equipment (OBE) within a vehicle;
— on-board unit containing the communications and computing sub-functions;
— optional integrated circuit card which may carry electronic money, service rights and other secured information;
— communication between OBE and RSE based on DSRC;
— equipment for the fee collection at the road-side (RSE) containing the communications and computing sub-functions;
— equipment for the enforcement at the road-side;
— central equipment for the administration and operation of the system.

	The scope of this Technical Specification relates solely to OBE and RSE and the DSRC interface between OBE and RSE including its functions to perform the fee collection as illustrated by Figure 2. All the equipment used for enforcement (e.g. detection, classification, localisation and registration) and central equipment are outside the scope of this Technical Specification.  **Figure 2 — OBE/RSE interface and associated environments**

Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) this standard is recommended to develop its conformance requirements in the future		

WG /Organization	**ISO/TC 204/WG 5 on Fee and Toll Collection and CEN/TC 278/WG 1 on Electronic Fee Collection**
Number	**CEN ISO/TS 14907-2:2005**
Title	**Road transport and traffic telematic - Electronic fee collection - Test procedures for user and fixed equipment - Part 2: Conformance test for the onboard unit application interface**
Scope	This CEN / ISO Technical Specification describes tests that verify OBU conformance of implementations of functions and data structures, as defined in the implementation conformance statement based on prEN ISO 14906, for EFC applications. After the tests of isolated data items and functions (C.1-C2), an example is given for testing of a complete EFC transaction (C.3). The scope of this CEN / ISO Technical Specification comprises definitions of OBU conformance assessment tests of: — Basic DSRC L7 functionality; — EFC application functions; — EFC attributes (i.e. EFC application information); — the addressing procedures of EFC attributes and (hardware) components (e.g. ICC and MMI); — the EFC transaction model, which defines the common elements and steps of any EFC transaction; — the behaviour of the interface so as to support interoperability on an EFC-DSRC application interface level.

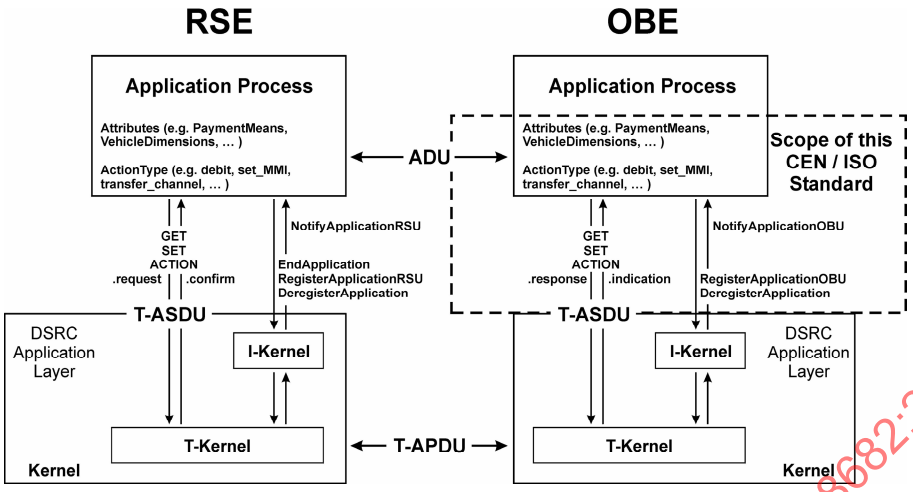


Figure B.1 — The EFC application interface

The purpose of this CEN / ISO Technical Specification is to define tests that

— Assess OBU capabilities;

— Assess OBU behaviour;

— Serve as a guide for OBU conformance evaluation and type approval;

— Achieve comparability between the results of the corresponding tests applied in different places at different times;

— Facilitate communications between parties.

Whereas this document defines examples of test cases for DSRC and EFC functionality in Annex C, it does not intend to specify a complete test suite for a certain implementation. To compose a test suite for a specific EFC implementation the test cases may have to be modified and new test cases may have to be defined and added in order for the conformance test to be complete. It may be useful to take into account the following considerations when defining a complete test suite:

— Small range: "exhaustive testing" of critical interoperability / compatibility features;

— Large range: testing of boundaries and random values;

— Composite types: testing of individual items in sequence or parallel.

Figure 2 shows the overall procedure of Conformance Testing.

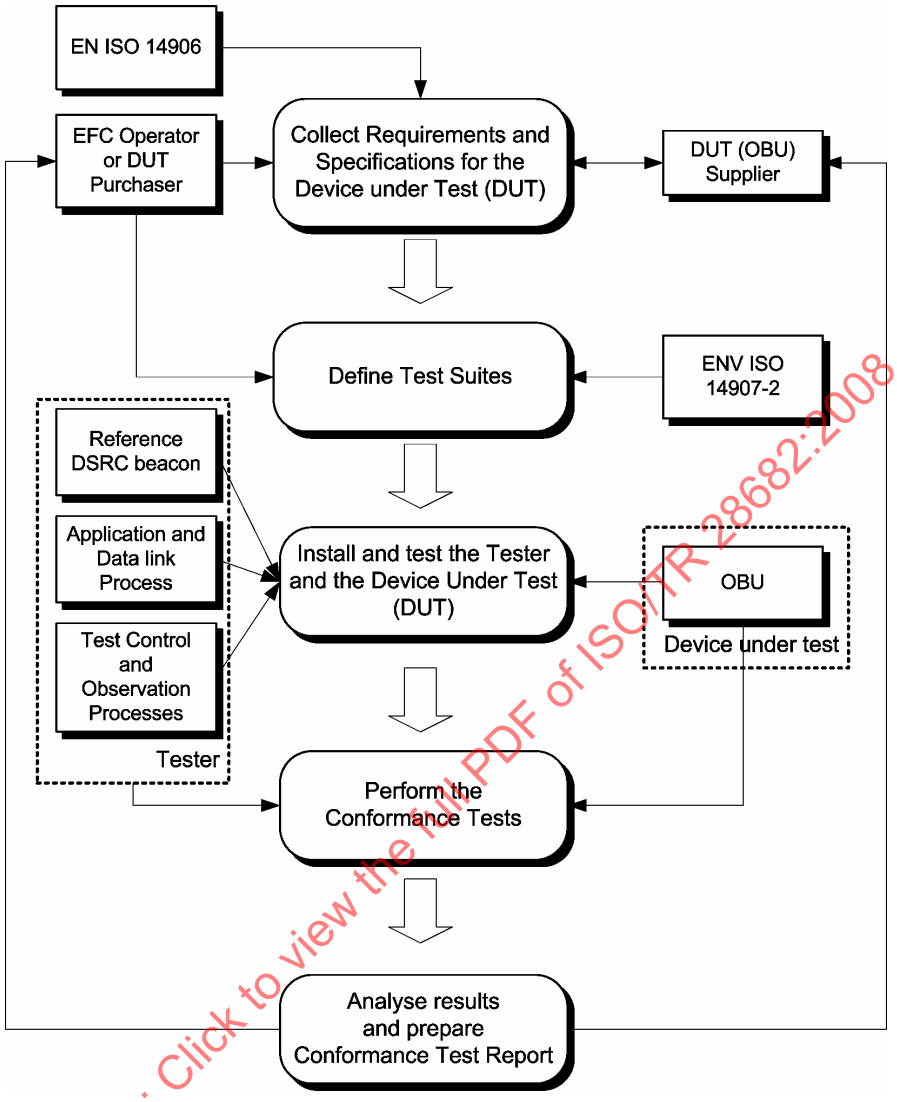


Figure B.2 — Conformance testing process

Figure 3 gives a more detailed picture of the interface between the entity performing the Conformance Test and the supplier of the Device Under Test (DUT). By the EFC Application Specification, the Implementation conformance statement proforma and the implementation extra information for testing proforma the supplier is requested to provide the DUT (OBU), containing the Implementation Under Test (IUT), as well as the documentation needed to perform the tests. More details on the content of the different documents are given in clause 5 on OBU and supporting information.

NOTE 1: The Device Under Test contains the Implementation Under Test.

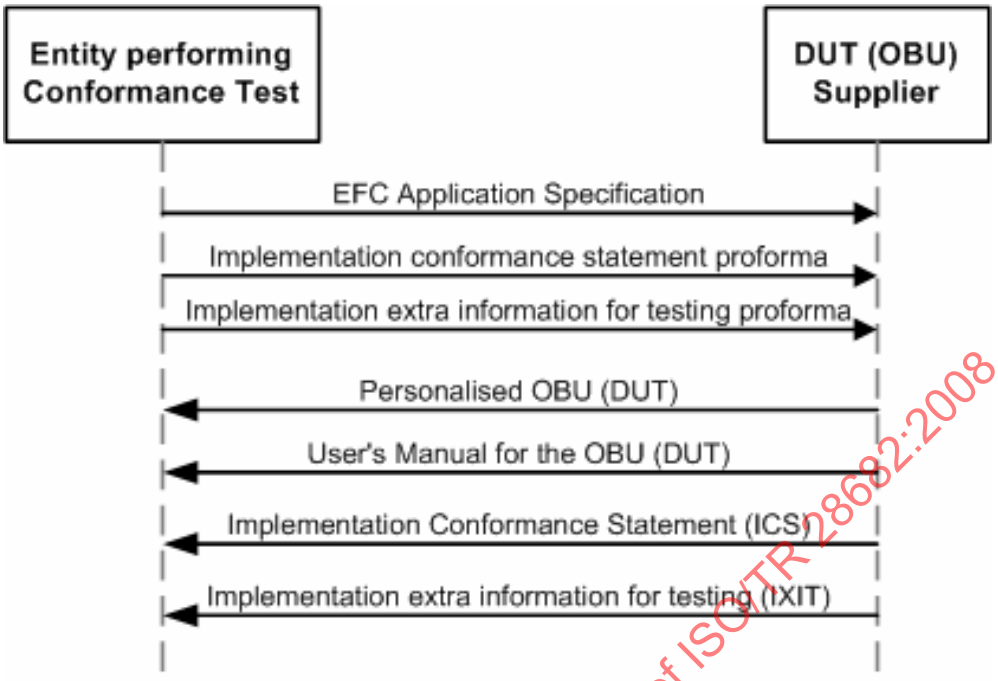


Figure B.3 — Documentation DUT supplier

It is outside the scope of this CEN / ISO Technical Specification to define tests that assess:

— performance;

— robustness;

— reliability of an implementation.

NOTE 2: prCEN/ISO TS 14907-1 defines tests procedures that are aimed at assessing performance, robustness and reliability of EFC equipment and systems.

NOTE 3: ISO/IEC 10373 (Identification cards – Test methods – Parts 1-7) family of standards defines tests methods for proximity, vicinity, integrated circuits(s) cards and related devices that may be relevant for OBUs that support such cards.

Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	**CEN/TC 278/WG 1 on Electronic Fee Collection**
Number	**CEN 00278188-EN**
Title	**Road transport and traffic telematic - Electronic fee collection – Conformity evalulation of on-board and roadside equipment to EN 00278187** **- Part 1: Test Suite Structure and Test Purposes** **- Part 2: Abstract test suite**
Scope	The objective of this standard is to define the tests for conformity evaluation of OBU and RSE according to the "EFC Interoperability Application Profile for DSRC": — Assess OBU and RSE capabilities; — Assess OBU and RSE behaviour; — Serve as a guide for OBU and RSE conformance evaluation and type approval; — Achieve comparability between the results of the corresponding tests applied in different places at different times; — Facilitate communications between parties CEN/TC 278(/WG 1) has produced several standards that support interoperable DSRC-EFC-systems, in particular EN ISO 14906 and CEN ISO DTS 14907-2, a "toolbox" for EFC transactions and conformance testing. However, these standards are of enabling nature and do no guarantee interoperability. Further specifications are needed for technical interoperability to be achieved. This standard is based on: — EFC Interoperability Application Profile (IAP) for DSRC — ISO 9646 family of standards on "Tree and tabular combined notation" The latter is a standardized "language" suitable for specification of test cases and steps for assessment of protocol and application behaviour. The "TTC N language" is also supported by modern automated tools that accelerate software design, implementation and testing. The scope of this test specification corresponds to the scope of the requirements specification, i.e. "EFC IAP for DSRC" focusing on the critical interoperability elements from a technical interoperability perspective: — Payment method: Central account based on EFC-DSRC; — Physical systems: OBU, RSE and the interface between them (all functions and information flows related to these physical parts); — DSRC-link (for the interface as above); — EFC transaction (for the interface as above); — Data elements to be used by OBU and RSE; — Security mechanisms for OBU and RSE; — Conformance procedures and test specification. It is outside the scope of this standard to define tests that assess: — performance; — robustness; — reliability of an implementation. Note that the OBU and RSE will be subject to additional testing in order to ascertain that they fulfil the essential radio requirements as set out in e g the European Directives – a pre-requisite for CE marking and placing on the European market. They are also likely to be subject to additional testing of physical, environmental endurance, quality assurance and control at manufacturing, charge point integration, as part of factory, site and system acceptance testing. The definition of these tests is outside the scope of this standard.

Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements	X	
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

E.1.4 ISO/TC 204 WG 7 –General fleet management and commercial fright operations

**** Submitted by (please contact following person for further information):***

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WG /Organization	**ISO/TC 204 WG 7 - Intelligent transport systems — General fleet management and commercial freight operations**		
Number	**ISO DIS 17687**		
Title	**Data dictionary and message sets for electronic Identification and monitoring of dangerous goods transportation**		
Scope	This international standard is to support the application of automated Identification, Monitoring and exchange of emergency response information regarding dangerous goods carried on board road transport vehicles. Such information may include the identification, quantity, and current condition such as pressure and temperature of such goods as well as any relevant emergency response information. When equipped with appropriate electronics and communications capabilities, vehicles carrying dangerous goods may respond to queries regarding their status or self-initiate a message. The information defined here, electronically carried on-board the road transport vehicle may be transferred to interested roadside systems by whatever communications means are appropriate to that roadside system. The primary intent of this international standard is not trade, economic, or commercial but to help save lives by facilitating emergency response. This international standard supports local on-site needs in the same manner as conventional visual placards do but with an optional, complementary, and enhanced more versatile electronic version.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future	In this case Conformance requirement are enacted by countries' laws if and when adopted by regulators	X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204 WG 7 - Intelligent transport systems — General fleet management and commercial freight operations**		
Number	**ISO CD 24533**		
Title			
Scope	This international standard specifies the data concepts applicable to the movement of freight and its intermodal transfer. It also addresses the business processes depicting the roles and responsibilities of the various participants in the international supply chain. This first version of the International Standard focuses on a single "thread" of the overall end to end supply chain consisting of a road-air-road combination. These data concepts include data elements, data frames (groups of data elements) and messages that comprise information exchanges at road transport interfaces along the chain of participants responsible for the delivery of goods from the point of origin through to the final recipient as presented in Figure 1. The scope includes motor transport data needs within the international supply chain to satisfy the requirements of both businesses and governmental organizations. This international standard is applicable to highway shipments that originate in one country and terminate in another. It may also be applied to highway shipments that originate and terminate in a single country. This international standard is applicable to highway freight movements that interface with other modes and incorporates requirements set for those other modes. If goods change to or from another mode between origin and destination, this international standard does not establish requirements for those other modes. However, it addresses the requirements of information exchange between the truck mode and the air freight mode. Further, this international standard does not constrain the requirements of Customs, regulatory, and safety bodies at border crossings. However, this International Standard does include the data elements most likely to be required by Customs		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future	In this case Conformance requirement are enacted by countries' laws if and when adopted by regulators	X

E.1.5 ISO/TC 204 WG 8 – Public Transport

**** Submitted by (please contact following person for further information):***

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WG /Organization	**ISO/TC 204 WG 8**		
Number	**ISO/CD 22951**		
Title	**Data Dictionary and Message Sets for Preemption and Prioritization Signal System for Emergency and Public Transport Vehicles (PRESTO).**		
Scope	The scope is data dictionary and message sets related to the communications between a roadside communication unit and each in-vehicle unit, between a roadside communication unit and roadside units and between in-vehicle units and roadside units in the system that allows emergency vehicles to arrive at scenes of incidents rapidly by giving the vehicles priority signal control service. Additionally, the system gives priority signal control service to public transport vehicles such as buses. The standardization targets only information related to priority signal control and does not deal with information provision such as that of the situations at scenes.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

** Submitted by (please contact following person for further information):*

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WG /Organization	**CEN TC 278 WG 3 SG5 / Joint WG ISO/TC 204 WG 8**
Number	**24014-1**
Title	**Public transport — Interoperable fare management system — Part 1: Architecture (ISO/DIS 24014-1:2005)**
Scope	This standard provides the basis for the development of multi-operator/multi-service Interoperable Public Surface Transport Fare Management Systems (IFM) on a national and international level. This international standard is applicable to bodies in public transport and related services which agree that their systems shall interoperate. While this standard does not imply that existing interoperable fare management systems need to be changed, the standard applies, so far as it is practically possible, to extensions of these. This standard covers the definition of a conceptual framework, which is independent of organizational and physical implementation. Any reference within this standard to organizational or physical implementation is purely informative. The objective of this standard is to define a reference functional architecture for IFM systems and to identify the requirements that are relevant to ensure interoperability between several actors in the context of the use of electronic tickets. The IFM system includes all the functions involved in the fare management process such as + Management of Application + Management of Products + Security management + Certification, Registration and Identification The work has benefited from the architecture work done in the Electronic Fee Collection (TC 278/WG 1 EFC) and other domains e.g : + ENV ISO 14904 “RTTT-Automatic Fee Collection-Interface specification for Clearing between Operators” + ENV ISO 17573 “RTTT Electronic Fee Collection, System architecture for vehicle related transport services” + existing international data security standards + ENV 12896 “RTTT- Reference data model” (Transmodel). The standard excludes consideration of: + the physical medium and its management; + the technical aspects of the interface between the medium and the medium acceptance device; + the data exchanges between the medium and the medium acceptance device; NOTE The data exchanges between the medium and the medium acceptance device are proposed by other standardization committees e.g. CEN TC 224 WG 11. + the financial aspects of fare management systems (e.g. customer payments, method of payment, settlement, apportionment, reconciliation).

	Part 1 of the standard describes the following main elements: + Identification of the different functional entities in relation to the overall fare management system. + Definition of a generic model of IFM system describing the logical and functional architecture and the interfaces within the system and with other IFM systems. + Use cases describing the interactions and data flows between the different functional entities. + Description of security requirements.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b) (If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

E.1.6 ISO/TC 204 WG 10 – Traffic and Traveller Information

**** Submitted by (please contact following person for further information):***

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WG /Organization	**ISO/TC 204 WG 10 / CEN TC 278 WG 4**		
Number	**EN ISO 141819**		
Title	**Traffic and Traveler Information via Traffic Message Coding**		
Scope	Part 1 to 3: EN ISO 14819 describes the ALERT-C protocol concept and message structure used to achieve densely coded messages to be carried in the RDS-TMC feature. Part 6: This document establishes a method of encrypting certain of the elements of the ALERT-C coded data carried in the RDS-TMC type 8A data group, such that without application by a terminal or receiver of an appropriate keys, the information conveyed is virtually worthless. Before a terminal is able to decrypt the data, the terminal requires two 'keys'. The first 'key' is given in confidence by the service provider to terminal manufacturers with whom they have a commercial relationship; the second 'key' is broadcast in the 'Encryption Administration group', which is also a type 8A Group. This specification explains the purpose of the two 'keys' and how often and when the transmitted 'key' may be changed. Before an individual terminal may present decrypted messages to the end-user, it must have been activated to do so. Activation requires that a 'PIN' code be entered. The PIN code controls access rights to each service and subscription period, allowing both 'lifetime' and 'term' business models to co-exist. The specification also describes the considerations for service providers wishing to introduce an encrypted RDS-TMC service, migrating from either a 'free-to-air' service based on public 'Location Tables' or a commercial service based on a proprietary 'Location Table'. Finally, 'hooks' have been left in the bit allocation of the type 8A group to allow extension of encryption to other RDS-TMC services.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

*** Conformance requirements have been developed by TMC-Forum, all standards are already in use in many countries in Europe and USA.**

WG /Organization	**ISO/TC 204 WG 10 / CEN TC 278 WG 4**		
Number	**ENV ISO14822**		
Title	**TTI Messages via DSRC Beacons**		
Scope	This Draft standard addresses the passive DSRC issues associated with Medium Range Pre-Information (MRPI) as applied to Traffic and Travel information issued from an information Service provider to a suitably equipped moving vehicle. The AID(Application Identification) No for all MRPI Application entities is defined as No 8 in accordance with the Draft standard of ISO/TC 204 working group 15, work item ISO/CD 15628		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204 WG 10 / CEN TC 278 WG 4**		
Number	**prENV ISO 14823**		
Title	**TTI Messages via Stationary Dissemination Systems**		
Scope	This final draft International Standard presents a system of standardized codes for existing signs and pictograms used to deliver traffic and traveller information. The coding system can be used to form messages to be handled by respective media systems, graphic messages on on-board units, and media system information on TTI Dissemination systems (VMS, PC, PAT, etc.) (including graphic data). These types of information are required by travelers for their pre-trip planning as well as their in-trip plan modification based on information obtained through media systems.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		N/A

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204 WG 10 / CEN TC 278 WG 4**		
Number	**CEN / ISO TS 18234**		
Title	**TTI over High Data-rate Digital Bearers**		
Scope	This Technical Specification provides an introduction and index to the initial set of TPEG applications and specifications. It allows the indexing of new applications as they are added to the TPEG applications family, by defining their Application Identification (AID). 5 As such developments occur this Technical Specification will be updated to indicate the latest status and the interworking of the various TPEG specifications. It shall be issued as a new editorial-version every time a new issue of any other specification is issued.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

Conformance requirements are worked out in the TPEG Forum

WG /Organization	**ISO/TC 204 WG 10 / CEN TC 278 WG 4**		
Number	**CEN / ISO TS 24530**		
Title	**TTI over High Data Rate Digital Bearers**		
Scope	The TPEG applications are intended to convey information to end-users. The information provided relates to event and status information on transport networks and on associated infrastructure affecting a journey. For example, limited information about abnormal operation of links in the network may be included, such as ferries, lifting-bridges, etc. The TPEG applications have the broad objective to allow the generation of Traffic and Travel Information (TTI) messages, for delivery to the end-user by one or more bearers. A hierarchical methodology has been developed to allow the creation of messages from a set of TPEG tables, which are essentially word oriented and cover most needs. These TPEG tables (essentially word oriented data object dictionaries) comprise a wide ranging ability to describe a TTI event and some status information, introducing new precision in a number of areas such as 'Vehicle types', 'Positional information on the carriageway' and 'Diversion routing advice'. This document establishes the top-level "containers" for TPEG messages in XML and the common data types that are used by TPEGML applications (e.g TPEG-ptiML).		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

Conformance requirements are worked out in the TPEG Forum

E.1.7 ISO/TC 204 WG 14 Vehicle/Roadway Warning Systems

**** Submitted by (please contact following person for further information):***

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WG /Organization	**ISO/TC 204/WG 14**		
Number	**ISO 15622 (published)**		
Title	**Adaptive Cruise Control Systems**		
Scope	This International Standard contains the basic control strategy, minimum functionality requirements, basic driver interface elements, minimum requirements for diagnostics and reaction to failure, and performance test procedures for adaptive cruise control systems. Adaptive cruise control is fundamentally intended to provide longitudinal control of equipped vehicles while traveling on highways under free-flowing traffic conditions. ACC may be augmented with other capabilities, such as forward obstacle warning.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:7)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 14**		
Number	**ISO 15623 (published)**		
Title	**Forward Vehicle Collision Warning System**		
Scope	This standardization draft specifies system requirements and test methods for systems capable of warning the driver of short inter-vehicle distance and closing speed which may cause a rear end collision with other vehicles including motor cycles ahead of the subject vehicle while it is operating at ordinary speed. The scope of this standard covers operations on roads with curve radii over 125 meters as well as higher radius curves and includes straight roads.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:6)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

* Conformance requirements: Test methods, procedures, etc.

WG /Organization	**ISO/TC 204/WG 14**		
Number	**ISO 17386 (published)**		
Title	**Maneuvering Aid for Low Speed Operation**		
Scope	This standard of Manoeuvring Aids for Low Speed Operation addresses light duty vehicles, e.g. passenger cars, pick-up trucks, light vans and sport utility vehicles (motorcycles excluded) equipped with such MALSO systems. It specifies minimum functionality requirements which the driver can generally expect of the device; i.e., detection and information of the presence of relevant obstacles within a defined (short) detection range. It defines minimum requirements for failure indication as well as performance tests procedures and it includes rules for the general information strategy, but does not restrict the kind of information or display system. MALSO systems use object detection devices (sensors) for ranging in order to provide the driver with information based on distance to obstacles. The sensing technology is not addressed, however, technology affects the performance test procedures set up in this standard. The current test objects were defined based on systems using ultrasonic sensors, which is the most commonly used technology at the time of editing this standard. For other sensing technologies possibly coming up in the future, these test objects shall be checked and changed if required. Visibility enhancement systems like video camera aids without distance ranging and warning are not covered by this standard. Reversing aids and obstacle detection devices on heavy commercial vehicles are not addressed by this standard, requirements for those systems are defined in ISO/TR 12155.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:7)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 14**		
Number	**ISO 17361 (approved DIS without negative ballot)**		
Title	**Lane Departure Warning Systems**		
Scope	This standardization working draft specifies the definition of the system, classification, functions, human machine interface (HMI) and test methods for lane departure warning systems. These are in-vehicle systems that can warn the driver of a lane departure on highways and highway-like roads. The subject system, which may utilise optical, electromagnetic, GPS, or other sensor technologies, shall issue a warning consistent with the visible lane markings. The issuance of warnings at road way sections having temporary or irregular lane markings such as road work zones is not within the scope. The standard shall apply to passenger cars, commercial vehicles and buses. The system will not take any automatic action to prevent possible lane departures. Responsibility for the safe operation of the vehicle remains with the driver.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:5)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 14**		
Number	**DIS 17387 (under DIS ballot)**		
Title	**Lane Change Decision Aids Systems**		
Scope	This standardization draft specifies system requirements and test methods for Lane Change Decision Aid Systems (LCDAS). LCDAS are fundamentally intended to warn the driver of the subject vehicle against potential collisions with vehicles to the side and/or to the rear of the subject vehicle, and moving in the same direction as the subject vehicle during lane change manoeuvres. This standardization addresses LCDAS for use on forward moving cars, vans, and straight trucks in highway situations. This standardization does not address LCDAS for use on motorcycles or articulated vehicles such as tractor / trailer combinations and articulated buses.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:6)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 14**		
Number	**PWI 22839**		
Title	**Rear-End Collision Mitigation Braking Systems**		
Scope	This International Standard specifies the concept of operation, minimum functionality, system requirements, system interfaces, and test methods for Rear-End Collision Mitigation Braking Systems (RECMS). It specifies the behaviors that are required for RECMS, and the system test criteria necessary to verify that a given system implementation meets the requirements of this International Standard. Implementation choices are left to system designers, wherever possible. The RECMS enhances the driver's capability to mitigate rear-end collisions or to avoid them under favorable conditions. It reduces collision energy and impact velocity. The resulting benefits include reduced collision severity, and reduced likelihood of collision injury, damage, or fatality. It supplements crashworthiness systems such as airbags, seatbelts and other energy-absorbing systems by reducing the impact energy for unavoidable crashes. By automatically activating the brakes after delivering a collision warning, RECMS assists in slowing the vehicle when a collision is likely. Under some limited conditions RECMS operation can reduce the collision velocity to zero, resulting in no collision. The RECMS is for use on road vehicles intended for public and non-public roadways. The system is not intended for off-road use, or for installation on single-track vehicles.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:8)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 14**
Number	**NP 22840**
Title	**Extended Range Backing Aid Systems**
Scope	This International Standard (draft) for Extended Range Backing Aids (ERBA) addresses light-duty vehicles (e.g. passenger cars, pick-up trucks, light vans and sport utility vehicles (motorcycles excluded)) equipped with such ERBA systems. This standard establishes minimum functionality requirements that the driver can expect of the system, such as the detection of and information on the presence of relevant obstacles within a defined detection range. This standard also sets minimum requirements for failure indication as well as performance test procedures. It includes rules for the general information strategy but does not restrict the kind of information or display system. ERBA systems are intended to provide backing aid functionality over an extended area located aft of the subject vehicle. ERBA systems are not intended for short-range detection of obstacles located immediately behind the vehicle. If a short-range detection system is needed, either in lieu of or in addition to an ERBA system, it is recommended that the short-range system be implemented in compliance with the Manoeuvring Aids for Low Speed Operation (MALSO) International Standard (ISO 17386:2004(E)). This International Standard does not include reversing aids and obstacle-detection devices for use on heavy commercial vehicles. Requirements for those systems are defined in ISO/TR 12155. This International Standard does not include visibility-enhancement systems such as video-camera aids that do not have distance ranging and warning capabilities. ERBA systems use object-detection devices (sensors) for detection and ranging in order to provide the driver with information based on the distance to obstacles. The sensing technology is not addressed; however, technology does affect the performance-test procedures defined in this International Standard. The test objects are defined based on systems using radar sensors, which are the most commonly used detection technology for long-range applications at the time of this International Standard. For future sensing technologies, these test objects shall be validated and replaced, if required. ERBA systems are intended to supplement the interior and exterior rear view mirrors, not eliminate the need for such mirrors. Automatic actions (e.g. applying brakes to prevent a collision between the subject vehicle and the obstacle) are not addressed in this standard. Responsibility for the safe operation of the vehicle remains with the driver. ERBA systems will calculate a dynamic estimate of collision danger (e.g. perhaps using a Time To Collision (TTC) algorithm) and warn the driver that immediate attention is required in order to avoid colliding with the detected obstacle. A dynamic warning is necessary for the higher vehicle speeds which occur in backing events where the relative closing velocities between the vehicle and the obstacle are greater as compared to low-speed situations such as parking and/or maneuvering (reference Manoeuvring Aids for Low Speed Operation (MALSO) International Standard (ISO 17386:2004(E)). The purpose of this dynamic warning is to deliver a more urgent warning to the driver in order for the driver to take timely action. Distance indications are optional; but if so included, it is recommended they be implemented in compliance with ISO 15008:2003, Road vehicles — Ergonomic aspects of transport information and control systems — Specifications and compliance procedures for in-vehicle visual presentation.

Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:9)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

WG /Organization	**ISO/TC 204/WG 14**		
Number	**NP 22178**		
Title	**Low Speed Following Systems**		
Scope	This International Standard contains the basic control strategy, minimum functionality requirements, basic driver interface elements, minimum requirements for diagnostics and reaction to failure, and performance test procedures for Low Speed Following (LSF) systems. LSF is primarily intended to reduce the driver's workload of repeatedly operating the accelerator and the brake pedal under congested traffic in order to keep a proper following distance behind the target vehicle for a relatively long period on roadways where there are no objects like pedestrians and bicyclists who may interrupt motorized traffic flow. LSF provides the automatic car-following at lower speed, by use of a driver interface mechanism and a speed adjustment system.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:7)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 14**		
Number	**NP 22179**		
Title	**Full Speed Range ACC**		
Scope	This International Standard contains the basic control strategy, minimum functionality requirements, basic driver interface elements, minimum requirements for diagnostics and reaction to failure, and performance test procedures for Full Speed Range Adaptive Cruise Control (FSRA) systems. FSRA is fundamentally intended to provide longitudinal control of equipped vehicles while travelling on highways (roads where non motorized vehicles and pedestrians are prohibited) under free-flowing and congested traffic conditions. FSRA provides support within the speed domain of standstill up to the designed maximum speed of the system. The system will attempt to stop behind an already tracked vehicle within its limited deceleration capabilities and will be able to start again after the driver has input a request to the system to resume the journey from standstill. The system is not required to react to stationary or slow moving objects (in accordance with ISO 15622 ACC).		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:7)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

WG /Organization	**ISO/TC 204/WG 14**		
Number	**PWI26684**		
Title	**Intersection Signal Information and Violation Warning Systems**		
Scope	This standardization Working Draft specifies the concept of operation, system requirements, and test methods for Intersection Signal Information and Violation Warning Systems (ISIVWS) at signalized intersections. ISIVWS are intended to reduce the likelihood of crash injury, damage, and fatality by enhancing the capability of drivers to avoid crash situations at signalized intersections. The ISIVWS application shall include at least one of the following two functions:(1)A system that communicates the current phase of the traffic signal to the subject vehicle for display to the driver, thus enhancing the driver's awareness of the signal state; and(2)A system that uses the traffic signal phase information communicated to the subject vehicle to provide an in-vehicle warning to the driver of an imminent traffic signal violation, thus enhancing the opportunity for the driver to avoid the signal violation. The scope of ISIVWS standardization includes basic functions, functional requirements, performance requirements, information contents, and test methods.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	X (clause no:)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

*** Conformance requirements: Test methods, procedures, etc.**

E.1.8 ISO/TC 204 WG 16 Wide Area Communications

**** Submitted by (please contact following person for further information):***

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WG /Organization	**ISO/TC 204/WG 16 Wide Area Communications**		
Number	**ISO15662**		
Title	**Protocol Management**		
Scope	**This international standard specifies the template of message headers for telematics communications**		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

WG /Organization	**ISO/TC 204/WG 16/SWG 16.2 Wide Area Communications**		
Number	**ISO21210-1**		
Title	**CALM Networking Protocol for Internet connectivity**		
Scope	This international standard specifies the networking protocols and parameters for CALM, initially using cellular communication, 5 GHz, Millimeter and infra red, but capable of supporting other media that are able to comply with the protocols.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

WG /Organization	**ISO/TC 204/WG 16/SWG 16.2**		
Number	**ISO21210-2**		
Title	**CALM Networking Protocol for direct mode connectivity**		
Scope	This international standard specifies the networking protocols and parameters for CALM, initially using cellular communication, 5 GHz, Millimeter and infra red, but capable of supporting other media that are able to comply with the protocols.		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no:)	X
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

Submitted by (please contact following person for further information):

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WG /Organization	**ISO/TC 204 WG 16 Wide Area Communications**
Number	**ISO 21212**
Status	**Approved CD.**
Title	**Intelligent transport systems — Communications, air-interface, long and medium range (CALM) — 2G Cellular systems**
Scope	This standard determines the air interface using 2nd Generation cellular networks : 2nd Generation (e.g. using WAP and I-Mode type protocols). The standard provides protocols and parameters for long range, medium speed wireless communications in the ITS sector Using 2nd generation cellular telephone communications. Such links are required for quasi-continuous, prolonged or short communications between vehicles and the roadside, between vehicles, and between mobile equipment and fixed infrastructure points, over medium and long ranges. Wherever practicable, this standard has been developed by reference to suitable extant standards, adopted by selection. Required regional variations are provided. Due account is given to, and use made of, any relevant parts of appropriate communications systems, such as 'Global Positioning Systems' (GPS), 'Digital Audio Broadcasting' (DAB), 'Digital Video Broadcasting' (DVB), radio LANs, 'Digital Data Broadcasting' (DDB), TETRA, FM subcarrier, 'Mobile Broadband Systems' (MBS, W-ATM), internet protocols, and of course, DSRC. Specifically, for this standard, by adoption of 2nd Generation cellular protocols and standards Application specific upper layers will not be included in this standard, but will be driven by application standards (which may not be technology specific).

Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		X
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no: 2, 6, 10)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		X

WG /Organization	**ISO/TC 204 WG 16 Wide Area Communications**		
Number	**ISO 21213**		
Status	**Approved CD.**		
Title	**Intelligent transport systems — Communications, air-interface, long and medium range (CALM) — 3G Cellular systems**		
Scope	This standard determines the air interface options applicable to CALM using 3rd Generation cellular networks. The standard provides protocols and parameters for long range, medium speed wireless communications in the ITS sector using 3rd generation cellular communications technology. Such links are required for quasi-continuous, prolonged or short communications between vehicles and the roadside, between vehicles, and between mobile equipment and fixed infrastructure points, over medium and long ranges. Wherever practicable, this standard has been developed by reference to suitable extant standards, adopted by selection. Required regional variations are provided. Due account is given to, and use made of, any relevant parts of appropriate communications systems, such as 'Global Positioning Systems' (GPS), 'Digital Audio Broadcasting' (DAB), 'Digital Video Broadcasting' (DVB), radio LANs, 'Digital Data Broadcasting' (DDB), TETRA, FM subcarrier, 'Mobile Broadband Systems' (MBS, W-ATM), internet protocols, and of course, DSRC. Specifically, for this standard, by adoption of '3rd Generation' (3G), as defined by 3GPP and 3GPP2 and including IMT-2000, cellular protocols and standards Application specific upper layers will not be included in this standard, but will be driven by application standards (which may not be technology specific).		
Relevance of conformance requirements	Category	Yes	No
	(a) Objective of this standard is to define conformance requirements		
	(b)(If no in question (a)) This standard includes some clauses on conformance requirements	(clause no: 2, 6, 10)	
	(c) (If no, in question (a) and (b)) This standard is recommended to develop its conformance requirements in the future		

WG /Organization	ISO/TC 204 WG 16 Wide Area Communications
Number	ISO 21214
Status	Approved International Standard
Title	Intelligent transport systems — Communications, air interface, long and medium range (CALM) — Infra-red systems
Scope	This International Standard determines the air interface using Infra-red systems at 820 to 1010 nm. The International Standard provides protocols and parameters for medium range, medium to high speed wireless communications in the ITS sector using infra-red systems. Such links are required for quasi-continuous, prolonged or short communications between - vehicles and the roadside, - between vehicles, and - between mobile equipment and fixed infrastructure points, over medium and long ranges. Vehicles may be moving or stationary. Wherever practicable, this International Standard has been developed by reference to suitable extant International Standards, adopted by selection. Required regional variations are provided. Due account is given to, and use made of, any relevant parts of appropriate communications systems, such as 'Global Positioning Systems' (GPS), 'Digital Audio Broadcasting' (DAB), 'Digital Video Broadcasting' (DVB), 'Radio Local Area Networks' RLANs, 'Digital Data Broadcasting' (DDB), TETRA, FM subcarrier, 'Mobile Broadband Systems' (MBS, W-ATM), 'Internet Protocols', and DSRC. The International Standard: · supports data rates of 1Mbit/s up to 128Mbit/s. It may support higher data rates; · supports vehicle speeds to a minimum of 200km/h (closing speeds could be double this value); · defines or reference environmental parameters relevant to link operation; · supports communication distances to 100 meters. It may support longer communication distances of 300 to 1000 meters; · supports latencies and communication delays in the order of milliseconds; · is compliant to regional/national regulatory parameters; · may support other regional/national parameters as applicable. Application specific requirements are outside the scope of this International Standard. These requirements will be defined in the CALM management and upper layer standards and in application standards. Application specific upper layers are not included in this International Standard, but will be driven by application standards (which may not be technology specific).