CEN/TC 278
PROJECT TEAM 12
« M 270 Phase 1 »

STANDARDS FOR ROAD TRANSPORT AND TRAFFIC TELEMATICS

ANNEXES

MAY 1999

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ANNEX 3.1.1

History and background of CEN TC 278

September 1990 : Workshop organised by CEN on standardisation in automatic identification of containers and vehicles. Recommendations were made for European standardisation in many areas of RTTT. Priority was accorded to toll collection for motorways and parking. Recommendation for a new CEN TC be established for the field of « road to vehicle communications »

January 1991 : Resolution agreed by the CEN Programming Committee 5 Transport requesting the CEN Technical Board to create a CEN TC on Road Transport Informatics. The resolution was endorsed by the CEN BT on 20-23 Marsh 1991, the Secretariat being allocated to the Netherlands.

July 1991 : CEN/TC 278, RTTT held its first meeting and defined its standardisation strategy

- Promote standardisation to create pan-European interoperability and compatibility of vehicle and infrastructure functions
- Concentrate standardisation on items necessary for compatibility, interoperability and common understanding
- Define interfaces to support a multi-vendor situation
- Base priorities in standardisation on the urgency of the need of the standard or on the difficulty of the standardisation task
- Support standardisation with the aim to facilitate legislation and regulation.

September 1991 : CENELEC prepared to start the work of its TC 114, Surface Transport Electrotechnical Systems Equipment, with a tentative scope clearly overlapping that of CEN/TC 278. In ETSI, no new activity, but several work items of great potential interest in the field of RTTT were well in the process of standardisation or even completed

January 1992 : At the initiative of the Joint Presidents' Group of CEN/CENELEC/ETSI, creation of the TET (Transport Expert Team), formed by nine experts (3 from the automotive industry, 5 from the electronic and systems industry, 1 from the infrastructure), to propose an overall work programme in the field of RTTT standardisation and to avoid the potential problem of conflict of interest between the three standardisation bodies.

1st quarter 1992 :TET inventoried the field of RTTT standardisation in RTTT and elaborated a workplan with a scheme of WG, WI, priorities from which derived the first version of TC 278 workplan and future action.

The TET deliberately adopted a **bottom-up approach**. The main goal of the expert team was to produce an **action plan** for the field of standardisation in RTTT. The team based their judgement in defining their scheme on **existing problems** and on **real user needs**. The team had the clear feeling that the list of items did not cover all aspects of RTTT standardisation and preferred to put emphasis on small WI for the sake of short term results and to leave all freedom to future project teams to adopt any orientation according the needs. The main criteria for assigning priorities and action types to WI were feasibility, user needs and economical impact.

In 1993, in order to accelerate harmonisation, the European Commission forwarded to the European Standardisation bodies the mandate M/018 to produce European standards in order to ensure pan-European interoperability of RTTT and assigned three areas as highest priorities : electronic fee collection, dedicated short-range communication, automatic identification of vehicles and equipment.

In 1995, the mandate M/210 followed, which referred specifically to the preparation of a work programme for the development of voluntary European harmonised standards for automatic toll collection systems. Later this year, a third mandate (M/211) addressed the elements involved in the use of IC cards in automatic road toll collection systems in Europe.

Finally, based on the fact that, since the TET report and the setting up of the CEN/TC 278 programme of work, the markets and technology involved had undergone a rapid evolution, mandate M/270 was issued in 1998 with the general aim of reviewing the RTTT standardisation programme, with the definition of three phases for the completion of this mandate :

- phase 1 : evaluation of the global situation on RTTT standardisation
- phase 2 : drafting of a programme of work
- phase 3 : elaboration and adoption of European standards.

The previous list of priority areas are of the most concern to DG XIII is enlarged to eight items, namely :

- System Architecture
- Data exchange
- Radio Data System- Traffic Message Channel (RDS-TMC)
- Electronic fee Collection (EFC)
- Human Machine Interface (HMI)
- Smart cards
- Dedicated Short Range Communication (DSRC)
- Multimodal freight

ANNEX 3.1.2

Some particular characteristics of European standards

EN (European Standard)
Principal deliverable of CEN, a European Standard is a set of prescriptions drawn in collaboration and with the approval of concerned parties in different countries participating to CEN. Elaborated according the consensus principle, it is voted at the weighted majority. In case of adoption, it is integrally inserted in national standards collection by respective NSBs and all national contradictory standards must be withdrawn.

ENV (European Pre-standard)
A European Pre-standard can be set up as a prospective standard for a temporary application in technological fields where the innovation level is high or when an urgent need of orientation is felt. Very quickly set up, the ENV is subject to an experimentation on a maximum period of three years, in general. If national standards exist that conflict with a pre-standard, it is not obligatory to withdraw them.

CEN standstill
An agreement among the CEN members not to take any action, either during the preparation of an EN or HD, or after its approval, which could prejudice the harmonisation intended and in particular, not to publish a new or revised national standard which is not completely in line with an existing EN.

Essential requirements
Requirements that represent the core of Union law around which an effective policy has been developed in matters of safety, health and other measures for those areas covered by the New Approach Directives

News Approach Directives
They are directives, put in force since a resolution dated 7 May 1985, which define that « legislative harmonisation in those sectors where barriers to trade are created by justified divergent national regulations concerning the health and safety of citizens and consumers and environmental protection, will be confined to laying down the « essential requirements » conformity with which will entitle a product to free movement within the Community ». The new approach is still a uniquely European example of co-operation between legislators and standardisers.

Harmonised standard
In the New Approach Directives, only essential requirements are mandatory. However, in order to allow industrial actors to use technical specifications both detailed and accepted for the conception and the manufacturing of their products, these directives foresee the optional use of European standards called « harmonised standards ». Such a standard is developed under a mandate from the EC and/or EFTA (European Free Trade Association). If, in addition, its reference is published in the OJEC (Official Journal of the European Community) , it gives presumption of conformity to the « essential requirements » of the related Directive.

CEN Workshop Agreement (CWA)
CEN has created the CWA as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardisation represented by CEN and its national members . An important distinction is that the CWA is developed by CEN Workshops comprising only participants with direct interest and so it is not granted the status of a European standard.

European Mark (Keymark)
Recognising the importance of market certainty in the use of European standards, CEN and CENELEC jointly offer a European Mark (the Keymark) which is a third party certification mark through which compliance with European standards can be demonstrated. Proposals for European Mark Schemes may be proposed by the CEN national members, the CEN Technical Committees or any European organisation.

ANNEX 3.2

Organisation of CEN TC 278

http://www.nni.nl/cen278/organisation.html

ANNEX 3.3

Organisation of ISO TC 204

http://www.sae.org/TECHMCMTE/204org.htm

ANNEX 3.4

CEN/TC 278 work programme

Remark : In the following list, the work programme of each WG is listed, except for the WG5, WG6 and WG11 which are currently dormant/inactive

Annexe 3.5

ISO/TC 204 status report

(as at 1 January 1999)

		WG	Work Item Title	Reg.	Original Target	New Target
NP	14812	1	Glossary of standard terminologies for the transport information and control sector	94/12	96/06	98/10
CD	14813-1	1	Reference model architecture for the TICS sector - TICS fundamental services	97/08	99/02	98/06
NP	14813-2	1	Reference model architecture for the TICS sector - Core reference model	94/12	96/06	98/06
NP	14813-3	1	Reference model architecture for the TICS sector - Example elaboration	97/08	99/02	98/06
NP	14813-4	1	Reference model architecture for the TICS sector - Reference model tutorial			98/06
CD	14813-5	1	Reference model architecture for the TICS sector - Description of architecture in TICS standards	97/08	99/02	98/06
NP	14813-6	1	Reference model architecture for the TICS sector - Data presentation in ASN.1			98/06
NP	14813-7	1	Reference model architecture for the TICS sector - TICS Data Profiles			99/06
CD	14814	1	Reference model architecture for generic AVI/AEI	94/12	96/06	98/06
CD	14815	1	Standard AVI/AEI generic system specifications	94/12	96/06	98/06
CD	14816	1	Numbering schemes for generic AVI/AEI	94/12	96/06	98/06
NP	14817	1	Data modelling for transport information and control systems (TICS) sector data dictionary	94/12	96/06	99/06
NP	14818	10	TTI conceptual model architecture and terminology	94/12	96/06	
CD	14819-1	10	TTI messages via traffic message channel, coding protocol for radio data system TMC	94/12	96/06	
CD	14819-2	10	TTI messages via traffic message channel, event & information codes for radio data system TMC	97/08	99/02	
CD	14820-1	10	TTI messages via dedicated short range communication, data specification downlink	94/12	96/06	
CD	14820-2	10	TTI messages via dedicated short range communication, data specification uplink	97/08	99/02	
CD	14821	10	TTI messages via cellular networks	94/12	96/06	99/06
CD	14822	10	Medium range pre-information	94/12	96/06	
CD	14823	10	Stationary dissemination systems for traffic and traveller information	94/12	96/06	
TR	14825	3	Geographic Data File	94/12	96/06	99/02
NP	14826	3	Physical storage for TICS database technology	94/12	96/06	99/09
CD	14827-1	9	Data interfaces between centres for transport and information control systems (TICS)	94/10	96/04	98/10
CD	14827-2	9	Data interfaces between centres for transport and information control systems (TICS) - Data dictionary	94/10	96/04	98/10
						New Target
CD	14906	5	Electronic fee collection application interface definition for dedicated short range vehicle-beacon communication	95/04	97/10	98/07
CD	14907	5	Test procedures for electronic fee collection user equipment and electronic fee collection fixed equipment	95/04	97/10	
NP	15074	10	User services integration for traffic and traveller message lists	95/07	98/01	

NP	15075	11	In-Vehicle Navigation Systems - Communications message set requirements	95/07	98/01	98/01
NP	15622	14	Adaptive cruise control	96/11	98/05	98/12
NP	15623	14	Forward vehicle collision warning system	96/11	98/05	98/12
NP	15624	14	Roadside traffic impediment warning systems	96/11	98/05	98/12
NP	15627	15	Data link layer for dedicated short range communication - DSRC layer 2	96/11	98/05	99/04
NP	15628	15	Application layer for dedicated short range communication - DSRC layer 7	96/11	98/05	98/12
NP	15662	16	TICS wide area communication message protocol structure	96/12	98/06	
NP	15784-1	9	Data exchange involving roadside modules in Transport Information & Control Systems - Overview	97/03	98/09	99/03
NP	15784-2	9	Data exchange involving roadside modules in Transport Information & Control Systems - Profiles	97/03	98/09	99/10
NP	15784-3	9	Data exchange involving roadside modules in Transport Information & Control Systems - Management Standards	97/03	98/09	99/03
NP	17261	1	AVI/AEI Intermodal Goods Transport - Architecture and Terminology	98/05	99/11	
NP	17262	1	AVI/AEI Intermodal Goods Transport - Numbering and Data Structures	98/05	99/11	
NP	17263	1	AVI/AEI Intermodal Goods Transport - System Parameters	98/05	99/11	
NP	17264	1	AVI/AEI Intermodal Goods Transport - Interfaces	98/05	99/11	
NP	17265	8	Transit Vehicle Local Area Network	98/05	99/11	
NP	17267	3	Navigation system application program interface	98/05	99/11	
PWI	pwi 3.1	3	Publishing update for geographic databases	95/11	97/05	98/08
PWI	pwi 3.2	3	Location referencing	95/11	97/05	99/03
PWI	pwi 5.1	5	Electronic Fee Collection Architecture	97/10	99/04	
PWI	pwi 5.2	5	Security Services Framework for EFC	97/10	99/04	
PWI	pwi 5.3	5	EFC Applications Interface Definition for CN/GNSS based EFC	97/10	99/04	
PWI	pwi8.2	8	Transit Communications Interface Protocol	97/03	98/09	
						New Target
PWI	pwi 9.1	9	Data dictionary for transport management, information, and control	98/05	99/11	
PWI	pwi 11.2	11	Centrally Determined Route Guidance	97/10	99/04	99/04
PWI	pwi 11.3	11	Message set description language	98/05	99/11	
PWI	pwi 14.4	14	Manoeuvring Aid for Low Speed Operation	94/12	96/06	98/10
PWI	pwi 14.5	14	Side Obstacle Warning Systems	94/12	96/06	98/09
PWI	pwi 14.8	14	Lane Departure Warning Systems	96/05	97/11	98/10
PWI	pwi 17.1		Theft prevention for parking access	98/05	99/11	
PWI	pwi 17.2		Sequential video for red light violations	98/05	99/11	
PWI	pwi 17.3		OCR type approval procedures	98/05	99/11	
PWI	pwi 17.4		Support for storing and retrieving video images	98/05	99/11	
PWI	pwi 17.5		Crypto signature to be embedded in video images	98/05	99/11	
PWI	pwi 17.6		OCR contained in video images	98/05	99/11	

PWI	pwi 17.7		Crypto transmission of compressed images point to point via different media	98/05	99/11	
PWI	pwi 17.8		Capturing and handling of video images	98/05	99/11	

Annex 3.6

Report ot the 16th CEN/TC 278 convenors meeting, Prague, 24 March 1999

see document CEN/TC278/N962

Annex 3.7

Draft Minutes of 21st CEN/TC 278 Plenary meeting

See document CEN/TC278/N964

Annex 3.8

Global situation and perspectives in the field of DSRC and EFC standardisation

CEN/TC278 - Mandate 270 - Phase 1

GLOBAL SITUATION AND PERSPECTIVES IN THE FIELD OF DSRC AND EFC STANDARDISATION

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Summary:

In the framework of the CEN/TC 278 Mandate 270, phase 1, this report is contributing to the evaluation of the global situation on DSRC and EFC standardisation. It provides a snapshot of international/European/national standards. The paper concludes with suggesting areas in which further work is needed in order to achieve interoperability and to avoid non-compatible in-vehicle units, based on relevant EFC standards.

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1. INTRODUCTION AND BACKGROUND

The main justification for standardisation was to enable pan-European interoperability of systems and to create a single European market for related equipment. Interoperability is still considered a key factor in achieving, through market acceptance, better safety and efficiency and a deduction of the environmental consequences of transport and traffic.

Since 1992, starting year of CEN/TC278, obviously the markets and technology have undergone a rapid evolution, although perhaps not quite as rapid as might have been expected in certain fields. Therefore, it seems appropriate, after half a decade, to examine if the programme of work is still in line with market requirements.

The European Commission has formulated, as Phase1 of Mandate M270 forwarded to the European standardisation bodies, a request for the evaluation of the global situation on RTTT standardisation.

The evaluation study identifies:

- the current typical European dimension in terms of technology and its deployment in the area of RTTT ;
- the implications of RTTT standardisation for European industry, including its prospects in non-European markets ;
- the European and world-wide situation with regards to (de jure and de facto) standards, publicly available specifications, etc... which are currently available or in the drafting process ;
- the present level of participation of European manufacturing and service industries and users in standardisation activities ;
- actions that need to be taken by the different actors involved in European standardisation in terms of new or modified standardisation requirements ;
- missing links with ongoing RTD programmes, and actions needed to improve the co-operation between RTTT standardisation and RTD projects.

The present report will be used as input into Phase 2 of Mandate M270 (elaboration of a revised common work programme).

2. ELECTRONIC FEE COLLECTION (EFC)

2.1 INTRODUCTION

This section is related to European and world-wide, standardisation situation in the field of electronic fee collection (EFC) based on dedicated short-range communication (DSRC). It also provides a snap-shot of the current EFC standardisation programme and recent progress made in this field.

In the field of EFC, standardisation is required to stimulate an open market, faster technical developments and agreements on operational issues, and to enlarge the economical scale envisaged for EFC products and systems. Interoperability is an important issue for systems to be implemented on European motorways or urban areas.

The standardisation in the field of EFC started 1992 within CEN in Technical Committee 278 (TC278), which was later 1994 followed by the initiative for standardisation on a world-wide level within ISO/TC204. These two TCs co-operate and jointly develop standards in the field of road transport and traffic telematics (RTTT).

The European Committee for Standardisation (CEN/TC278/WG1) and International Standardisation Organisation (ISO/TC204/WG15) are tasked to develop standards within the field of EFC.

2.2 STRUCTURE OF WG1, SUB-GROUPS, AND CONVENORSHIP

The scope of CEN/TC278/WG1 is standardisation of information, communication and control systems in the field of fee and toll collection systems for urban and interurban surface transportation including intermodal and multi-modal aspects. This area also include development of conformance test procedures for the DSRC family of standards, and OBU-ICC standards.

The working-group WG1 has retained the following key principles:
- Enabling vs. Prescribing
- Interfaces vs. Equipment
- Application vs. Technology
- Fee Collection vs. Toll Collection
- IC cards vs. Magnetic stripe cards, barcodes and coin machines

The WG1 is holding meetings every 3 months. The first meeting was held in 1992, since then 31 meetings held.

Subgroups operational:
- SG1 (T. Foss – Norway): Integrated Payment
- SG2 (Ph. Thoreau – France): EFC Requirements for DSRC
- SG3 (J. Engdhal – the Netherlands): EFC Requirements for IC cards (smart-cards)
- SG4 (L. Halsen – Norway): Security
- SG5 (I. Catling – UK): EFC using GNSS/CN

2.3 EXPECTED BENEFITS FOR EQUIPMENT SUPPLIERS AND OPERATORS

The fundamental interests of the EFC equipment suppliers in standardisation are:
- to reduce costs by cutting development cycles and by large scale production,
- to address both active and homogenous markets,
- to design basic and application oriented products according to a set of well-established and consistent technical specifications, subject to formal procedures for adoption/evolution,
- to reduce obsolescence risk, and to share part of R&D investments with 2nd level suppliers.

The EFC operators, typically, wish equipment/system interoperability and exchange-ability in order :

(1) to reduce technology investment risk and to enjoy the price effects of large scale production and multiple sources of equipment,
(2) secondary interests often include means to effectively deal with the (future) cross-border traffic, i.e. the handling of OBUs acquired for usage in an adjacent EFC system and possibly (but not necessary) the handling of associated contractually related issues.

The End Users' benefits include choice of makes, different product designs with different man-machine interface capabilities, from basic to more sophisticated on-board equipment. The End User often also indirectly benefits from an harmonised market, which allows for large scale productions and alternative compatible products, in terms of lower prices.

2.4 EFC AND DSRC STANDARDISATION PROCESS

The methodology chosen for the development of the application standards, both within CEN and ISO, can be described as a three steps approach as illustrated in Figure 1.

Box 1

Work methodology for EFC/DSRC standardisation

Application requirements (ITRs) - CEN/TC278/WG1(1994-95)
· EFC requirements for DSRC
· EFC requirements for ICC
⇓
Technology pre-standards (ENVs) - CEN/TC278/WG9 (1995-97)
· DSRC family of standards
⇓
Application pre-standards (ENV) - CEN/TC278/WG1 (1996-1999)
· EFC application interface definition for DSRC

This approach relies on a co-operation between the application and the technology oriented working groups (WGs). The application WG develops Application Requirements, in form of internal technical reports (ITR), serving as input to the technical WG. The technology standards are subsequently developed using these inputs. The third step consists in developing application standards based on the foundation provided by the technology standards.

Box 2

Recently completed : prENV ISO 14906 - EFC Application Interface Definition for DSRC

ISO voting results:
Affirmative (9) : Australia, Czech Republic, France, Japan, Korea, Netherlands, Norway, United Kingdom, USA
Abstaining (1) : Italy

CEN voting results:
Affirmative (16),
Abstaining (2, Portugal and Spain),
Rejecting (1, Italy)

Conclusion: ENV ISO 14906 has been approved in ISO and CEN and is ready for publication (some editorial changes are still needed)

2.5 OVERVIEW OF EFC APPLICATION PRE-STANDARDS

The EFC application pre-standards, based on the usage of DSRC, consist of currently of fours (draft) pre-standards. These four are EFC application interface definition for DSRC (prENV ISO 14906), General data (ENV 1545-1) and Transport payment related data elements (ENV 1545-2) and Test procedures for EFC fixed and user equipment (prENV ISO 14907-1).

REFERENCE AND ABBREVIATED TITLE	STATUS	SCOPE
ENV ISO 14906 "*EFC Application Interface Definition for DSRC*"	**Approved** as ENV by CEN. **Approved** as ENV by ISO	This standard specifies the (application layer) communication medium and includes definition of EFC application information, data addressing procedures and (hardware) components (e.g. ICC and MMI), EFC application functions which are further qualification of DSRC-Application Layer's generic (Action) services. It also specifies an EFC transaction model providing a mechanism that allows handling of different versions of EFC transactions and associated contracts, which is a key functionality for graceful evolution and effective version handling. Further, it provides security-specific functionality as place holders (data and functions) to enable the implementation of secure EFC transactions. Yet the specification of the security policy (including specific security algorithms and key management) remains at the discretion and under the control of the EFC (payment system) operator, and hence is outside the scope of this pre-Standard.
prENV ISO 14907-1 "*EFC Test procedures for user and fixed equipment – Part 1: Description of test procedures*"	Under review after inquiry	prENV ISO 14907-1 provides definition of the test procedures of RSE and OBE with regard to the conformance to EFC related standards. It relates solely to OBE (comprising an OBU and sometimes also and ICC) and RSE. It lists tests which are required to measure the performance of EFC equipment, and the components involved. The list of test includes : Environment EMC DSRC, Pre-tests of EFC equipment, Quality, communication AFC-Application, traffic & environmental Influenences, functionality, test results report.

The interface between an OBU and an integrated circuit card (ICC) is also to be deemed as open interface, given the rapid increase in usage of ICC also in EFC. ENV 1545-1/2 has been developed in CEN/TC224/WG11 (Machine readable cards, related devices and operations - Transport Applications) and specifies general and

transport payment related data elements, respectively. These standards defines data elements that may be exchanged between and ICC and a card accepting device (such as an OBU) in a transport application (e.g. EFC). This standard compliments the specified data elements in ENV ISO 14906.

2.6 STATUS OF EXISTING WORK ITEMS

Delivery to date:

- 1 ENV ISO 14904 publication – title : Interface specification for clearing between operators
- 1.ENV ISO 14904 5 internal technical reports :

1.1.1	ITR N278	Requirements for integrated payment
1.2.1	ITR N318	EFC requirements for DSRC
1.2.2	ITR N779	EFC requirements for Integrated Circuit Cards
1.4.1	ITR N780	Definition of threats and security control for EFC
1.5.1	ITR N789	Application Requirements for GNSS/CN based EFC

- 1 ENV ISO 14906 ready for publication
- 1 ENV ISO 14907 under review after inquiry

3. DEDICATED SHORT RANGE COMMUNICATIONS (DSRC)

3.1 INTRODUCTION

The key areas of WG9 standardisation, given the common incentives of the equipment suppliers and EFC operators, are to define the open interfaces, i.e. interfaces where equipment exchangeability are desired. The dedicated short-range communication (DSRC), i.e. the link between the roadside equipment and the on-board unit in the vehicle, is an obvious such interface.

3.2 STRUCTURE OF WG9, SUB-GROUPS, AND CONVENORSHIP

The scope of WG9 is standardisation of major technical items related to the DSRC road/vehicle link, essentially:

- layer 1 : physical interface
- layer 2 : communication protocols
- layer 7 : application interface
- communication profiles

WG9 is now structured as follows:

- SG.L1 (D. Gunton – UK) : Physical layer
- SG.L2 (C.-H. Rokitansky - G) : Data Link Layer
- SG.L7 (S. Bueno - F) : Application Layer
- SG1 Initial Report – closed
- SG 2 DSRC Architecture (A. Heljmare – SE) - closed
- SG 3 RTI Requirements – closed
- SG 4 DSRC Profiles – closed, work continued in SG2
- SG 5 (O. Clair – F) : Physical integration

SG5, chaired by Olivier Clair, was recently created at the last WG9 plenary meeting, held in Nice on the 17th of March 1999.

3.3 OVERVIEW OF DSRC PRE-STANDARDS

The dedicated short-range communication (DSRC) family of standards, highlighted in table below, defines the communication protocol between the roadside equipment (RSE) and the on-board unit (OBU). This table provides an overview of the pre-standards that have been developed and approved up till now in the field of DSRC. The scope of the each pre-standard is briefly described and how they relate to the OSI reference architecture.

REFERENCE AND ABBREVIATED TITLE	STATUS	SCOPE
ENV 12253 "*DSRC Physical layer at 5.8 GHz"*	**Approved** as ENV on August 3rd 1997, with 77%	DSRC-Physical layer at 5.8 GHz (L1) defines important transmission parameters such as polarisation, spectrum mask, power levels, bit rates and modulation, coding schemes and associated values.
ENV 12795 "*DSRC Data link layer*"	**Approved** as ENV on June 13th 1997, with 85%	DSRC-Layer 2 specifies medium access and logical link controls behaviour, defining procedures for accessing the shared physical medium, addressing and error control. The frame structure conforms to the high-level data link control standard (HDLC, IS 3309), and the unacknowledged and acknowledged services are based on a subset of the local area network (LAN, IS 8802-2) standard.
ENV 12834 "*DSRC Application layer*"	**Approved** as ENV on September 1st 1997, with 84%	DSRC-Application layer (L7) provides communication tools for DSRC based applications. These tools consist of elements which can be used by application processes, for communication initialisation, data transfer and remote operations. It also provides simultaneous multi-application support, by means of application multiplexing.
CEN ENV 13372 "*DSRC Profiles for RTTT Applications"*	**Approved** as ENV in December 1998 with 89%	DSRC-Communication Profiles is a complement to the related standards for the DSRC-layers 1, 2 and 7, as it defines a number of sets of parameter values to be used in communication between RSE and OBU and assigns a unique identifier to each set. This identifier is to be used in the negotiation and initialization procedures taking place between fixed and mobile equipment.
ETSI EN 300 674 "*ERM & Test methods for DSRC*"	**Approved** as EN by ETSI in January 1999 with 100%	This EN standard was produced by ETSI/RP8. It includes test procedures, measurement methods, electromagnetic conformance tests, for transmission equipment (500 Kbit/s / 250 Kbit/s) operating in the 5.8 GHz ISM band.

Infrared technology

The document “DSRC Physical Layer using Infrared at 850 nm” after editorially being revised by EFKON (Austria), has been agreed to be forwarded to CEN/TC278 Secretariat to be published as an Internal Technical Report of CEN/TC278.

4. GENERAL PERSPECTIVE AND MARKET SITUATION

There is a growing interest in communication equipment and systems based on DSRC communications for a variety of applications. The main interest is Electronic Fee Collection. However, there is also interest for emerging applications like TTI (Traffic and Travel Information), and others. The driving application is certainly EFC.

EU's projects has proven that the DSRC standard content in various ENV is able to satisfy the user's and system requirements, with regards to EFC and other (Dynamic Route Guidance, TTI) applications.

In some EU countries (e.g. Portugal, Italy) they are a number of existing large systems. Due to the fact that is was not possible from technical point of view to take into account the future user's requirements: multiple applications, multilane, it was not possible to harmonise with existing systems. In some countries like France, despite the existence of first generation systems, there was decision to go towards these new specifications.

The current status is to investigate the coexistence of existing systems with ENV. This has been carried out in VASCO with regard to the low datarate. It might be reasonable to investigate it as well in Italy. It should be noted that the so-called "high-datarate" has a low uplink datarate of only 144 Kbit/s

Considering the user's wishes and acceptance with regards to EFC, two complete different opinions can be found, across the different EU's countries:

- countries with manual systems and conventional fee collection: user's acceptance is quite high because of demonstrated advantages,
- in countries where EFC is supposed to finance the use of the roads, there are some kind of resistance from the public, particularly where EFC is introduced in the framework of road-pricing.

In the future, the traveller information could also benefits from the charging methods developed for EFC: the driver information might be provided as a neutral or advertising base.

The development of DSRC ENV based systems is not only going on in CEN member states, but also outside EU across several major projects listed below:

- Austria: has introduced recently the Okopunkte-System (ECO-point system), a nation wide access control system for Alpine transit traffic of heavy vehicles, and is planning for a nation-wide highway toll for heavy trucks.

- France: TIS, Télépéage Inter-Sociétés. The French motorway operators, members of ASFA, have decided to deploy a nation-wide and interoperable system. Prior to equipment deployment over the motorway network, the project is now aiming to establish full interoperability between two EU's manufacturers of DSRC-beacons, and one supplier of OBU. This system will be fully compliant with the DSRC and EFC standards (layer 1,2,7 and application interface definition) and will be put in operation on July, 1st of the year 2000.

- the Netherlands: EFC is evaluated under the Rekeningrijden (road-pricing) project, undertaken by the Dutch Ministry of Transport. Rekeningrijden is one of the combination of activities aimed at reducing traffic congestion during rush hours on working days in the Netherlands, in particular in the major urban areas to the west of the country. Prototypes of OBU and complete road-side equipment designed for full multilane operation were recently field tested in Utrecht, under real traffic conditions, in order to evaluate performances and select the final supplier(s) among the four contracted manufacturers. It was decided to use electronic purses in the next phase of the project.

- Scandinavia: the Nordic countries (Norway, Finland, Sweden Denmark) are working on interoperable EFC systems in the MXNS initiative.

- UK: The DETR has recently issued an invitation to tender for the provision, operation and support of two sites of an end-to-end interoperable EFC system demonstrator based on CEN/TC278 standards for DSRC. The envisaged application is congestion pricing in urban areas.

- Switzerland is planning to introduce a distance-related Heavy Vehicles Fee (HVF) by the 1st of January 2001. Heavy vehicles and trailers with a maximum laden weight in excess of 3.5t will be subject to the fee. A DSRC link will be used to identify passage across the national borders. The system will be operated by the Swiss Customs Authority.

- Norway: a new EFC system will be installed, and is now is the process of procurement, under the autoPASS project, managed by the Norwegian Operator Association. The first systems, based upon DSRC ENV, will be installed in Trondheim in 2001 and other sites will follow.

- Denmark : the toll collection on the Great Belt Bridge has been recently put into operation (on the14th of June 1998), and adopted 5.8 GHz DSRC based systems.

- Germany: EFC will be considered for heavy trucks in Germany,

- Slovenia: The EFC systems currently works in the 2.45 GHz band, and is intended to upgrade it towards a new EFC system, following a six month trial period to demonstrate feasability and public acceptance. The new 5.8 GHz system will be compliant to European DSRC standards.

- Greece: the first commercial EFC system, based upon DSRC standards, is now in the process of procurement, in the framework of the Athens Peripheral Motorway project.

- Australia: EU's companies were selected for Melbourne City Link and Sydney Harbour Bridge. Moreover, CEN/ENV standards have been adopted as national Australia standards in April 1998.

- US situation: there are currently a large number of different systems operating in the 902 to 928 MHz frequency band. A migration toward the 5,9 GHz frequency band is envisaged for mid-term, and now investigated by FCC authorities. Some efforts have been made to converge to a common standard related to physical layer (ASTM V6 & V7), and to datalink layer.

- South America: European vendors are in competition with American vendors. A major motorway construction programme is carried-out in Brazil. Such programme may require (at mid-term) high volumes of EFC equipment.

Only two counties in Europe appear to be interested in the GSM/GPS type of technology for tolling purpose: Switzerland is deploying a system using GSM and distance measurement by tachograph, and Germany is known to be interested in possibility of such systems. The EU's project INITIATIVE will develop and test prototype of hybrid equipment supporting both DSRC and GSM/GPS technologies.

It should be mentioned that both in TIS and in the Swiss HVF projects, the call for tender for the road-side beacons is made independently from the OBU development and procurement. This is possible thanks to DSRC and EFC standardisation, that now allows operators to select independently the optimum supplier for on-board and road-side equipment.

The effective "multisourcing" can be considered as major output of the standardisation process, ability should be encouraged for new projects,

In the framework of the STAR project, supported by DGIII, six European manufacturers are working to finalize the requirements for interoperability of the DSRC link. They will propose a refinement of the existing CEN standards (layer 1, 2 and 7), in which a number of options will be removed.

At the technical level, VASCO and STAR will recommend simplification of the present DSRC stack, and provide to relevant WG technical inputs for migration from ENV to EN. The CESARE project is investigating the possibility of having Telepass and CEN beacons at the same toll plazas.

At the procedural level, CARDME will define a common payment service which will extend the scope of existing system. CESARE and MOVE-it will develop an MoU concept..

Physical integration of OBU, and metallised windscreens

An Ertico task force[1] was created in 1998, in order to address technical issues related to physical integration of OBU for EFC, and particularly the problem endued by metallised windscreens. The task force follows a two-phase approach. Phase 1 has been concerned with the provision of a non-metallised window and has resulted in agreement by the manufacturers to provide a window with dimensions of 120 mm x 70 mm in car windscreen. Phase 2 involves longer-term possibilities, and is concerned with requirements for further physical integration, and the use of external antennas.

The current solution for mounting the OBU is to use a window, free of metal, located at central position in the windshield nearby the rear-mirror. At this position, only EFC can be supported because the OBU is removable, standalone and not connected to other vehicular systems. If the OBU is supposed to be connected to the in-car system, this position is not ideal. Therefore, with regard to the problem, it is extremely important that the equipment suppliers, together with automotive industry, and especially the glass industry, are going in the direction to develop integrated DSRC based systems.

[1] Chaired by O. Clair, secretary : P. van der Perre

5. STATUS OF INTERNATIONAL STANDARDISATION IN THE FIELD OF DSRC/EFC

5.1.1 ISO Layer 7 and Communication Architecture

At ISO/TC204/WG15[2] level, the on-going works are now concentred on the application layer, for which the working group WG15 is now very close to reach a final agreement. The first draft specifications of layer 7 will be approved before June 1999 by WG15. The ISO application layer is developed in closed co-operation with national groups from Europe, Japan, Canada, Korea, and the US. There will be an ISO Layer 7 consistent with the existing prENV and forthcoming EN. It will allow to develop and to combine applications on-top of the existing layer 7, as illustrated by the table below.

REGION	**Europe**	**North America**	**Japan**
APPLICATION LAYER	**ISO DSRC "Application Layer" currently being harmonised**		
DATA LINK LAYER (LLC[3])	**ISO DSRC "Data Link Layer Interface" (including Layer 7)**		
DATA LINK LAYER (MAC[4])	Expected to be in accordance with the corresponding Physical Layer (region specific)		
PHYSICAL LAYER 5.8 GHz	CEN/ENV 12253 (5.8 GHz systems)	Currently 915 MHz	Physical Layer at 5.8 GHz

During the last ISO/TC204/WG15 meetings (Seoul, Orlando, Nice), significant progress was made with regard to an harmonised ISO DSRC Layer 7 "Application Layer", taking the requirements of Europe, North America, and Japan into account. All comments were solved except for the Link Identifier (LID) and the definition of the layer 2 interface.

[2] chaired by Dr. C.-H. Rokitansky
[3] Link Logical Control
[4] Media Access Control

5.1.2 Current status with regard to application and services, based upon DSRC

REGION	Europe	North America	Japan
MAJOR ACHIEVEMENTS FOR DSRC STANDARDISATION			
National standardisation bodies	CEN ETSI	ASTM FCC IEEE	ARIB[5]
Communication architecture	Layer 1,2, 7 Profiles	Layer 1,2, 7	Layer 1,2, 7
Standardisation of applications	Application interface definition	Draft IEEE Specification	Non Standardised at national level
SCOPE OF APPLICATIONS CONSIDERED FOR DSRC			
Electronic Fee Collection	X	X	X
Traffic and Traveller Information	X		
Notification of route information			X
Guidance to EFC dedicated lanes			X
CVO[6] Electronic Screening		X	
CVO Border Crossing		X	
Private Messaging		X	

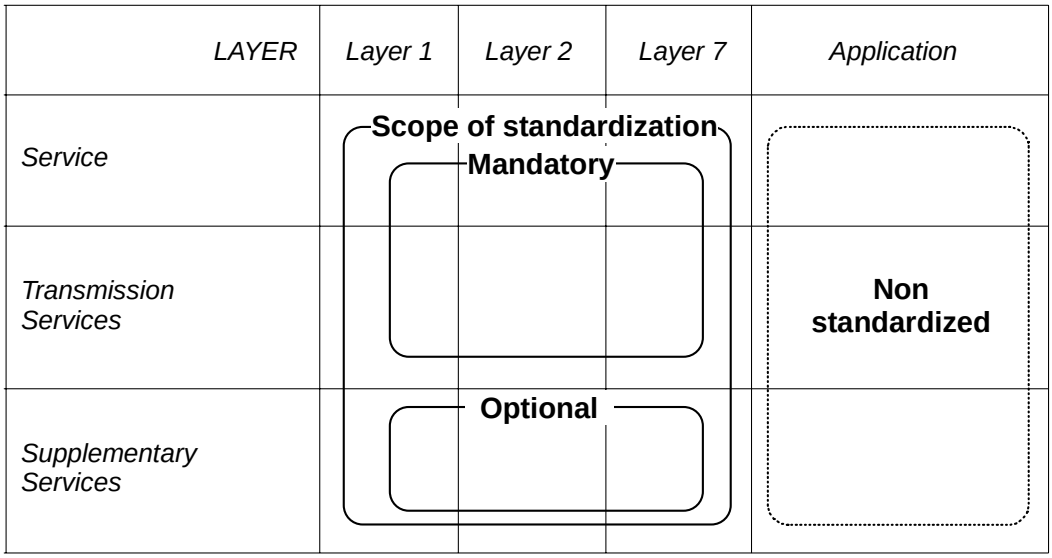
[5] Association of Radio Industries and Businesses
[6] CVO = Commercial Vehicle Operation

5.1.3 Standardisation in Japan

In Japan, the Association of Radio Industries and Businesses (ARIB) has approved on the 27th of November 1997 a standard entilted "*Dedicated Short Range Communication (DSRC) for Transport Information and Control Systems (TICS)*", published under the reference "*ARIB STD-T55 Version 1.0*", in English version in August 1998. The standard was developed based on the participation of and discussion with the various radio equipment manufacturers, operators and users. The scope of application of the standard covers the minimum requirements for communications between on-board equipment and road-side unit. The purpose is to ensure the quality and compatibility of radio facilities and equipment.

The standard adopts the 3 layer structure of the Open Systems Interconnection (OSI) basic reference model, and the standardised objects are Layer 1, Layer 2, and Layer 7.

At this stage of the standardisation process, optional standards related to the application services are put aside as future projects. The figure below outlines the relationship between standardised services and optional protocols used.



The services provided by the system have the attributes listed below :
- information transfer capability : unrestricted digital information,
- information transfer rate : 1024 Kbps
- communication configuration : point-to-point, point to multipoint

The basic services provided through the information transfer channel are :
- exchange of the information about the toll collection, and the reading/writing of the data performed through the radio facility (lane based antenna) installed at the toll gate
- transmission of the guiding information about the lanes, in order to guide the vehicles equipped with OBU to the dedicated lane and to achieve smooth operation of traffic lanes,
- notification of the route information

Supplementary services are considered as pending items for the future.

Depending on the communication range, RSU are classified as follows :
- Class 1 : radio communication range is below 10 m, transmit power below 10 mW
- Class 2 : radio communication range exceeds 10 m, but within 30m ; transmit power below 300 mW

The basic procedure for communication control is synchronous, based on adaptative slotted ALOHA, and suited to point-to-point, short time, two-way communication between OBU and RSU. It is a full-duplex communication, which uses different transmission channels (frequencies) for uplink and downlink, respectively. In the standard, a communication control type which also allows half-duplex communication is specified.

The main transmission parameters are summarised as follow:
- radio access type : TDMA-FDD
- multiplexed number of TDMA : less than 8
- frame length : 9 slots or less
- slot length : 100 bytes
- modulation method : ASK
- medium access control method : adaptative slotted ALOHA
- radio frequency band : ISM band 5.725 – 5.875 GHz
- carrier frequency difference between transmission and reception : 40 MHz
- downlink carrier central frequency : 5,795 and 5,805
- uplink carrier central frequency : 5,835 and 5,845
- carrier frequency spacing : 10 MHz
- bit error rate : 10E-5 or less

In the basic rules for protocol, the architecture is defined in conformity of well know standards of the field of local area networks (ISO 7498, ISO/IEC 8802-2). The layer 2 is divided into the logical link control sub-layer (LLC) and the medium access control sublayer (MAC).

A security algorithm, based upon polynomial calculation, is part of the standard, and provides a type of secure communication.

Typical installation heights of antennas are specified in the standards to 5 m, 6 m, 10 m respectively for lane-based antenna, navigation antenna, and approach antenna.

5.1.4 Standardisation in USA

Within the overall context of DSRC operations, the Working Group P1455, from the Institute of Electrical and Electronics Engineers (IEEE) has specified an unapproved draft standard entitled "*Message Sets for Vehicle/Roadside Communications*".

This first standard covers the communications protocols above the OSI Data Link Layer for the DSRC wireless interfaces. To ensure interoperability between DSRC equipment manufactured by different suppliers, the standard also specifies the resources that may be present on a transponder and the means by which the roadside equipment shall control those resources.

<TO BE COMPLETED>

5.1.4.1 US-FCC Petition for DSRC at 5.8 GHz

In response to a request filed by the Intelligent Transportation Society of America, the US-FCC (Federal Communication Commission) has issued a Notice of Proposed Rulemaking (NPRM), asking for comments on using the 5.850 – 5.925 GHz band for a variety of DSRC uses, such as:

- electronic fee collection
- traveller's alerts
- traffic congestion detection
- emergency dispatch services, and
- electronic inspection of moving trucks though data transmissions with roadside inspection facilities.

This petition was registered under the title "*DSRC of Intelligent Transportation Services*", released on the 11th of June 1998, and referenced "*ET Docket 98-95, FCC 98-119*"

The FCC Commission is proposing to allocate 75 Megahertz of spectrum[7] to DSRC. It is anticipated that the corresponding channelization plan could provide for a few wide-band channels for certain purposes, such as backscatter EFC, and also reserve a number of narrow-band channels for active transponders.

DSRC communications will be used for non-voice wireless transfer of data over short distances between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation services applications in a variety of public and commercial environments.

The FCC tentatively concluded that DSRC operations, Government radar operations, and satellite earth-to-space operations should be able to share the same spectrum on a co-primary basis subject to co-ordination. The FCC noted that frequency and geographical separation should enable DSRC operations to share the spectrum with secondary amateur operations. The overall objective of this action, as defined by FCC, is to provide sufficient spectrum to permit the development of DSRC technologies to improve the nation's transportation infrastructure and bolster the involvement of United States companies in this emerging industry.

[7] In Europe, CEPT allocated 10 MHz at the European level, and an additional 10 MHz band at national level, subject to national authorisation.

6. CONCLUSIONS AND RECOMMENDATIONS

The promises of the standardisation process are now being materialised in approval of the long awaited key standards, such as the DSRC family of standards and the EFC application interface definition. Products are being announced conforming to, and EFC systems are being procured based on, this set of standards.

The work is however not completed with these first encouraging results, given that the objective is to accomplish open specifications that provide solid support for equipment exchangeability over the DSRC and OBU-ICC interfaces. The following gaps will have to be filled in order to accomplish a (more) complete set of EFC related standards:

All the equipment used for enforcement (e.g. detection, classification, localisation and registration) and central equipment are outside the scope of the ENV ISO 14907-1 pre-standard, which describes procedures, tools and a test plan, showing the relation between tests and the sequence of these tests.

Whilst the tests procedures are defined, the parameter values to test against are not provided. Hence, this standard is not sufficient to rely on for type approvals or (field or laboratory) acceptance test but provide vital input for such activities.

1. The DSRC requirements specifications need to be accompanied with associated test procedures, for conformance test purposes. Test procedures for the physical layer have been developed within ETSI, but no work has yet been started within CEN/ISO with regards to the data link, the application layers and the communication profiles standards. Conformance test procedures for EFC application interface are foreseen, and an early draft is available (prENV ISO 14907-2).

2. Adequate standards with regards to the OBU-ICC need to be developed. It is e.g. important to define procedures for identification and selection of an (EFC) application residing on the ICC, in order to allow for a generic autonomous selection by the OBU (inherently performed outside the control of the RSE). It is equally desirable to define a procedure for loading of ICC/purse instructions from the ICC to the OBU, providing the OBU with the necessary resources to support an ICC/purse not known by the OBU at times of factory delivery.

3. Finally, in as much as large scale deployment of EFC partly relies on the availability of adequate standards, it is also vital that the results reach out and are understood by the users of the standards. A gap of knowledge related to the EFC standardisation (and regionally applicable regulations) was identified within the EFC community during the recent assessment performed by an expert team (CEN/TC278/PT11) of the EFC standardisation programme, its targets and priorities. This gap of knowledge could be effectively bridge, e.g., by means of workshops on the contents of the standards.

References of information included and related publications:

[1] STANDARDIZATION IN THE FIELD OF ELECTRONIC FEE COLLECTION – CURRENT SITUATION AND AN OUTLOOK - J. Engdahl - Intercai Nederland B.V. – ITS Seoul 1998

[2] CEN/TC278/WG9 Report to CEN/TC278 – Dr. C.-H. Rokitansky – March 1999

Annex 4.1

US critical standards

Remark : in this annex , **SDO** means « Standard Development Organisation »

Name: Advanced Traveler Information System (ATIS) Data Dictionary

SDO: Society of Automotive Engineers

Document: J2353

Description: A minimum set of media-independent data elements needed by potential information service providers to deploy ATIS services and provide the basis for future interoperability of ATIS devices.

Criticality: Foundation

Rationale: Enables service providers with conforming products to provide travel information to mobile users nationally.

Status: In ballot

Name: Advanced Traveler Information System (ATIS) Message Set

SDO: Society of Automotive Engineers

Document: J2354

Description: A basic message set, using the data elements from the ATIS Data Dictionary standard, needed by potential information service providers to deploy ATIS services and provide the basis for future interoperability of ATIS devices.

Criticality: National

Rationale: Enables service providers with conforming products to provide travel information to mobile users nationally.

Status: In ballot

Name: ATMS Data Dictionary (TMDD)

SDO: Institute of Transportation Engineers

Document: TM 1.01 & TM 1.02

Description: A data dictionary for traffic management applications. Describes and standardizes roadway links and nodes (that is, location information) for incidents and traffic-disrupting roadway events. Includes data elements for traffic control, traffic detectors, actuated signal controllers, traffic modeling, vehicle probes, ramp metering data, dynamic message signs (DMS), video and camera control, parking management and weather stations.

Criticality: Foundation

Rationale: The Advanced Traffic Management System (ATMS) data dictionary is used by traveler information systems that provide services to mobile users nationally, such as information about roadway conditions, and by traffic management systems that collect, interpret and present traffic management information.

Status: In ballot

Name: Commercial Vehicle Credentials

SDO: American National Standards Institute, Accredited Standards Committee X12, Electronic Data Interchange

Document: TS 286

Description: A set of transactions for electronic data interchange that can be used by owners, lessees, and drivers of commercial motor vehicles to apply electronically for credentials necessary to operate those vehicles legally, and by authorizing jurisdictions to transmit electronically credential data to applicants and other authorized parties.

Criticality: National

Rationale: Enables every commercial carrier to communicate with and transmit required information to state transportation agencies and relevant state and national databases electronically.

Status: Published

Name: Commercial Vehicle Safety and Credentials Information Exchange

SDO: American National Standards Institute, Accredited Standards Committee X12, Electronic Data Interchange

Document: TS 285

Description: A set of transactions for electronic data interchange that permits enforcement officials, government administrators and other authorized parties to ask electronically for information on the safety performance, regulatory compliance and credentials status of commercial motor vehicles, carriers and drivers. Can also be used by the sources that maintain such data to respond electronically to the requests.

Criticality: National

Rationale: Enables every commercial carrier to communicate with and transmit required information to state transportation agencies and relevant state and national databases electronically.

Status: Published

Name: Commercial Vehicle Safety Reports

SDO: American National Standards Institute, Accredited Standards Committee X12, Electronic Data Interchange

Document: TS 284

Description: A set of transactions for electronic data interchange that allows authorized parties to request and send electronically reports on information related to the safe operation of commercial vehicles, such as inspection reports, safety and compliance review reports, and hazardous material incident reports.

Criticality: National

Rationale: Enables every commercial carrier to communicate with and transmit required information to state transportation agencies and relevant state and national databases electronically.

Status: Published

Name: High Speed FM Subcarrier Waveform Standard

SDO: Computer & Electronics Manufacturing Association

Document: CEMA 1

Description: A high speed FM subcarrier signaling system for wide-area data transfer for multiple applications, including traffic data for travelers and vehicles.

Criticality: National

Rationale: Allows traveler information messages to be broadcast to travelers nationally.

Status: Under development

Name: Information Service Provider-Vehicle Location Referencing Standard

SDO: Society of Automotive Engineers

Document: J1746

Description: A standard location-referencing format for information service provider (ISP)-to-vehicle and vehicle-to-ISP references. This standard adopts the cross-streets profile of the current location reference message specification (LRMS) document as expressed in SAE's National Location Referencing Information Report (J2374).

Criticality: National and Foundation

Rationale: Assures consistency in location referencing and uniform processing for mobile users nationally; used in other standards that specify location information.

Status: Under development

Name: Message Sets for DSRC, ETTM and CVO

SDO: Institute of Electrical and Electronics Engineers

Document: P1455

Description: Prescribes standard messages for dedicated short range communications (DSRC), and electronic toll and traffic management (ETTM) applications and commercial vehicle operations (CVO).

Criticality: National

Rationale: Provides message sets for various ITS user services, such as electronic toll, traffic management, and commercial vehicle operations.

Status: In ballot

Name: On-Board Land Vehicle Mayday Reporting Interface

SDO: Society of Automotive Engineers

Document: J2313

Description: Prescribes techniques that enable vendors with different communication methods to communicate with emergency response agencies in a standard digital format.

Criticality: National

Rationale: Provides for the transmission of messages and information between emergency management centers and mobile users nationally.

Status: Approved

Name: Standard for Common Incident Management Message Sets for Use by Emergency Management Centers

SDO: Institute of Electrical and Electronics Engineers

Document: P1512

Description: Standardizes the form and content of incident management messages and provides an emergency management data dictionary for use by all participating centers, including traffic management centers, public safety dispatch centers, hazardous material response centers, emergency management centers, emergency medical services, MAYDAY processing centers, and incident command posts.

Criticality: National

Rationale: Allows incident management messages to be shared among different ITS systems and entities and assures consistency of incident management messages for mobile and fixed-site users nationally.

Status: Under development

Name: Standard for Data Dictionaries for Intelligent Transportation Systems

SDO: Institute of Electrical and Electronics Engineers

Document: P1489

Description: Provides a standard structure for describing entries and attributes of data elements used in all ITS data dictionary standards and provides common structures, conventions and models that enable describing, standardizing, and managing all ITS data.

Criticality: Foundation

Rationale: Establishes the requirements for the attributes to be used by all ITS data dictionary standards to assure unambiguous information transfer.

Status: In ballot

Name: Standard for Message Set Template for ITS

SDO: Institute of Electrical and Electronics Engineers

Document: P1488

Description: Describes the structure of message sets for data exchange between traffic centers, emergency management centers and traveler information systems in a consistent and uniform manner.

Criticality: Foundation

Rationale: Standardizes the structure for messages used in all ITS standards.

Status: Approved

Name: Standard Specification on Dedicated Short Range Communications (DSRC)—Data Link Layer

SDO: American Society for Testing & Materials

Document: ASTM 1 (temporary)

Description: Specification for the data link protocol for dedicated short-range communications for ITS applications, such as electronic toll payment and commercial vehicle electronic screening.

Criticality: National

Rationale: Allows for short-range communications between roadside equipment and vehicles nationally.

Status: In ballot

Name: Standard Specification on Dedicated Short Range Communications (DSRC)—Physical Layer

SDO: American Society for Testing & Materials

Document: PS 111

Description: Specification for the radio-frequency characteristics for dedicated short-range communications operating in the 902-928 MHz frequency band. Supports both active and backscatter technologies.
Criticality: National

Rationale: Allows for short-range communications between roadside equipment and vehicles nationally.

Status: Approved

Name: Standard Specification on Dedicated Short Range Communications (DSRC) at 5.89 GHz

SDO: To be determined

Document: To be determined

Description: Proposed specification for the radio-frequency characteristics for dedicated short-range communications operating at a frequency of 5.89 MHz. (This is the international frequency for ITS applications. It is under consideration by the Federal Communications Commission for use in the United States for future ITS applications.)

Criticality: National

Rationale: Allows for short-range communications between roadside equipment and vehicles nationally.

Status: Under development

Name: Standards for ATIS Message Sets Delivered Over Bandwidth Restricted Media

SDO: Society of Automotive Engineers

Document: J2369

Description: A general framework allowing transmission of traveler information via bandwidth-reduced media such as those found in wireless applications. Creates a uniform coding and message structure for link travel times, incident text, and weather and transit information for broadcast delivery.

Criticality: National

Rationale: Allows mobile users with conforming products to access traveler information services uniformly nationally.

Status: In ballot