Steria

Ministère de l'Equipement, des Transports et du Logement

IDENTIFICATION OF STANDARDISATION WORK

Study co-financed by the European Commission (DGTREN)

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SUMMARY

The present study is the product of the identification phase of the standardisation works - Phase I of the ACTIF project (Framework Architecture for the Intelligent Transport Systems in France) carried out from June till December 2001. The document is composed of three parts, i.e.: presentation of the approach, overview of the existing standards and of the organisations involved, and identification of the standardisation needs .

Identifying these standards is an essential aspect within the Framework Architecture approach as it meets one of the primary goals of ACTIF, which is to promote and ensure interoperability of the intelligent transportation systems.

Given the multiplicity of standards and their application area, this study focuses particularly on the area of intelligent transportation. That is why, though not pretending to be exhaustive, the study highlights the most essential standards with regards to the development of intelligent transportation systems; these standards may be already existing standards, standards being developed, or standards which analysis and implementation seem to be vital in the French current context.

The study consisted in presenting the major players participating in the standard development process, listing the standards, pre-standards and de facto standards existing in France, in Europe as well as worldwide, and identifying the standardisation requirements basing on the different document sources of the ACTIF project.

The study enabled the setting up of a list of 39 ITS-relevant standard objects; 27 were incorporated in ACTIF and 12 proposed as standardisation work items.

On a general level, it seems that the standards relating to data modelling and dataflow modelling are still essential.

The synthesis tables detail the various standards eligible for development and state the subject of the standard, the elements concerned within the framework architecture, the support actions to plan and the players liable to be involved.

This document aims at encouraging the various bodies (namely Public Authorities) to tackle these issues. The standardisation process is a long and exacting approach requiring continuous enhancements. Comments from people and bodies involved in standardisation contribute to enhance the process.

1. INTRODUCTION

1.1. Context and objectives

This document is the deliverable of « Phase I » (identification phase of standardisation work), of **ACTIF** (Framework Architecture for Intelligent Transportation in France).

The major objectives of the approach used in this study are the following:

- Identifying standards (international, national, etc) whether existing or in progress and their corresponding components in the physical architecture
- Summarizing the preceding phases to list and classify the standards to be developed
- Consolidating results with those obtained in the framework of the priority area studies.

For an overall description of ACTIF, the interested parties are advised to visit the site http://www.its-actif.org.

The Project Implementation Guide (mentioned in Annex Bibliography, ref. ARCST0005) provides a detailed description of modelling concepts and of the framework architecture components.

Readers will refer to Annex 5 for more information on the stakes of ITS interoperability and on the role of ACTIF and standards with regards to interoperability.

1.2. Approach to the integration of standardisation within ACTIF

1.2.1. Classification of standard types regarding ITS

The place of standards within the NTIC (new techniques of information and communication) environment is essential to understand its subject.

In the framework of this study and after analysing the classification of current standards (refer to 3.2. "Overview of the current standards"), we propose the following classification. Complementary studies should be carried out for validating this choice. This classification could possibly become the subject of a standard[1] …

0. General
- terminology – glossary
- architecture

1. Data
- dictionary
- data model
- format
- numbering, identification

[1] To set up such a classification, we think that the quality of the structuring is more important that a detailed description. It is namely important to rule out (or minimise ?) the overlap between identified classes.

2. ***Exchanges between applications***
   (for other ISO[2] exchange layers, the standards are of « telecommunications » type)
   - data format
   - message structure, interface specifications (APIs)
   - application protocol (message dynamics)

3. ***Telecommunications***[3]
   - physical characteristics
   - structuring depending on the ISO layers concerned

4. ***Processing***
   - algorithms
   - performances (non-functional constraints: response time, volumetrics, etc.)
   - development standards (coding rules, etc.)

5. ***Man– machine interfaces***

6. ***Others***
   - Trial, test or homologation procedures
   - Quality (ISO 9000 , etc.)
   - Security

Standard/classification links
The standards linking within this classification is achieved at level 2 (items within each class), when possible or relevant, or at level 1 (class).

A standard can be linked to several items.

1.2.2. Global approach: identification and linking

The standards applicable to intelligent transport systems and identified during the study are incorporated within ACTIF framework architecture.

Integration features two aspects:

- Intrinsic identification of the standard, e.g. descriptive information such as name of the standard, its reference, the issuing organisation, etc.
- Impact of the standard on the framework architecture: it consists in highlighting the components of the framework architecture to which the standard applies.

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[2] *ISO reference model in Telecommunications defines 7 layers ; the 4 lower layers (physical, link, network and transport) traditionnally relates to Telecommunications and the 3 higher (session, presentation, application) to IT and application software.*

[3] *ACTIF model addresses only the « business » aspects in Transportation : with regards to Telecoms, it only describes the application layers (refer above) ; the « communication » layer has not been modelled, hence. Other aspects were not modelled, too, namely static data, off-line functions, etc. Thus, such standardisation needs cannot be explicitly linked to objects in ACTIF model.*

Links have been established between the standards and the components of the framework architecture basing on the following principles (which are documented in ACTIF Implementation Guide) :

1. All standards are linked to one component of the framework architecture, at least.
2. General purpose standards are linked to the “Intelligent Transport System” system.
3. Other standards are linked to physical sub-systems and/or physical dataflows;
4. Furthermore, the standards may be linked to one or several components of the logical architecture (functions, logical dataflows, or data stores). In this case, only low level functions and logical dataflows shall be taken into account (i.e. without any breakdown). Linking to components of the logical architecture is optional.

This modelling, which includes namely the specific links between the standards and the framework architecture, can be accessed in two ways, i.e.:

- By navigating on the web site of the architecture (http://www.its-actif.org) ;
- Via Appendix 7 of the reference documentation of the framework architecture, which can be downloaded onto the same site.

1.2.3. The object "standard" in ACTIF

The table hereunder, taken from the Implementation Guide, shows the data structure defined in ACTIF for standards, and implemented on MEGA tool.

Attributes	Description	Mandatory /Optional
Name	Short naming with a name	**M**
Description	A few sentences describing the content	**M**
Reference	Reference of the standard	**O**[4]
Type of standard	A value amongst standard, corporate standard, de facto standard, regulation, recommendation, ACTIF advice	**M**
Object	Object of the standard : see Typology defined in § 1.2.1	**M**
Body	Body issuing the standard	**O**
Country	List of countries where the standard is applicable	**O**
Recommended by ACTIF	Boolean (yes/no) specifying if ACTIF recommends to apply the standard (if several standards are liable to apply to a same object)	**O**
Functions	List of functions to which the standard applies.	**O**
Datastores	List of datastores to which the standard applies.	**O**
Dataflows	List of dataflows to which the standard applies	**O**
Terminators	List of terminators to which the standard applies	**O**
Subsystems	List of subsystems to which the standard applies	**O**

Notes :

- The linking of a standard to a component of ACTIF does not give any indication on the coverage of the standard regarding this component. For example, an interface specification can be linked to a function in ACTIF though this interface does not provide all the services offered by this function (and reciprocally)
- Further indications could also be listed, such as implementation of the standard, (possible) associated certification procedures, existing products implementing the standard and satisfaction regarding these products, etc.
  These indications require however more frequent updates and are sometimes more or less confidential.

1.2.4. Updates

The initial identification of standards is not sufficient.

- Identification work must be continued as the aim is to achieve a higher exhaustiveness,
- When ACTIF is used in order to identify standards, a periodic updating has to be planed. The update should be carried out yearly, at least.

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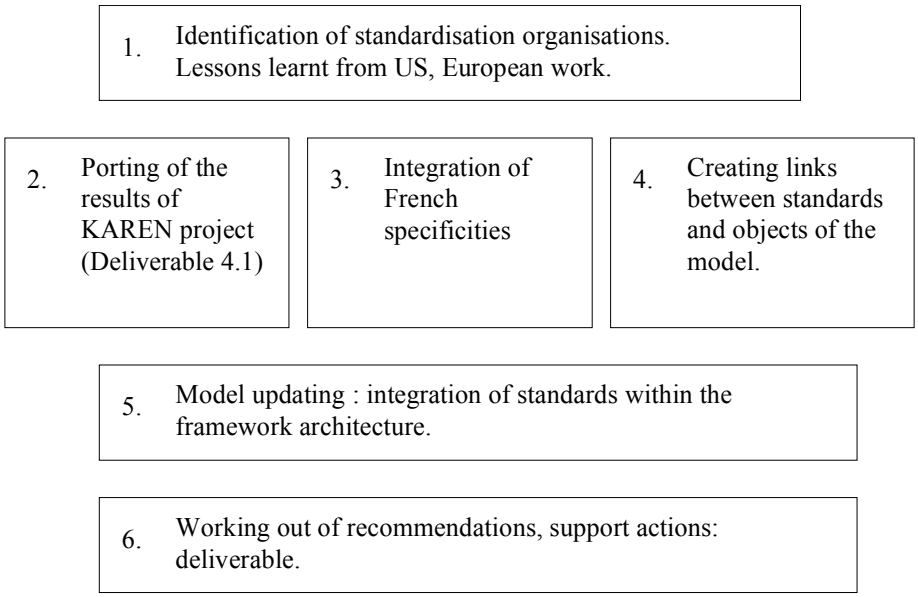
[4] *Optional when no precise reference is required (for a recommendation, an advice or a « corporate » specification), mandatory otherwise.*

1.3. Phases of the study

1..3.1. Overview

The study entailed the following phases:



Phase 1 specifies the scope of the study .

Phases 2, 3 and 4 provide an overview of current standards in the field of Intelligent Transport.

Phase 5 updates the framework architecture model.

Phase 6 identifies the standardisation requirements and proposes supporting actions.

1.3.2. Phase 1 - Identification of standardisation organisations

Phase 1 enabled the organisations involved in the standardisation in the field of Intelligent Transport Systems (ITS) to be identified .

European and American works enabled us to set up a preliminary list, which has been completed afterwards on the basis of the information available on the standardisation organisations' Internet sites.

1..3.3. Phase 2 – Porting of the results of KAREN project

Phase 2 enabled the standards applicable to the ITS identified from KAREN project to be listed.

This work was carried out basing on the following deliverables:

- KAREN D4.1:

  « European ITS Framework Architecture : Proposed Framework of Required Standards », Issue 1, 28 August 2000, produced by ISIS – ERTICO (KAREN Deliverable number D4.1)

- Report on Phase 2 of CEN 270 Mandate:

  « Recommendations for a Revised Programme of Standardization and Normalization Work for ITS in Europe », final draft for consultation, 2001-09-17.

1.3.4. Phase 3 - Integration of French specificities

Phase 3 aims at completing the works carried out in the framework of Phase 1 and hence focuses more on the framework architecture components which have evolved between KAREN and ACTIF.

These evolutions result from the taking into account of new needs and a more in-depth analysis of some issues when performing the area studies. They were mainly reflected by the addition, modification or deletion of functions and dataflows. For these objects, an analysis of applicable standards was conducted basing on the standards identified before on the one hand, and on the standards issued by the standardisation bodies identified in Phase 1, on the other hand. The standards identified during the area studies were also taken into account.

1.3.5 Phase 4 – Creating links between the standards and the objects of the model

It consists in modelling the application fields of standards by creating for each standard a link between this standard and the objects of model to which it applies. This explicit modelling of standards and their application fields provides the basis for numerous analyses and enables the parts of the framework architecture which are not subject to standardisation to be identified.

The following principles have been defined for linking standards to the objects within the model:

1. General-purpose standards shall be linked to the «intelligent transport system» process;
2. All other standards shall be linked to one component of the physical architecture at least, either a physical sub-system or a physical dataflow;
3. Should it be desirable to precise the object of a standard, it can also be linked to one or several components of the logical architecture such as functions, logical dataflows or datastores. In that case, only low level functions and logical dataflows will be selected.

Should a standard be composed of several sections, a single “standard” object shall be created, in the description of which all sections are detailed. The legibility of the model is thus preferred to its exhaustiveness.

1.3.6. Phase 5 – Model updating

It consists in incorporating the standards identified above into the MEGA base of the framework architecture.

Standards are modelled depending on the data structure described in Appendix (refer to §1.2.3 The object “standard” in ACTIF). The linking of standards to the other elements of the model is based on the principles defined above (refer to § 1.3.5, Phase 4 – Creating links between the standards and the objects of the model).

The incorporation of the standards into the model enables to:

- consult the standards whilst navigating on the framework architecture’s site;
- generate a document presenting all modelled standards (detailed description of each standard and indication of the objects to which the standard applies), based on the model: it is the Appendix 7 of the framework architecture’s reference documentation.

1.3.7. Phase 6 – Working out of recommendations

It consists in identifying the standardisation needs and the standardisation organisations liable to be involved and in proposing supporting actions.

The approach hereunder has been selected:

1. initialising the analysis by a work covering all documents and reference reports (Karen D4.1, CEN M270/2, reports on the 10 area studies and on the 5 project case studies).
2. consolidating this analysis with the experts' comments;
3. updating the recommendations by functional areas and depending on the framework architecture components concerned.

1.4 Information sources

The study has been carried out basing on the analysis of numerous documents and Internet sites of the bodies liable to be involved in standardisation work in the field of Intelligent Transport.

The main documents used to work out the overview of current standards and to identify the standardisation needs were the following:

- KAREN : D4.1,
- CEN : M270 – phase 2,
- ITS Critical Standards (US Architecture; refer to Overview of ITS standards in the USA, in Annex 4),
- Reports on the 10 priority area studies,
- Reports on the 5 project case studies.

(references of these documents are shown in « 5. ANNEX 0 : Bibliography »)

We also gathered a lot of information on the Internet sites of the major standardisation organisations.

(The references of these Internet sites are listed in "ANNEX 0: Bibliography and Web sites".

Last but not least, the study has been permanently enriched by the remarks and advices of the experts involved in the project, namely:

- M. Jacques MEUNIER, BN-EVT,
- M. Jean-Loup COMMO, AFNOR,
- M. Patrick GENDRE, CERTU,
- M. Jacques-Claude RENESSON, AFT-IFTIM,

Let us thank them warmly for their contribution.

1.5. Contents of the document

The document includes five chapters, and annexes.

Chapter 1 provides a short description of the context and objectives of the study, the approach used for integrating the standardisation work within ACTIF, the different phases of the study, the documents analysed and the experts called on, and the structure of the document.

Chapter 2 shows an overview of current standards in the field of intelligent transport: it specifies the standardisation bodies involved and identifies the current standards.

Chapter 3 identifies the major standardisation requirements from various documentary sources and presents the results in the form of tables featuring the object of the standard, the concerned components of ACTIF architecture, the support actions to be planned and the organisations liable to be involved.

Chapter 4 is a general conclusion.

2. OVERVIEW OF CURRENT STANDARDS

2.1. Scope of the study

There is a high number of existing standards and their field of application is very large; one of the prime objective of the document is thus to identify the standards in connection with Intelligent Transport and focus on them. We did not intend to make an exhaustive research, which could not be possible, but to highlight the standards the most relevant for the development of Intelligent Transport, those in progress as well as those which study and implementation seem to be vital in the French current context.

Therefore, the study consisted in listing the standards, pre-standards and de facto standards, whether existing or in progress, at French, European and international levels.

2.2 Standards and standardisation

2.2.1. Definition and objective

The definition of standards, according to ISO, is as follows:

> *« Standards are documented agreements containing technical specifications or other precise criteria to be used consistently as guidelines, or definitions of characteristics, to ensure that materials, products, processes or services are fit for their purpose".*

Standardisation aims at minimising technical obstacles to trade, strengthening security and enabling interoperability of products, systems and services, and facilitating a common technical understanding.

The strength of standardisation relies on the principle of consensus and its application is generally based on voluntary involvement, and hence optional.

Exceptionally, contrary to this principle, standards can be made mandatory:

- Directly, in pursuance of Article 12 of the decree n° 84-74 from January,26,1984, which sets the status of standardisation in France.

  This procedure enables to make standards compulsory at the manufacturing, importing and marketing level. A hundred of standards have thus been made compulsory in pursuance of this decree, for the following reasons:
  - safety,
  - health or hygiene,
  - fair transactions and fraud fighting,
  - rationalisation of exchanges,
  - environmental protection

- Indirectly, when regulations refer to standards.

  Regulations in a specific business may, when drafting the detailed text of technical specifications, refer to the stipulations of one or several standards, which make it/them compulsory. Referring to standards is a way to draft technical regulations which consists in substituting the text of detailed specifications with a reference to one or several standards.

Thus, in the framework of the "New Approach", the European Directives taken on the basis of Article 95 (formerly Article 100 A) of the European Union Treaty in order to harmonise national regulations relating to the design of various categories of equipment no longer require precise technical specifications; now, they are confined to imposing very general requirements the so-called " essential requirements" and refer to the European standards for the elaboration of detailed specifications. Those standards constitute a presumed proof of conformity with those essential requirements and their application is however of a voluntary type.

One shall also distinguish between a public procurement contract, in which case the compliance with standards may be compulsory, and a private deal governed by the sole contract between the Parties.

Some consumer goods which are not covered by a business activity regulation regarding their safety come under general security requirements; in that case, the compliance of the good with those safety requirements may be evaluated taking the standards into account, namely.

The list of regulatory texts on this subject are shown on the AFNOR site.

2.2.2. Standardisation process

There are tow standardisation processes:

1. The emergence of practices sanctioned by custom which have been developed by an industrialist or a community and which application may enhance products, systems or services interoperability. In this case, they are generally named "**de facto standards"**.

   In this category, one distinguishes between:

- "open" de facto standards, which are completely specified and published and which development has been agreed upon: they are standards issued by "open" consortiums such as OMG, OGC W3C, etc. Even if these organisations are not "official" and hence do not develop "de jure" standards, the process is very similar to that of official standardisation bodies (nevertheless W3C and IETF freely supply their standards, but CEN and AFNOR do not)
- "proprietary" de facto standards, which relate to a widely used product (a consensus on market standards such as MS-Word for example has been "achieved" between Microsoft and its customers, though customers do not vote for working out the specifications of next release!)

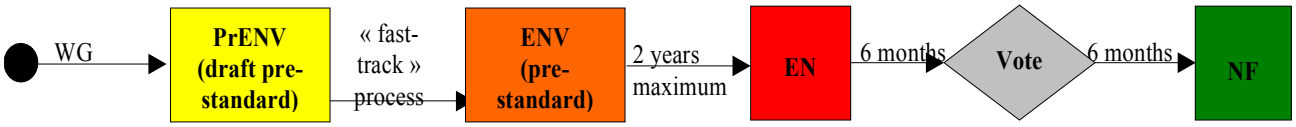
2. The development of **standards** by standardisation bodies. They are developed according to the following principles:

   - *open development process*
     Representatives of all the parties interested are directly associated to the development process of the standards concerning their sector.
   - *transparency*
     Standards are developed basing on a formalised and public process.
   - *consensus*
     The views of all interests are taken into account: manufacturers, vendors and users, consumer groups, testing laboratories, governments, engineering professions, and research organisations.
   - *technical consistency*
     The standards constitute a consistent set at international and cross-sector levels.

These processes can be run one after the other as a de facto standard is often the starting point of the work of a standardisation body.

The standardisation process generally includes the following steps (example of European standards taken over in the French standards list: European standards (EN) must be transposed into French standards homologated by AFNOR (NF EN):

Once a new Work Item has been included in the programme of a Working Group, the process runs as follows:



Other standardisation bodies (ISO, etc.) use a similar process.

2. 3 . International standard classification

ISO set up an international classification of standards (ICS). It is a hierarchical classification by areas containing three levels and enabling to access directly all the standards relating to an area. The Intelligent Transport Systems are covered by the following areas.

Area	*group*	*Sub- group*	*N° ICS*
Sociology. Services. Company organisation and management. Administration. Transport	Transport	Transport in general	03.220.01
		Road transport (including road transport services)	03.220.20
		Transport by rail	03.220.30
		Transport by water	03.220.40
		Transport by air (air transport services incl.)	03.220.50
IT. Office machines	Character sets and information coding.	Includes coding of audio, picture, multimedia or hypermedia information, data protection in IT, encryption, bar codes, etc.	35.040
	IT in general	Applications of IT in general	35.240.01
		Identification cards and similar devices (including applications of cards for banking, trade, telecommunications and transport, etc.)	35.240.15
		IT application in transport and trade (including EDIFACT)	35.240.60
		IT application in science, including digital geographic information (EDIGEO)	35.240.70
Civil engineering	Road engineering	Road equipment and installations (including road traffic warning and control systems, devices and installations)	93.080.30
	Construction of railways	Including rail traffic control systems, devices and installations	93.100
	Construction of airports	Including air transport equipment and installations	93.120
	Construction of waterways and ports	Including water transport equipment and installations	93.140

Link with the framework architecture

The table hereunder underlines the relationships between the different domains of the international classification of standards (refer to table above) and the highest level components of the framework architecture (refer to Annex 1 – Physical architecture).

ICS domain	Framework architecture components concerned
35.040 - Character sets and information coding**.**	General
35.240.01 - Applications of IT in general	General
35.240.15 – Identification cards and silmilar devices (including applications of cards for banking, trade, telecommunications and transport, etc.)	Toll administration system Toll collection system
35.240.60 - IT application in transport and trade (including EDIFACT)	all systems
35.240.70 - IT application in science, including digital geographic information (EDIGEO)	General

Comments :
For « transport » standards, one could consider using a complementary classification, depending on the functional areas of the framework architecture.

2.4. ITS Standardisation organisations

2.4.1. Overview of the standardisation organisations in the ITS domain

Standardisation bodies involved in the development of standards applicable to the Intelligent Transport Systems are shown in the table hereunder. This table gives the internet address, intervention level and standardisation domain for each of them.

Organisation	Web site	level	Standardisation field
ISO International Organization for Standardization	http://www.iso.ch	worldwide	All fields except electrical and electronic engineering
IEC (CEI) International Electrotechnical Commission (Commission Electrotechnique Internationale)	http://www.iec.ch	worldwide	Electrical and electronic engineering and related technologies
CEN Comité Européen de normalisation	http://www.cenorm.be	European	All fields except electrical and electronic engineering
CENELEC Comité Européen de Normalisation pour l'Electrotechnique	http://www.cenelec.org	European	Electrical and electronic engineering and related technologies
ITU : International Telecommunication Union (UIT : Union Internationale des Télécommunications)	http://www.itu.org	worldwide	Telecommunications
ETSI European Telecommunications Standards Institute	http://www.etsi.org	European	Telecommunications
AFNOR Association Française de Normalisation	http://www.afnor.fr	French	Coordinating and running the French standardisation system.

These standardisation bodies are organised in Technical Committees (TC), Sub-Committees (SC) and Working Groups (WG).

Paragraphs hereunder provide a brief description of each body and the list of TC addressing Intelligent Transport Systems.

2.4.2. ISO

The International Organisation for Standardisation (ISO) is a worldwide federation of national standards bodies from some 140 countries, one from each country, established in 1947.

The scope of ISO covers all technical fields except electrical and electronic engineering, which is the responsibility of IEC. The work in the field of information technology is carried out by a joint ISO/IEC technical committee (JTC1).

The work liable to be of interest to intelligent transport systems is carried out by the Technical Committees, as follows:

TC	Scope
JTC1	Standardisation in the field of Information technology
ISO TC 22	Road vehicles
ISO TC 68	Banking, securities and other financial services
ISO TC 104	Freight containers
ISO TC 154	Processes, information elements and documents in commerce, industry and administration
ISO TC 204	Transport information and control systems
ISO TC 211	Geographic Information / Geomatics

ISO/TC 154 is responsible for the international standardization and registration of business, and administration processes and supporting data used for information interchange between and within individual organizations and support for standardization activities in the field of industrial data:

1. Development and maintenance of application specific meta standards for:
   - process specification (in the absence of development by other technical committees),
   - data specification with content,
   - formats-layout (paper / electronic).
2. Development and maintenance of standards for
   - process identification (in the absence of development by other technical committees),
   - data identification.
3. Maintenance of the EDIFACT-Syntax.

ISO / TC 204 is responsible for the overall system aspects and infrastructure aspects of transport information and control systems (TICS), as well as the co-ordination of the overall ISO work programme in this field including the schedule for standards development, taking into account the work of existing international standardization bodies. Its covers the standardization of information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects thereof, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services in the transport information and control systems (TICS) field. Excluded: in-vehicle transport information and control systems (ISO / TC 22).

ISO/TC 211 aims to and provide a framework for the development of sector-specific applications using geographic data. 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, analysing, accessing, presenting and transferring such data in digital / electronic form between different users, systems and locations.

JTC1 is a joint ISO/IEC Technical Committee which scope of work is the standardization in the field of digital geographic information. This scope of work is defined by all the scopes of work of the Subcommittees of JTC 1 and the internal links it has established, these links acknowledging implicitly the prerogatives of the other ISO Technical Committees and ICE Comités d'Etudes.

JTC 1 includes the following subcommittees:

Committee	Name
JTC 1/SC 2	Coded character sets
JTC 1/SC 6	Telecommunications and information exchange between systems
JTC 1/SC 7	Software and system engineering
JTC 1/SC 11	Flexible magnetic media for digital data interchange
JTC 1/SC 17	Cards and personal identification
JTC 1/SC 22	Programming languages, their environments and system software interfaces
JTC 1/SC 23	Optical disk cartridges for information interchange
JTC 1/SC 24	Computer graphics and image processing
JTC 1/SC 25	Interconnection of information technology equipment
JTC 1/SC 27	IT security techniques
JTC 1/SC 28	Office equipment
JTC 1/SC 29	Coding of audio, picture, media, multimedia and hypermedia information
JTC 1/SC 31	Automatic identification and data capture techniques
JTC 1/SC 32	Data management and interchange
JTC 1/SC 34	Document description and processing languages
JTC 1/SC 35	User interfaces
JTC 1/SC 36	Learning technologies

2.4.3. CEI (IEC)

Founded in 1906, the International Electrotechnical Commission (IEC) is the global organization that prepares and publishes international standards for all electrical, electronic and related technologies. The IEC was founded as a result of a resolution passed at the International Electrical Congress held in St. Louis (USA) in 1904. The membership consists of more than 60 participating countries, including all the world's major trading nations and a growing number of industrializing countries.

The IEC's mission is to promote, through its members, international cooperation on all questions of electrotechnical standardization and related matters, such as the assessment of conformity to standards, in the fields of electricity, electronics and related technologies.

The IEC charter embraces all electrotechnologies including electronics, magnetics and electromagnetics, electroacoustics, multimedia, telecommunication, and energy production and distribution, as well as associated general disciplines such as terminology and symbols, electromagnetic compatibility, measurement and performance, dependability, design and development, safety and the environment.

IEC is organised in committees. The work in connection with intelligent transport systems is carried out by the following committees:

Committee	Scope
JTC 1	Information technology.
TC 100	Audio, video and multimedia systems and equipment.

JTC 1 is a joint ISO/IEC committee (see § 2.4.2).

TC 100's scope is to prepare international documents in the field of audio, video and multimedia systems and equipment. These documents include mainly performance criteria for systems and equipment, based on essential measuring methods, terms and definitions in audio, video and multimedia technologies in consumer and professional applications as well as their interoperability with other systems and equipment.

Note : multimedia is the integration of any form of audio, video, graphics, data and telecommunication. Integration includes the production, storage, processing, transmission, display and reproduction of such information.

2.4.4. CEN

CEN's mission is to promote voluntary technical harmonisation in Europe in conjunction with worldwide and European bodies. It works in partnership with CENELEC – the European Committee for Electrotechnical standardisation - ETSI – the European Telecommunications Standards Institute -, and ISO.

The work liable to be of interest to intelligent transport systems is carried out by Technical Committees, as follows.

Committee	Name
TC 224	Machine-readable cards, related device interfaces and operations
TC 225	Bar coding
TC 226	Road equipment
TC 256	Railway applications
TC 261	Packaging
TC 278	Road transport and telematics
TC 287	Geographic information
TC 320	Transport services

TC 278 works in co-ordination with Technical Committees from:

- CENELEC : TC9X : Railway electrical and electronic applications,
- ETSI : TC ERM : Radio and electromagnetic compatibility.

2.4.5. AFNOR

AFNOR is the French standardisation organisation; it is composed of 31 "standards bureaux" (BN), public authorities and about 30 000 experts. AFNOR carries out its missions in the framework of the French Decree dated 26 January 1984 which sets the status of standardisation.

AFNOR identifies standardisation needs, works out strategies, co-ordinates and directs the BNs' activities; it also ensures that all interested parties are represented in the standardisation committees, organises public surveys and homologates French standards.

AFNOR represents French interests in all European and international standardisation bodies. It is a CEN and ISO member.

With regards to Intelligent Transport Systems, the standards bureaux liable to be involved are as follows:

BN	Title	Object
BNEVT	Road and Transport operation	Standardisation of equipment and operation systems in connection with traffic control and public transport organisation, excluding electrical and electronic aspects in-vehicle equipment and rail specific applications.
BNA	Automotive	Standardisation of the functional characteristics of road vehicles and cycles, and materials, components and equipment specific to their manufacturing, implementation, control and maintenance.
BNAE	Aeronautics and Space	Standardisation of aeronautics and space studies and manufacturing.
BNF	Railways	Standardisation of rolling stock, fixed railways equipment and products specific to railways.

2.4.6. Further standardisation bodies and processes

In addition to these standardisation organisations, work has been carried out in the framework of forums, consortiums and MoUs (*Memorandum of Understanding*) involving industrialists, namely:

- RDS-TMC : co-ordination of RDS activities (Radio Data System – Traffic Message Channel),
- DATEX-net (international exchange of data traffic), which CEN has recently adopted,
- GATS : GSM-type cellular network services,
- EFC – Electronic Fee Collection,
- GNSS – Global Navigation Satellite System.

At the European level, CWAs (CEN Workshop Agreement), composed of groups or organisations interested, work out recommendations ("standards which are not really standards") which allow to accelerate normative procedures (by by-passing vetos) and to achieve "agreements" more rapidly. The objective is that these recommendations become fully-fledged standards.

A list of non-exhaustive bodies and consortiums developing specifications related to ITS is shown in Annex 0 "Bibliography and Internet Sites".

2.5. Standards applicable to ITS

This chapter provides a detailed but not exhaustive description of the standards applicable to Intelligent Transport Systems. It gives an overview of the links established between the standards and the framework architecture components.

39 normative documents related to ITS have been identified and listed hereunder. In ACTIF model, they correspond to 27 "standard" objects which are linked to framework architecture components (such as sub-systems, dataflows, etc.).

The table hereunder, lists TC278 work items and their links with the framework architecture. It is not exhaustive, but it:

- lists the identified standards or pre-standards (references, names),
- defines the type of content with reference to the typology set in § 1.2.1,
- identifies the architecture components concerned:
  - Physical systems when the object of the standard is a glossary, a conceptual data model or an application,
  - Families of physical dataflows when the object of the standard is an exchange of information or a communication interface.

Standard	***Class***	***Framework architecture components concerned***
ENV 13106 Traffic and Travel data dictionary	Data model	All systems
ISO/TR 14812 Glossary of standard terminologies for the Transport Information and Control Sector	Glossary	All systems
ISO/TR 14813 Transport and Information and Control Systems – Reference Model Architecture(s) for the TICS sector	Data model	All systems
ENV ISO 14825 Geographic data Files	Exchanges between applications	All systems
ENV 12009 Geographic Data – Reference Model	Data model	All systems
ENV 12656 to ENV 12660 Geographic Data – Data Description	Data model	All systems
ENV 12761 ENV 12762 Geographic Data – Referencing system	Processing	All systems
prENV 13376 Geographic Data – Application rules	Processing	All systems
WGS84 World Geodetic System 1984 – Absolute localisation in ground coordinates	Exchanges between applications	All dataflows
NF Z13-200 Information technologies. Electronic data interchange. Use of the SIRENE system for identification of data interchange partners.	Exchanges between applications	All dataflows

ENV 12253 DSRC Physical layer ENV 12795 DSRC Data Link Layer ENV 12834 DSRC Application Layer ENV 13372 DSRC profiles for RTT applications	Exchanges between applications Telecommunications	Dataflows between *infrastructure* and *vehicle* systems
NF P99-302 Road information and exploitation. Protocol for the transmission of alphanumerical road data	Exchanges between applications	Dataflows between the *Traffic management* system and *(road) infrastructure* systems
NF P99-340 Road information and control. Road control language. General rules and command library	Exchanges between applications	Dataflows between the *Traffic management* system and *(road) infrastructure* systems
NF P99-341 Road information and control - Road control language - Controlling and checking of variable message signs	Exchanges between applications	Dataflows between the *Traffic management* system and *(road) infrastructure* systems
NF P99-342 Road information and control - Road control language – Video camera checking and remote control	Exchanges between applications	Dataflows between the *Traffic management* system and *(road) infrastructure* systems
ENV 13777 DATEX Specifications for information messages on traffic conditions	Exchanges between applications	Dataflows between two *Traffic Management* systems Dataflows between *Traffic Management* systems and *ISPs*
ENV 12313, PR NF EN ISO 14819 Traffic and Traveller Information (TTI) (RDS-TMC using ALERT-C and ALERT-PLUS)	Exchanges between applications	Dataflows between the *Traffic Management* system and the terminator *Traveller*
ENV 12315 Traffic and Traveller Information (TTI) (messages broadcasted via DSRC)	Exchanges between applications	Dataflows between the *Traffic Management* system and the terminator *Traveller*
ISO/TR 15497 Road vehicles – On-board software development Guide	Processing	*Vehicle* system
ENV 12796 Public Transport – validators	Processing	*Public Transport vehicle* system
PR NF EN ISO 15005 Road Vehicles - Ergonomic aspects of the in-vehicle presentation of transport information and control systems – Dialogue management principles and compliance procedures .	Processing	*Public Transport vehicle* system
PR NF EN ISO 15006 Road vehicles - Transport Information and Control Systems – Man-Machine Interface – Auditory information presentation - Requirements.	Processing	*Public Transport vehicle* system

PR NF EN ISO 15007 Road vehicles – Measurement of driver visual behaviour with respect to transport information and control systems	Processing	*Public Transport vehicle* system
PR NF EN ISO 17287 Road vehicles- Ergonomics aspects of transport information and control systems – procedure for assessing suitability for use while driving	Processing	*Public Transport vehicle* system
ENV 12896 Public Transport – Reference data model	Data model	*Public Transport management* system *Public Transport vehicle* system
ENV 13149 Public Transport -Road vehicle scheduling and control systems - WORLDFIP	Processing	*Public Transport management* system *Public Transport vehicle* system Dataflows between these systems: inside the vehicle, more generally - bus CAN type
ENV 12314 Road Transport and Traffic Telematics - Part 1: Reference architectures and terminology	Glossary Data model	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system
ISO/TS 14815 Road Transport and Traffic Telematics – Automatic vehicle and equipment identification – System specifications	Processing	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system Dataflows between those systems
ISO/TS 14816 Road Transport and Traffic Telematics - Automatic vehicle and equipment identification – Data coding and structure	Exchanges between applications	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system Dataflows between those systems
ISO/CEI 14662 Information Technology. Open – EDI reference model	Exchanges between applications	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system
NF EN 1475 EDI – Directory - D93-A	Exchanges between applications	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system Dataflows between those systems
NF EN 1574, 1575, 1578, 1580 to 1586, 1590, 1681 to 1664, 1697 to 1703, 1833 EDI Messages	Exchanges between applications	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system Dataflows between those

		systems
NF EN 29735 Electronic data interchange for administration, commerce and transport (EDIFACT). Application level syntax rules.	Data interchange	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system Dataflows between those systems
PR NF EN 9735 Electronic data interchange for administration, commerce and transport (EDIFACT). Application level syntax rules. (Version number for syntax : 4)	Exchanges between applications	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system Dataflows between those systems
PR NF ISO 20625 Electronic data interchange for administration, commerce and transport (EDIFACT).– Rules for generating files of XML (XSD) schemas based on EDI(FACT) implementation directives.	Exchanges between applications	*Freight Management* system *Fleet Management* system *Commercial Vehicle* system *Freight Equipment* system Dataflows between those systems
PR NF EN ISO/CEI 7501 Identification cards. Machine-readable travel documents. (part 1 : visa ; part 2 : size 1 and size 2).	Exchanges between applications	*Commercial Vehicle* system Dataflows between the *Commercial Vehicle* system, the *Fleet Management* system and the *Law enforcement Authorities* terminator
ENV ISO 14907-1 EFC – Test procedures for user and fixed equipment	Processing	*Toll Collection Equipment* system *Vehicle* system Dataflows between those systems
NF P99-500 Ticketing and Transport – Magnetic track cards for passenger land transport - Characteristics of flexible thin cards featuring TFC.1.B format	Processing	*Payment collection* system
NF P99-510 Ticketing and Transport – Data support for services - Definition and organisation of post-payment systems.	Processing	*Toll Administration* System

In short, this first analysis of current standards enabled the identification of an already significant set of standards directly applicable to the various concepts of Intelligent Transport Systems as they are modelled within ACTIF framework architecture.

The chapter hereunder focuses on an analysis of the standardisation needs as detected in the various sources referenced.

3. IDENTIFICATION OF STANDARDISATION NEEDS

3.1 Approach

Chapter 3 focuses on the standardisation needs identified in the following sources:

- Identification by KAREN project of the standardisation work to be carried out (reference : Priority standardisation work, as defined in § 5 « First Priorities » of D4.1 report – KAREN deliverable, summer 2000),
- Study of Mandate 270 Phase 2 on « Recommendations for a Revised Programme of Standardisation Work for ITS in Europe" (reference : CEN TC 278, N1246, M270/2 Final Draft For Consultation, 17 September 2001),
- 10 priority area studies carried out for ACTIF Project during Phase D (reference : ARCST0090-Synthesis of standardisation needs identified in the area studies, Phase E, 21 September 2001),
- 5 project cases studies for ACTIF project during Phase F (references in "Annex 0: Bibliography"),
- Identification of the physical dataflows not linked to standard..

Parts 3.2 to 3.6 analyse each of these sources separately; part 3.7 provides a general synthesis. Excerpts of the various source documents are provided in ANNEX 2 "Detailed Identification of standardisation needs".

The aim was not to make an exhaustive research on the standards being developed or failing but to focus on:

- The standards considered as the most interesting or relevant for development,
- The standards liable to interest the highest number of players,
- The scope of transport.

Furthermore, the standardisation needs do not foresee the way to achieve standardised solutions (issued specifications /de facto standards, European or non-European de jure standards, etc.)

The global overview presents the major lessons learnt from the identified standardisation needs and a table featuring:

- The standardisation work to be carried out,
- Its object (link with the typology defined in § 1.2.1)
- The ACTIF architecture components concerned
- The supporting actions to be planned
- The organisations liable to be involved.

3.2. Standardisation needs identified from KAREN D4.1 deliverable

Basing on the priority standardisation needs listed in §5 « First Priorities » of KAREN D4.1 document, the following standardisation work items were identified:

- Data exchange (namely traffic data, but also urban/interurban directory, public transport, etc.)
- Localisation data repository ,
- International harmonisation of specifications for DSRC,
- Basis information for emergency calls (form, content, positioning, etc.),
- Payment of road and traffic information services in general (driver guidance, route, tourist information, etc.),
- Harmonisation of human machine interfaces,
- Definition of a digital tachograph.

3.3. Recommendations from M270 phase 2

All the recommendations made by experts in the report referenced M270 phase 2 Final Draft For Consultation, N1246, CEN TC 278 have been analysed.

The first recommendations (R1 to R24) relate to the organisation of the Technical Committees (TC) and Work Groups (WG) at a European level; then, recommendations have been grouped together depending on the KAREN areas to which they apply. This breakdown is relevant for our presentation of standardisation needs as the ACTIF project took in all KAREN functional areas.

The orientations identified by Mandate 270 phase 2 are summarized hereunder :

R1: encourage the use of generic communication technologies (i.e. use as far as possible current standards worked out for the telecommunications, information and internet technologies),

R2: encourage multimodality (shifting from road to multimodal transport),

R21: design a conceptual data model for freight and fleet managers (common data model enabling to create a stable basis for new and updated data dictionaries, and much more),

R27: encourage the implementation of an Integrated Transport Payment card (using smart cards architecture ?),

R27 to R31: provide for an interoperable transport payment card, define a limited number of smart card technologies for paying transport services (ITP : integrated transport payment), define the interfacing procedures between the payment terminals and their related back-end systems and fee-deciding environment, define standardised conformance-test procedures,

R51: develop/adapt, design process related standards building on European Statement of Principle on HMI for In-vehicle Communication based services,

R55: define an In-vehicle “black box”,

R 63: standardise the localisation data repository ,

R 77: standardise the accident data supplied by the digital tachograph or the black box,

R81: provide a common vehicle categorisation/classification to introduce an ELP (electronic license plate) identification system,

R91: develop a conceptual model of intermodal information regarding freight tracing,

Data modelling and the definition of data and messages dictionaries and of localisation standards stand out as the most important items and have already been underlined many times.

To best meet the standardisation needs identified by Mandate 270, it is worth stressing that it is advisable to use current generic standards not only from the Telecommunications or IT technologies but also from transverse sectors such as banking, packaging, customs, etc.

3.4. Standardisation needs identified in the 10 area studies

This part is based on document ARCST0090-« Synthèse des besoins en normalisation issus des études de domaines », version 1.0, from 21 September 2001.

This overview is part of the framework architecture enhancement process initiated after the priority area studies (Phase E); it includes a preliminary identification of the standardisation work to be carried out.

As a matter of fact, certain priority area studies identify some standardisation needs and the document referred to above consolidates these results, on a global level.

The standardisation needs identified in the 10 area studies relate to:

- data modelling (definition standards, terminology) – needs regarding static/dynamic geographic data are very strong,
- dataflow modelling (definition standards for dictionaries and messages, protocols, grammar),
- standardisation of PGT / PGD (traffic management plans / travel management plans)
- user-friendly presentation of information, namely for kiosks and HMIs
- common standards for the functions Emergency management (flows, signals, etc.),
- security and confidentiality of data interchange (namely regarding the protection of privacy)
- definition of digital tachograph.

3.5. Standardisation needs identified in the 5 project cases studies

This part groups the standardisation needs identified in each of the 5 project case studies.

Study 1: Real time road information handled by the CIRs

The proposed recommendations for Standards made in this study seem to be highly relevant for the deployment of Intelligent Transport systems in France; they relate essentially to:

- The standardisation of dataflows, both on their form and content (dictionary and grammar),
- The implementation of a standardised, user-friendly presentation acknowledged by all players,
- The standardisation of maps repository ,
- The use of European location data acknowledged by all players.

Study 2 : Centralized multimodal Travel Management – Grenoble City

The major standardisation needs identified in this study are the following:

- Design of models of generic multimodal networks and data integrating data relating to Personal Vehicles and to Public Transport (refer to SITP/VP project, Transmodel extensions, etc.).
- Dynamic data in the field of Public Transport.
- Geo-referencing (refer to ACTIF/I Study– Geo-referenced information).

It will be difficult to achieve national standards for all the work items, but it may be sufficient to define, on a local level, a set of elements enabling the various players to communicate.

Operators of urban and regional networks need to exchange data in the framework of the co-ordinated urban travel management. However, interurban network operators have more standardisation needs as they more often intervene on a national scale. For this reason, data interchange between urban and interurban network operators should rely as far as possible on the standardisation efforts made by interurban network operators.

When developing standards, the elements of the various layers involved in the exchanges (data dictionaries, messages and communication protocols) shall be kept apart.

Study 3 : SILEVIC system (Freight tracing)

This study describes the needs when starting or continuing the following standardisation work items:

- upgrade and refine the architecture (datastores, message content, more detailed physical architecture, etc.).
- define a Freight and Fleet data model complementing/enriching the current FRAME / ACTIF Logical Layer.
- consistency/synthesis of all works about tracing & tracking.
- continue to integrate EDI and EDIMOBILE Messages (including between vehicles and freight platforms) in exchange scenarios.
- standardise and integrate output formats of digital tachographs within EDIMOBILE, with a view to sending them to staff and fleet management applications.

Etude 4 : SITP Project (Ticketing)

The major recommendations of this study relate to the modelling of Area 1 and namely to the distinction to be made between users and contracts on the one hand, and between payment and validation, on the other hand. Furthermore, the document mentions the development of European standards in connection with ticketing, and, with regards to Public Transport, it mentions the fact that the results of the SITP study were used as a basis for Transmodel version V5, which was submitted to CEN TC 278.

Etude 5 : STRIP project: Traffic Data by Mobile Phone Tracing

The study proposes to work out generic “specifications” to describe the co-operation (data interchange contracts) between the various partners, i.e. information suppliers, operators, services operators, travellers, etc. to best specify:

- A scope of exchange (cooperation): question/answer scenario,
- The messages to be exchanged and their sequence,

- The description of these messages basing on the data they transmit (which may refer to standards),
- The structure of these data using a XML (DTD, XSD, etc.) standard scheme.

However, this document does not provide any precise proposal of standards; it just underlines the role which XML and e-business approaches may play in the ITS standardisation process.

3.6. Analysis of the standardisation needs specified in the framework architecture

The standards identified as applicable to intelligent transport systems (refer to § 2.5. "Standards applicable to ITS") have been integrated within the framework architecture.

The links established with the architecture components (refer to § 1.2.2) reflect the significance of standards. They enable the identification of all the physical dataflows that are not linked to a standard in the current version of ACTIF (V2.0). We remind here that ACTIF addresses only the "business" aspects of the Transport sector; regarding Telecoms, it only describes the application layers; it did not model the "communication layer". Furthermore, other elements (static data, off-line functions, etc.) were not or only partly modelled. Their standardisation needs cannot thus be explicitly linked to objects in the ACTIF model.

The list of physical flows is shown in Annex 3 "Analysis of standardisation needs from the framework architecture".

The analysis of this list enables the identification of four major dataflow families which are not linked to standards, i.e.:

- emergency management dataflows,
- travel coordination and traveller information dataflows,
- law enforcement[5] dataflows,
- IT systems/operators or travellers dataflows.

For each of these major families, the paragraph hereunder provides a "global synthesis" and standardisation proposals to make up for the gaps identified. This first analysis does not enable the identification of dataflows missing some standards, but it confirms the needs already identified from other sources.

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[5] This type of dataflows can be subject to standardisation. But, as it relates to law enforcement, one shall ensure, as a « support action » and prior to any commitment to perform a work, that the administrations concerned (French administrations for exclusively national standards, European and EU-members' administrations for European standards) explicitly agree to support the process : these administrations shall agree about using standards for enforcing a particular law and about the scope of future standards.

This also applies to « emergency management dataflows » whenever it is an emergency case in connection with law enforcement.

3.7. Global synthesis

This paragraph summarizes the different analyses of the standardisation needs as identified from the various sources mentioned in the chapters above. It aims at emphasizing the most essential standardisation needs.

3.7.1. Major lessons

At a general level, the **data standardisation need** appears as **essential**. This concerns:

- Basis data (reference or "static" data which are supplied in one operation),
- Dynamic data (which are periodically updated),
- Historical data.

According to the classification established in the framework of this study, there are several data standardisation levels (refer to classification in § 1.2.1.)

- Terminology – glossary- dictionary
- Data model
- Format

Regarding the modelling of **dataflows** for exchanges between applications**,** the classification established in the framework of this study distinguishes between:

- Data format,
- Message structure,
- Application protocols

When developing standards in connection with dataflows, it is preferable to keep these various independent levels apart.

3.7.2. Recommendations for standardisation actions

The work carried out for identifying the standardisation needs enabled to gather recommendations from experts or to emphasise recommendations on the conditions necessary for a successful standardisation process.

- Standardisation shall only concern an item to which it can add a "plus".
  Standardisation is not always necessary. It is not a goal in itself. It is often possible to use at first an existing or provisional specification.
- It shall also be checked if the item has not been handled before in another field, namely:
  - Telecoms,
  - IT,
  - Banking (current standards are numerous, see ISO/TC 68 and JTC 1[6]),
  - Freight (current standards are numerous, see JTC 1),
  - Packaging (current standards are numerous, see CEN/TC 261 and JTC 1),
  - Customs (TC 154),
  - Rail transport.

  It is hence advisable to use these specific standards.

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[6] *JTC 1 : Joint Technical Committee 1, see description in § 3.2.2.*

- Logically, standardisation shall be developed by the economic players themselves as they better know the needs to be satisfied and the items subject to standardisation.
  This should enable to handle a subject in a less theoretical way.
  However, it is necessary that the progress of the project is rather well ahead to be able to best define the specifications. As a matter of fact, it is very unlikely that a standard developed *a priori*, prior to realisation, suits effective needs, as those could not be properly specified.
  The definition of the standard can be based on the first realisations performed.

- For transverse issues, it is sometimes difficult to call on players from other business activities, in which case Public Authorities may act as initiators and catalysts to encourage the development of standards. Should the standardisation need be identified and no action be undertaken by the players concerned, it is then necessary to involve a group of representative players in the standardisation process.[7] However, one should know that the first thing to achieve is to agree upon the terminology used in each area, and in ITS domain globally, as data or protocol definition standards are based on the terminology utilized in a specific activity sector.
  The involvement of the French Ministry of Transport (METL) in the standardisation process indeed helps to direct the standardisation work to the relevant players (or benefiting parties) depending of ACTIF functional areas.

- The identification and quick access to a standard must be made easier.
  These operations should now be carried out rapidly via Internet.
  The non-use of standards because people are just unaware of their existence, should be thus partly ruled out.

- Additional support actions are also recommended, i.e.:
  - Provide potential users and players with information to enable them to identify the standards liable to be useful to them and, possibly, to participate in the standardisation process,
  - Analyse thematic aspects such as protection of privacy,
  - Cooperate in associated standardisation processes.

- ACTIF can provide support to allow for these different aspects:
  - Identification of standards via the architecture components concerned,
  - Analysis of the context of the standardisation work to be carried out by displaying its respective global functional process .

3.7.3. Synthesis table

The table hereunder gives an overview of the needs identified in the five parts above; it points out the relationships between the standardisation needs and the components of the physical architecture and provides thus a detailed analysis of these needs. For each standardisation work line, it provides the following:

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[7] *One could take the example of local government agencies. As a matter of fact, though their needs are very similar, their decision power is much splitted. Their interest in standardisation is often real but this approach is not part of their culture. States could then act as a catalyst within the group of representative players .*

- The object of the standard: refer to typology as defined in paragraph 1.2.1. Classification of standard types regarding ITS ,
- The architecture components concerned:
  - Physical systems when the object of the standard is an application ;
  - Families of physical dataflows, otherwise,
- The standardisation bodies concerned
  The table identifies the standardisation bodies involved for each item. It is obviously necessary to involve professionals of the activity as well as the government agencies concerned. Today, the standardisation groups are mostly composed of industrialists or services operators; it would be advisable that public players (Central Departments of the Ministère de l'Equipement, local government agencies, etc.) involve themselves more deeply in this process,
- Support actions
  These actions should mainly take into account the recommendations defined in the paragraph above.

N°	Standardisation work	Object	Framework architecture components concerned	Standardisation bodies	Support actions
1	Define data dictionaries: Traffic data…… Geographic data……. Urban / interurban dictionaries … Public Transport dictionaries…… Freight/fleet dictionaries…… Design a conceptual data model for freight and fleet (including intermodal information for freight tracking)	Data model	…Traffic management …All PSS …All PSS …PT management,. Commercial Veh. …Freight management, Fleet management, Commercial Vehicle. Freight Equipment	BVNET, CEN TC 226, CEN TC 278, CEN TC 287, ISO TC 211, ISO TC 22 and JTC1/SC32 ISO/TC 154 members	Design a common data model to create a stable data basis Use standards developed by JTC1 and ISO/TC 154 Continue the work initiated by CT 32 (JTC 1/SC32) and assess the feasibility to use ISO/TS 16668 and BSR tool developed by ISO/TC 154 Continue SITP work Extend the standard ENV-TRANSMODEL to the other modes. It is a conceptual data model not a dictionary. (see PREDIT-STIP/VP project) Group together freight and fleet players
2	Define localisation data modelling in « enhanced X,Y » to create a « pivot » data format Make the use of this format mandatory for the exchange of localisation data.	Data model Data interchange	All dataflows exchanging localisation data	ISO TC204 WG1, CEN TC278 WG13, CEN TC278 WG4, CEN TC 287, and CTC211 members	Make the linking of the various geographic data bases to Lambert 93 and WGS84 mandatory. Use recommendations from I and J studies Extension of ISO 14817 WI

N°	Standardisation work	Object	Framework architecture components concerned	Standardisation bodies	Support actions
3	Define a single model for the basis information of emergency calls (form, content, localisation namely, etc.) which can be used by all emergency management functions The target is to standardise this type of data from the different assistance services (police, ambulances, fire brigade, etc.) The availability of a single format will enable the standardisation of exchanges in connection with emergency calls (dataflows, signals, protocols, etc.) As well as accident data supplied by digital tachograph ……. Or black boxes……	Data model Exchange between applications	Emergency management Traffic management, Public transport mgt Freight management, Fleet management. …commercial vehicles ...all vehicles.	CEN TC278 WG5 members CENELEC	Use recommendations from Study F A preliminary "organisational" phase should be necessary to redefine the roles of the various assistance services … Ensure that modelling and dataflows take into account the main existing communication systems, namely professional mobile communication systems (Tétrapol, Tétra (ETSI), the adapted GSM solutions (rail GSM)
4	Define the structure of the traffic/travel management plans Define the associated exchanges.	Data model Exchange between applications	Traffic management Travel Coordination, Public transport mgt Freight management, Fleet management	operators, BNEVT	Use the existing Traffic Management Plans and define a generic model
5	Define the modelling of data interchange flows between on-board applications and fleet managers' applications.	Exchange between applications	Dataflows between Commercial Vehicle and Fleet management	CEN TC278 WG2, WG12, WS MEET, ISO JTC1 SC31 WG4, ISO TC22 members	Involve the professionals in the process, namely FNTR[8] and TLF[9].

[8] *FNTR : Fédération Nationale des Transporteurs Routiers.*

[9] *TLF : Fédération des entreprises de Transport et Logistique de France.*

N°	Standardisation work	Object	Framework architecture components concerned	Standardisation bodies	Support actions
6	Encourage international harmonisation of DSRC specifications.	Telecoms Exchange between applications	All dataflows between Infrastructure and Vehicle (I.V and V.I)	Those involved in existing standards such as CEN TC278	Use the works in progress
7	Define freight tracking rules and tools.	Data Exchange between application Processing	Dataflows between Freight Mgt, Fleet Mgt and Commercial Vehicle.	WS MEET, CEN TC278 WG12, ISO TC204 WG4, ISO/CEI JTC1 SC31 WG4, SITS members	Involve the professionals in the process, namely TLF and FNTR.
8	Define a single representation (pictograms, graphical chart, etc) whatever the support involved may be (paper, panel, screen, VMS, kiosks, etc.) The aim is to implement an ergonomic, standardised and widely recognised presentation of information. Standardise man-machine dialogs in on-board systems (to handle the critical case of drivers)	HMI Data	All PSS All vehicles	ISO TC 22, CEN TC 278 WG10, CEN TC278 WG3, SERTI, JTC1/SC35, CEN TC 122, ISO/TC145 members CEN TC278 WG8 and CEN/ISSS WS DFA (« Design-for-All and Assistive Technologies for ICT »)	Use the existing presentation, define a generic model and involve specialists in cognitive ergonomics (INRETS, ANACT[10])

[10] *ANACT : Agence Nationale pour l'Amélioration des Conditions de Travail.*

N°	Standardisation work	Object	Framework architecture components concerned	Standardisation bodies	Support actions
9	Define the digital tachograph. It shall allow to process its contents remotely. *The definition of the digital tachograph is shown in an appendix to rule 3821-85, which adoption by the European Commission is in progress.* *Data interchanges between the structures responsible for checking in the Member States are not defined yet (« Tachonet » network)* *Companies shall be able to access the data recorded by tachograph; the appendix above mentioned shall specify the data model, but the form of the interchanges is not defined yet, as far as we know.* *There is a risk for companies which have to change their management system if they call on an another tachograph supplier.*	Data Exchanges between applications Processing Telecoms	Commercial vehicle Dataflows between Commercial Vehicle and Law Enforcement	CEN TC 278, ISO TC 22 members	Involve professionals in the process, namely TLF et FNTR. Handle the issue of the tachograph in detail, and the resulting exchanges in the Freight domain of the architecture.

N°	Standardisation work	Object	Framework architecture components concerned	Standardisation bodies	Support actions
10	Define a single “black box” for all vehicles. It shall enable all existing parameters to be retrieved prior to an accident so as to analyse them (post-accident enquiry). The use of black boxes in the framework of fraud fighting, can also be considered (data interchange with law enforcement agencies).	Data Exchanges between applications Processing Telecoms	All vehicles	ISO TC 22 members	Preliminary communication action to the general public, highlighting first the Security aspect and stressing rather the “educational” (personal awareness of risks) aspect than the fraud fighting one.
11	Define an “Integrated Transport Payment card” to encourage its creation.. Provide for an interoperable ITP card, define a limited number of smart-card technologies, procedural interfaces between payment terminals and their related backend-systems (central and fee-deciding systems) and conformance test procedures for toll standards.	Data Exchanges between applications	Dataflows between passengers, toll fee collection, toll administration, financial institutions	members of CEN TC278 WG1, CEN TC 224 , CEN/ISSS WS/FASTEST, ICTSB, JTC 1/SC17…	Involve as of the beginning the major players such as Public transport operators, Car-park managers, Motorways companies, car-rental agencies, etc. Involve CNIL for matters in connection with protection of privacy.
12	Define a single classification and identification for all vehicles which are compatible with automated toll collection systems and other electronic control devices.. This standard would the development of electronic licence plate recognition systems (ELP : electronic license plate)	Glossary processing	All PSSs All vehicles	Members of CEN TC278 WG1, CEN TC278 WG12, ISO/TC 154, JTC 1/SC 31 CEN/TC 225	Work in cooperation with the Ministry of Finance to simplify fiscal vehicle classification (including reducing the number of classes) and involve Motorways companies, car-rental companies, insurance companies, etc.

4. CONCLUSION

The analysis of the international context as well as of the European and French standardisation needs enabled the setting-up of a preliminary list of standards most relevant for development both for institutional and industrial players as they encourage the system scalability, compatibility and interchangeability, the market expansion, etc.

The description of standards shown in ACTIF and their links with Framework architecture components enable the dataflow families for which no standard has been identified to be quickly pointed out. These families are roughly the same for which standardisation needs have been identified, which means that ACTIF provides a reliable overview of the standardisation of ITS.

However, one should not forget that standardisation is a means rather than a target and that organisational issues have also to be dealt with to enhance interoperability.

The study proposes recommendations regarding both the nature of the specifications subject to standardisation and the support actions to be undertaken, namely the role that the French Ministry of Transport (METL) should play by acting as “leader” in each ITS application area, and also with regards to standardisation.

The standardisation effort should also handle the tools support projects, such as typical requirement specifications, safety repositories, typical contracts, etc. The link between regulation and standardisation must be once more highlighted as a regulation can ultimately be considered as the decision to make a technical, contractual or organisational standard mandatory.

We already quoted the example of the prior reorganisation of the Emergency Services and teams; there are however further examples regarding namely the definition of payment for road and traffic information services (guidance, route, tourist information, etc.).

5. ANNEX 0 : BIBLIOGRAPHY AND INTERNET SITES

This Annex lists all the reports and documents mentioned or used for drafting the main document.

Title	Organism / Author	Date	Pg
ACTIF, Cahier des clauses techniques particulières de l'étude de réalisation, v1.0	CETE de Lyon	25/05/00	48
ACTIF, ARCST0005, « Implementation Guide », v1.0	I. Thomas, Stéria	30/07/01	28
KAREN D4.1, « European ITS Framework Architecture : Proposed Framework of Required Standards », Issue 1, (KAREN Deliverable number D4.1)	A. Winder et al., ISIS - ERTICO	28/08/00	96
CEN, Report from Mandate 270 phase 2, « Recommendations for a Revised Programme of Standardization and Normalization Work for ITS in Europe », Final draft for consultation	B. Williams et al.	17/09/01	337
ITS-America "Intelligent Transportation Systems : Critical Standards"	R. Slater, ITS-America	20/05/99	20
ACTIF, ARCST0090- « Synthèse des besoins en normalisation issus des études de domaine », Phase E, v1.0	V. Levet, Stéria	21/09/01	5
ACTIF-Area study A « Use of ITS operations for transport planning» v1.6	J-F. Poulain, Stéria	05/07/01	94
ACTIF-Area study B « Freight management on intermodal platforms » v1.7	L. Flory, Stéria	27/07/01	119
ACTIF-Area study C « Co-ordinated urban travel management » v1.3	T. Boyer, Stéria	23/07/01	99
ACTIF-Area study D « Route optimisation » v2.4	M. de Saint Loubert, Stéria	23/07/01	107
ACTIF-Area study E « Law enforcement » v2.2	M. de Vallier, Stéria	27/07/01	55
ACTIF-Area study F « Emergency call management » v1.1	Ph. Duthoit, Stéria	09/07/01	44
ACTIF-Area study G « Protection of privacy » v2.2	Ch. Hista, Stéria	27/07/01	79
ACTIF-Area study H « Short Range communication services » v1.7	F. Bessaguet, Stéria / G. Fremont, Cofiroute	03/09/01	68
ACTIF-Area study I « Geo-referenced information » v1.1	M. Girard, Magellan	16/03/01	75
ACTIF-Area study J « Dynamic positioning » v1.1	N. Bondarenco, Stéria	18/04/01	166
ACTIF- ARCST0073 « Real-time Road Information handled by the CIRs », v1.0	A. Popot, Stéria	15/09/01	129

Title	Organism / Author	Date	Pg
ACTIF- « Centralised multimodal travel management in Grenoble City», v1.2	Th. Boyer, Stéria	01/10/01	80
ACTIF- « SILEVIC system (Freight Tracing »	J-Cl. Renesson, AFT-IFTIM	19/09/01	195
ACTIF- « SITP project (Ticketing) »	P. Pietri, SETEC	n.c.	n.c.
ACTIF- « Traffic Data by mobile phone tracing »	A-F. Mahieu, Méga International	august 2001	61

Standardisation bodies and standards Web Sites :

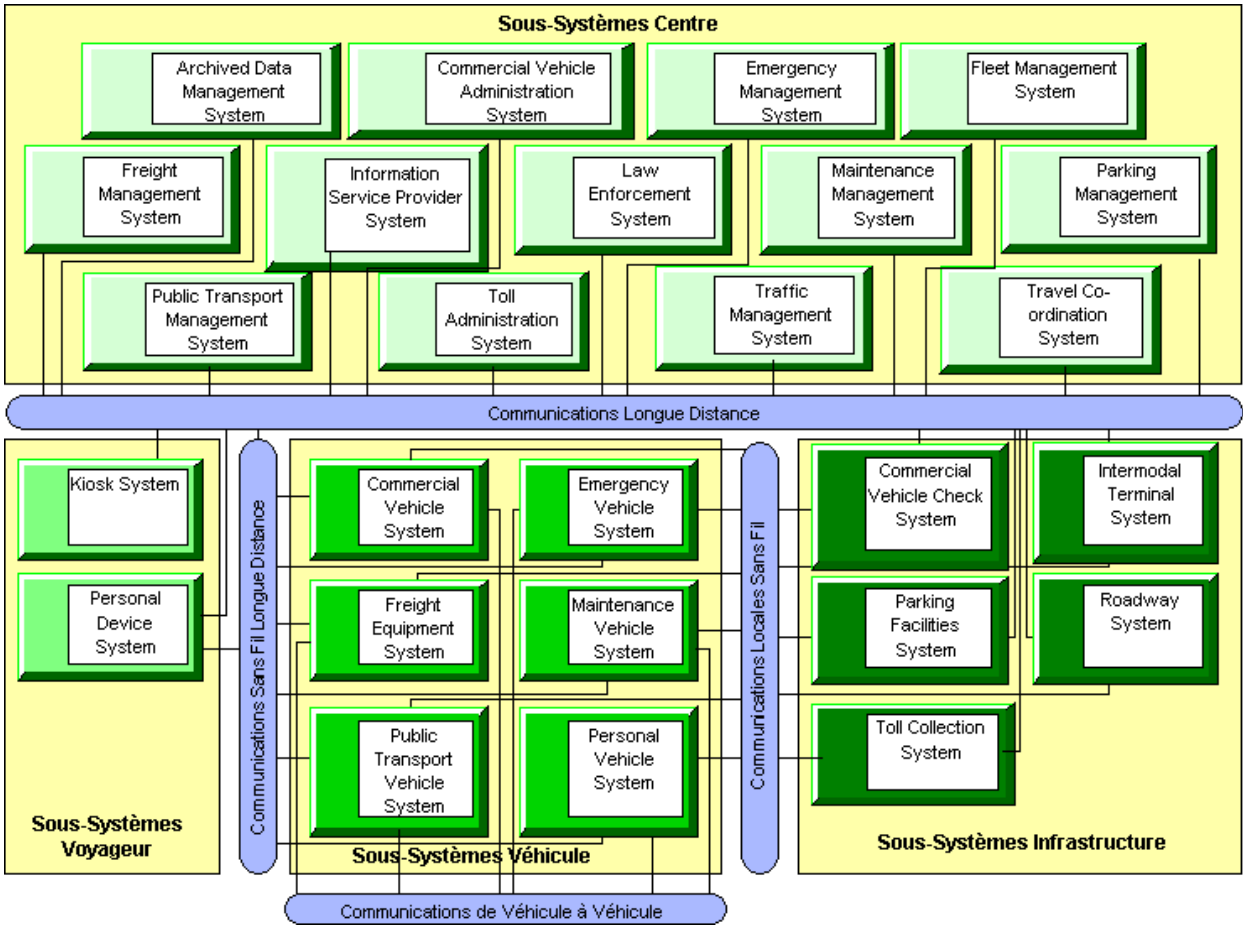
ISO	www.iso.ch	Describes namely the activities of the various TCs . It seems that a TC204 site managed by SAE is no longer maintained.
	www.itu.int	
CEN	www.cenorm.be et www.cenorm.be/sectors/transport/intertrans.htm	Second link, regarding namely transport intermodality issues.
	www.cenelec.org	
	www.etsi.org www.ebu.ch	
CEN / TC278	www.nni.nl/cen278	
AFNOR	www.afnor.fr	
DATEX, TEPG etc.	www.datex.org www.ertico.com/activiti/projects/trident/home.html www.tpeg.org	
telematics	http://www.magicservicesforum.org/ http://www.telematicsforum.com www.tmcforum.com/ www.wapforum.com www.bluetooth.com	MAGIC GATS WAP etc
Data Interchange Standards Association	www.disa.org www.oasis-open.org www.ebxml.org	EDI
LCR	equidyn.free.fr	
American ITS Standards	www.its-standards.net www.sae.org www.ntcip.org www.tcip.org www.ite.org/tmdd standards.ieee.org/regauth/its www.aimglobal.org	
Internet and NTIC Standards	www.ietf.org www.w3.org www.omg.org www.opengis.org	

	www.openls.org www.oag.com	
UTMC U.K.	www.utmc.dtlr.gov.uk	

6. ANNEX 1 – PHYSICAL ARCHITECTURE

The diagram hereunder represents the first layer of the framework architecture, namely:

- the systems categories studied
- the physical systems identified
- the flows between the various categories of physical systems.



7. ANNEX 2 : DETAILED IDENTIFICATION OF STANDARDISATION NEEDS

This annex goes over the different parts of Chapter 3 of the main document and provides a detailed analysis of the standardisation needs identified in each document.

7.1. Approach

Chapter 3 recapitulates the standardisation needs identified during the following stages:

- identification by KAREN project of the standardisation work to be carried out (reference: priority standardisation work as mentioned in § 5 « First Priorities » in Report D4.1 – KAREN deliverable , Summer 2000),
- report from Mandate 270 Phase 2 « Recommendations for a revised programme of standardisation and normalisation work for ITS in Europe" (reference : CEN TC 278, N1246, M270/2 Final Draft For Consultation, 17 September 2001),
- 10 priority area studies performed in the framework of ACTIF Project during Phase D (reference : ARCST0090-Synthèse des besoins en normalisation issus des études de domaine, Phase E, 21 September 2001),
- 5 project cases studies performed in the framework of ACTIF Project during Phase F (references in Annex Bibliography).

A separate analysis of each reference and a general overview are provided hereunder.

The aim was not to conduct an exhaustive research on the standards being developed or missing, but rather to focus on those which seem to be most relevant or worth developing.

Furthermore, the standardisation needs do not tell how to achieve standardised solutions (specifications broadcasted, because they were implemented by the main users/de facto standard/European or not de jure standard, etc.).

The general overview of Chapter 3 presents all the results in the form of standardisation works to be carried out, support actions to plan and players liable to be involved.

7.2. Analysis of the needs identified in KAREN D4.1 deliverable

The list of priority standardisation works mentioned in §5 of D4.1 « First Priorities » are recapitulated hereunder.

Work items and numbers are the same as in the intermediary working documents.

N°	Work item	Details	Comments
1	Traffic data exchange and localisation repository	Extend the traffic data dictionary to cover urban messaging.	The issue is on WG4 TC278 agenda (ALERT C +)
		Extend the standardisation of data exchanges to all transport modes (extend DATEX or use a CORBA/JAVA platform)	A common language for all transport modes is necessary. DATEX is too road-oriented (a more general language shall be chosen). Issue being handled by WG3 TC278 (TRANSMODEL)
		Enhance the urban/interurban messaging interface (extension of DATEX for example)	
		Standardise the exchange organisation to be implemented	YES. Organisation to be set up (authority ? cooperation ? joint organisation ? …). It is more a matter of proposal than of standard.
2	Road-vehicle communication system, toll applications and emergency calls included	Handle the issue of metallic windshields which may impair DSRC - type communications.	Handled by TC 22
		Harmonise European, American and Japanese specifications for DSRC	Work being handled by TC 278 and TC 204
		Reach a consensus regarding the format of basis information for emergency calls (localisation)	The Emergency issue is not handled. A purely French solution shall be implemented (organisation, refer to Area Study F)
3	Control centre – road communication systems	Define a common approach for Europe to evaluate the American NTCIP (National Transportation Communications for ITS Protocol); Regarding TCP IP-type solutions, standardise the data dictionary, exchange protocol and localisation repository more in detail.	Purely French standards exist today for road data exchanges (example : LCR, DIASER). However, a technico-economic study on a European harmonisation should be carried out.
4	Control centre – vehicle communication systems	Standardise the exchanges with the ambient condition management systems (pollution, noise, etc.)	Nothing. There is no standard for Traffic lights control giving priority to public transport vehicles.
5	Vehicle – vehicle communication Systems	Standardise exchanges providing for two security levels: a low level for information exchanges between drivers and a high level for vehicle platoons.	Under study by TC 22. example: allocation of radio frequencies (very/too complex issue, being abandoned) example: electronic warning (compatibility problem, radio wave,

N°	Work item	Details	Comments
			etc.)
6	On-board systems	Still in a research and evaluation phase.	It interests mainly car manufacturers and part manufacturers + TC 22.
7	Routing and traveller information	Standardise the interface between users, financial institutions and service providers.	Regarding toll payment, there are works carried out by ISO SC 17 (cards), CN 03 (Public Transport), TC 68 (Banks), and WG 3 TC 278, WG 11 TC 224 (Public Transport), WG1 TC 278, and WG TC 204 (motorway toll). Traffic data payment is not handled in KAREN: Subject to keep (find support by consumer associations and DGCCRF). *Note that payment is not a subject to standardisation*
		RDS-TMC: consider more sophisticated localisation repositories.	Work is being handled by TC 278 (almost completed).
		TPEG (at EBU)	
8	Law enforcement systems	Harmonise cross-border continuity procedures	Refer to M270/2
9	Freight and fleet management systems	Reduce the part of free text in EDI messages	(refer to EDITRANSPORT). Reactivate WG2 TC 252.
		Harmonise human-machine interfaces	Handled by TC22 and WP29 (in-vehicle HMI general rules, ONU, etc.) To consider in connection with works regarding plurilingualism, cultural adaptability (JTC 1/SC 35) needs specific to impaired/disabled and elderly people. (CEN/ISSS WS DFA)
		Integration of digital tachograph in on-board systems.	The use of the data gathered from the digital tachograph for corporate management and driver advice is not at all handled, though it is a major issue. The major part of control shall be switched from road to corporate control. FNTR would agree to enforce a non-stop vehicle control. Requires decision from State (bill).

N°	Work item	Details	Comments
			Actually, a national bill is effective only in a European framework, to apply the regulations 3820 and 3821.

In short, with the exception of the propositions which are rather a matter of Law or those which are almost finalised, the standardisation work identified from KAREN D4.1 deliverable relates mainly to:

- data interchanges (including traffic data, but not only ; urban/interurban / public transport dictionary),

- localisation data repository,

- international harmonisation of specifications for DSRC,

- basis information for emergency calls (format, content, localisation, etc.),

- payment for traffic data and road data in general (guidance, route, tourist information, etc.),

- HMI harmonisation,

- definition of a digital tachograph.

The “global synthesis” of the report (main document) recapitulates all these points.

7.3. Analysis of the recommendations from M270 phase 2

The table hereunder goes over all the recommendations made by the experts in the report referenced M270 phase 2 Final Draft For Consultation, N1246, CEN TC 278.

The first recommendations (R 1 to R 24) involve more the TC and WG organisation at a European level; then the recommendations are listed by KAREN functional areas they relate to. As ACTIF reuses all KAREN areas, this splitting is thus consistent for our presentation of the standardisation needs.

Comments feature the remarks collected from the experts we met in the framework of this study and from cross-readers. They may be contradictory.

Functional area	N°	Description	Comments
General	R1	Application of generic technologies	OK. Generic vision
	R2	Expand the scope of information services associated with other modes of transport.	OK. Encourage multimodality
	R3	R 3 5 6 Measures for supporting standardisation (increase synergy with CEN/ISS, etc.)	R3,R5,R6 : Measures for supporting standardisation (increase synergy with CEN/ISS, etc.)
	R4		
	R5		
	R6		OK. Encourage synergy
	R7	Reorganising TC to reflect KAREN business areas.	Issue to be discussed: A good idea to enhance legibility (similar to the pointing out of standards in ACTIF)
	R8	Reorganising ISO TC 204 around the Service Groupings of ISO 32 fundamental services.	
	R9	R 9, 10, 11, 12, 13, 14, 15. Integration of FRAME architecture and keeping the architecture and ISO/CEN convergences operational.	R9 to R24 : regarding Architecture, Standards, data standardisation... : very generic, not normative … thus not very convincing ! Some arguments supporting UML are nevertheless convincing.
	R10		
	R11		
	R12		
	R13		
	R14		
	R15		
	R16	Standardisation of communication interfaces (new WI)	
	R17	Cross-border continuity (FRAME deliverables)	
	R18	Standardisation of information exchange and communication protocols (extension to	

Functional area	N°	Description	Comments
		ISO 14817)	
	R19	Organisational standardisation, e.g. Interchange agreements (extension to ISO 14817)	
	R20	Location referencing including in urban areas, and its convertibility (extension to ISO 14817)	
	R21	Common data models/structures to create a stable basis for new and updated data dictionaries (new WI)	Dictionary: on-going work carried out by TC32 + conceptual data model The conceptual data model can be subject to standardisation (for Public transport, env Transmodel standard is on-going and almost completed. Regarding fleet and freight, this would enable to get all players together, which is very interesting.)
	R22	Standardisation of time and timing (new WIs)	R9 to R24 : regarding Architecture, Standards, data standardisation... : very generic, not normative … and not very convincing !
	R23	Keep FRAME architecture up to date (create expert groups within FRAME)	
	R24	Provision of a software tool, as a common resource, to support development of consistent national architectures in Europe	
DF1 Provide Electronic Payment Facilities	R25	Extend architecture for traffic and transport related Integrated Payment Services (extension of existing WI)	Already handled.
	R26	Identify and apply standards in Banking sector (investigation and deliverable to WG)	Already done for Public transport, not completed for motorways.
	R27	Extend the architecture work item to include provision for an interoperable ITP card (extension of ITP)	Very good: a single Transport Payment card. To carry out.
	R28	Define a limited number of smart card technologies for ITP card (report to WG et projects)	R27 to R31: OK. Valuable recommendations. “ITP” = Integrated Transport Payment « interoperable ITP card » = universal payment card
	R29	Define adequate standardised procedural interfaces between the payment terminals and their related backend systems (new WI)	
	R30	Define adequate standardised procedural interfaces between the payment terminals and their related fee-deciding environment (new WI)	

Functional area	N°	Description	Comments
	R31	Develop standardised conformance test procedures (new WI)	On-going. It must be completed.
DF2 Provide safety and emergency services	R32	Automatic speed constraints (new WI)	R32 to R38 : Not subject to standardisation : should solutions be developed on a case-by case basis ? Studies and prototypes should perhaps be developed before standardisation!
	R33	Standard for hardware communication links between rollover/crash sensor devices on hazardous freight vehicles (new WI)	
	R34	Development of standard for Incident Management to increase their interoperability (new WI)	
	R35	Development of standard for data bases to avoid manual entry (new WI)	
	R36	Development of standard for ensuring a direct transfer of incident logs (New WI)	
	R37	Formalisation of data for various media such as video, speech, touch (planned)	
	R38	Investigate and develop standards for hazardous materials (standardisation documents)	Already handled by numerous texts: clarification to be envisaged ?
DF3 Manage traffic	R39	Extend DATEX data dictionary to cover urban messaging (project team deliverable)	Already done, more or less (urban DATEX)
	R40	Standard for location referencing for meeting the requirements of data exchange between traffic control systems and public transport operators (new WI)	Priority at traffic lights: neither standardised nor necessary
	R41	Communication between traffic management centres and roadside equipment to ensure interoperability (statement in the new Work programme)	French standards already exist: (hence no priority; nevertheless interesting in the medium term)
	R42	Adoption of NTCIP ; further work on the data dictionary and message format (project deliverable)	Not advisable because it competes with what has just be done in France. However, it should be noted that the structure of the NTCIP standard is more legible than the LCR standard.
	R43	Interfaces between UTMC - urban traffic management centres - (statement in the new Work programme)	Not necessary .
	R44	Define elements for the sharing of UTMC information, particularly the common data base (project deliverable)	Not necessary. Note : from R39 till R44 : DF3 has been sufficiently handled: there is no significant standardisation need.
DF4	R45	Public on-board data transmission interfaces	…, public transport, lorries, …

Functional area	N°	Description	Comments
Manage Public Transport operation		(workshop)	
	R46	Public Transport Road vehicles on- board equipment: environmental and electrical conditions and limits (workshop)	Already covered by communication standards
	R47	Logical architecture standards relating to data for main Public Transport functions (standard)	OK. (env Transmodel)
	R48	Develop standard defining Public Transport customer information (standard)	Useful; already existing, but needs to be completed and extended to Internet portals)
	R49	Public Transport road vehicles visible variable passenger information devices (deletion)	R49: OK for deletion
	R50	Automated Ticket vending machine MMI (deletion)	R50: to be deleted ? item to be discussed.
DF5 Provide Advanced Driver Assistance Systems	R51	Develop a European process for in-vehicle MMI communication (standard)	From R51 to R55 : interesting (ergonomics, namely)- ISO TC 22 is handling it.
	R52	Design of speech interfaces (industry project TC 22)	
	R53	Standardisation of travel guidance systems, pictograms, symbols, abbreviations (standard TC 22)	
	R54	OBE to have interfaces to assistive technologies for input/output of information (provision in standards)	
	R55	Standards for in-vehicle black-box collision detection/ notification systems (standard TC 22)	In-vehicle black-box: YES, to be done.
	R56	Use of RTT to wake sleepy drivers up (standard TC 22)	With regards to in-vehicle equipment, it involves car and part manufacturers; standardisation should be done in this framework.
	R57	Standardisation of Guidance Information to avoid confusion (standard TC 22)	
	R58	Standardisation of ergonomic design of command and control systems. (standard TC 22)	
	R59	Design of CCR systems based on task analysis CCR (project)	
	R60	Common website/WAP site for traffic information in all European countries (commercial projects)	
	R61	On-board equipment to have interfaces to assistive technologies for input/output of	

Functional area	N°	Description	Comments
		information (commercial project)	
DF6 Provide Traveller Journey Assistance	R62	Standardisation of common message sets and coding schemas allowing for open applications (standard)	OK
	R63	Standardisation of location referencing schemas (standard)	Yes: geographic data repository to be handled.
	R64	Link with payment systems to perform booking and payment functions (statement in new Work Programme)	Not useful, today.
DF7 Provide support to Law Enforcement	R65	Common European vehicle classification Identification (extension to WI)	Opinion 1 : from R65 to R76 : there is no standard; it is rather a matter of regulation (bill) rather than standardisation. Opinion 2 : standards have not the same role as bills; they are complementary; nevertheless, all that is proposed to standardisation is perhaps not relevant: in my opinion, exchanges between administrations do not need to be officially standardised; specifications common to those administrations may be sufficient. Opinion 3 : regulation renders a standard mandatory. Attaching a technical text to a regulation is no appropriate method as it will be difficult to proceed with the necessary extensions, when necessary. One could say that the initiative in developing a standard is the responsibility of public authorities; however it is not the same. One can imply that no industrialist will be willing to bear the development costs of control standards, but it does not mean that these standards must not be developed in an open, consistent and transparent way.
	R66	Recommendation to develop and agree on a single set of vehicle classification parameters (European Directive)	
	R67	Standardisation of messages between authorities (national authorities)	
	R68	Develop common European data for cross-border information exchange (project deliverable)	
	R69	Data processing: development of a network to deal with cross-border enforcement (EU project deliverable and Directive)	
	R70	Standard to enable enforcement device homologation (CENELEC standard)	
	R71	Standard to specify tests for digital enforcement systems (CENELEC standard)	
	R72	Standardise the periodic verification of digital enforcement systems (CENELEC standard)	
	R73	Consider to initiate a European directive for harmonised digital enforcement procedures (European directive)	
	R74	Data storage and transmission data security and integrity (European project and directive)	
	R75	Digital imaging for automated video enforcement (standard)	
	R76	Stolen vehicle tracking – after-theft devices (standard)	
	R77	Digital tachographs/black boxes – development of a European standard for accident data recorders.	OK : standards to be developed.

Functional area	N°	Description	Comments
	R78	Standardised approach to limit value measurement evidence for Drugs and alcohol (European directive)	R78 to R89 : these are directives rather than standards.
	R79	Standardised approach to tolerances of speed measurement for enforcement. (European directive)	
	R80	Standardise data capture from the crash scene to the central unit (standard TC 278 and national authorities)	
	R81	Provide a common vehicle categorisation/classification in Europe to introduce a pan-European electronic vehicle (standard)	Interesting
	R82	Development of a European standard for criteria on automatic enforcement after EU political agreement (directive and standard)	
	R83	Harmonisation of methods of video conference in the courts of European states (European directive)	
	R84	Harmonise and adopt electronic readable driver licence (directive)	Why not ? (does not really belong to ACTIF scope)
	R85	Common standards and bilateral access to national driver licences and vehicle data bases. (directive)	
	R86	European Privacy Guidelines (directive ?)	
	R87	Harmonisation of levels of responsibility for road traffic offences across European countries (directive)	
	R88	Harmonisation of levels of penalty for road traffic offences across European countries (directive)	
	R89	European harmonisation of admissibility issues of black box/tachograph data in Court (directive)	
DF8 Manage Freight and Fleet operation	R90	System architecture merging different existing system architectures (standard or standard subset) *TC shall request to merge different approaches performed or started at several levels before KAREN was completed or ... without taken it into account .. in FRAME (one shall not anticipate the potential final*	1. it does not seem very interesting to standardise the architecture. 2. No OK: general recommendations, on architecture description for instance (see IEEE 1471) may be useful on a methodological

Functional area	N°	Description	Comments
		normative status)	level.
	R91	Conceptual model for intermodal information allowing freight tracing *TC shall request the specific merging of the results of various non-coordinated approaches explicitly specified, normative or being under study relating to Freight tracking architecture in FRAME (R 92 shall handle the conceptual data model relating to the intermodality issue).*	YES : important item to standardise !
	R92	Transport vision as integrated in the supply chain (summarised results of existing studies) *TC shall request the specific merging of the results of various approaches explicitly named (THEMIS / INTACT / ARTEMIS), relating to the integration of the supply chain or intermodality transport (TRIM data model), into FRAME.*	From R92 to R101 : these recommendations relate to studies. Freight and fleet world is difficult to address. It is indeed difficult to fund this work within the usual operating framework of the standardisation structures. However, it does not question the economic and social interest of these standards. Public funding and a management mode appropriate to this project must be foreseen.
	R93	EC and CEN/ISSS initiatives are required to use these approaches rather than develop new, inconsistent approaches *TC shall draw the right conclusions and avoid to start new Freight architecture works, as it is too often the case*	
	R94	The deliverables from EC and CEN/ISSS initiatives are required to be provided to the appropriate working groups for consideration and comment prior to finalisation *Complement to previous recommendation*	
	R95	The refinement at all levels and merging of different system architecture approaches addressing FFM aspects in Standardisation bodies and national initiatives. *In FRAME …*	
	R96	Messaging supporting Functions and dataflows (EDI) within the FFM system architecture (deliverable). *Continuation of CEN / CEFACT cooperation. The issue is indeed Standardisation (Cartography Architecture. Standards) and not deliverables. It concerns the merging of ITS architecture works and*	

Functional area	N°	Description	Comments
		CEFACT works (regarding transport messages) which migration towards XML using a data model is required.	
	R97	Bridging status reporting messaging with tracking and tracing intermodal and multimodal freight common aspects. *One shall ensure the implementation of the interface required between the Standardised Messages in connection with transport operations tracking/"information feedback". (IFTSTA for example) and the Standardisation of physical tracking tools for transport or transported units (bar codes, radio labels, etc.) and the information they process.*	
	R98	Extending messaging to Mobile data communication *Continuation or resumption of « EDIMOBILE » standardisation works regarding Messages as well as APIs (FAP for Fleet Application Protocol, for example).*	
	R99	Integrating On Board Systems Architecture and Interfaces for on board data communications. *Using COMETA contribution ?, standardisation works required by the proliferation of potential on-board systems (digital tachograph included) and of data to be processed on board or to be exchanged within networks shall be started (outside or completing ISO TC 22 works).*	
	R100	Specific investigation should address the future commercial vehicle drivers environment. *Realisation that after the HMI standardisation of intelligent vehicles in general, those relating to the tools specifically used in commercial vehicles shall be considered.*	
	R101	Hazardous Goods Monitoring and Control System at a European level could require the extension of KAREN (extension of standard) *System architecture works relating to the*	

Functional area	N°	Description	Comments
		transport of hazardous goods started in HAZEX should be resumed, with consequences on standards requirements.	
Technical area	R102	Creation of a new working group to mirror the activities of ISO TC 204 (extension to Work Programme)	R102 to R110 : these very much "technologies-oriented" ideas do not seem to be urgent (it is nevertheless interesting to study such technologies), but it does stand on the same level
	R103	CALM using GSM (extension to Work Programme)	
	R104	CALM using 2/2.5 Generation Cellular Communications (to Work Programme)	
	R105	CALM using 3G Cellular Communications (extension to Work Programme)	
	R106	CALM using 5,8-5,9 GHz Microwave technology (work programme extension)	
	R107	CALM using Millimetre Microwave technology (extension to Work Programme)	
	R108	CALM using Infra Red (extension to Work Programme)	
	R110	CALM using Network protocols (extension to Work Programme)	
	R111	Public Transport fare collection (extension to ISO 14813 and contribution of WG1/TC 278)	
	R112	Public Transport fare collection (participation in CEN TC 224)	

Shortly, the orientations identified by Mandate 270 phase 2 are the following :

R1: encourage the use of generic communication technologies (i.e. use as far as possible current standards worked out for the telecommunications, information and internet technologies),

R2: encourage multimodality (shifting from road to multimodal transport),

R21: design a conceptual data model for freight and fleet managers (common data model enabling to create a stable basis for new and updated data dictionaries, and much more),

R27: encourage the implementation of an Integrated Transport Payment card (using smart cards architecture ?),

R27 to R31, provide for an interoperable transport payment card, define a limited number of smart card technologies for paying transport services (ITP : integrated transport payment), define the interfacing procedures between the payment terminals and their related back-end systems and fee-deciding environment, define standardised conformance-test procedures,

R51, develop/adapt, design process related standards building on European Statement of Principle on HMI for In-vehicle Communication based services,

R55, define an In-vehicle" black box",

R 63, develop a standard for common location referencing schemas,

R 77, develop a standard for accident data recording (digital tachographs and black boxes),

R81, provide a common vehicle categorisation/classification to introduce an ELP (electronic license plate) identification system

R91, develop a conceptual model of intermodal information regarding freight management.

The data modelling and the definition of data and messages dictionaries and of localisation standards stand out as the most important items, which has already been underlined many times before.

To meet the standardisation needs identified by Mandate 270, it is worth stressing that it is advisable to use generic existing standards not only from the Telecommunications or IT technologies but also from transverse sector such as banking, packaging, customs, etc.

The "global synthesis" of the report (main document) recapitulates all these points.

7.4. Analysis of the needs identified in the 10 area studies

This part is based on document ARCST0090-« Synthèse des besoins en normalisation issus des études de domaines », version 1.0, from21 September 2001.

This overview is related with the framework architecture enhancement carried out following the priority area studies (Phase E); it is the result of a first identification of the standardisation work to be carried out.

The aim of this phase is to consolidate the results of the area studies with regards to standardisation.

The table hereunder lists the standardisation work to carry out in the framework of the 10 priority area studies.

Reference	Need	Impact on the architecture	§ and page
Study A : Use of ITS operations for transport planning	Standardise operating information : *This standardisation work could be carried out in the framework of the implementation of a datawarehouse-type tool within pilot projects, as recommended in the study in order to learn lessons, regarding namely the contract setting-up and organisation of exchanges and on the standardisation of operators' information.*	Datastores Physical dataflows between terminators and physical subsystems.	
	Standardise or coordinate data definition standards. *This would push on the thinking about meta data.*	Physical dataflows between terminators and physical subsystems Data modelling	5.3 p.67
Study B : Freight management on intermodal platforms	Standardise exchanges between all the players on a freight platform. *This can be done by creating a data model describing the manipulated objects such as hazardous goods and freight.*	Physical dataflows between terminators and Physical sub-systems. Data modelling	4.3.2 p.73
	Standardise exchanges related to localisation and arrival notification of goods on a platform using new dynamic localisation techniques.	Static and dynamic data (geographic reference data)	4.4.1 p.74
Study C : Co-ordinated urban travel management	Develop national standards related to the definition of communication elements between urban and intercity operators, e.g.: - Design of generic multimodal networks and data models integrating data related to Personal Vehicles and Public Transport (refer to SITP/VP project, extensions of Transmodel, etc.), - Standardisation of the traffic/travel management plan concept, - Dynamic data in Public Transport, - Geo-referencing (refer to Study ACTIF/I – Geo-referenced information).	Physical dataflows between terminators and Physical sub-systems. Data modelling Static and dynamic data (geographic reference data)	4.2.4 p.71
Study D : Route optimisation	Standardise access to raw information data on travels : *The information systems and routing systems must interface with numerous other systems or terminators to exchange lots of different data necessary for an optimum route calculation. Systems grouping data from various terminators shall be developed via in-depth work relating to the definition of information provision "contracts" and the development of standards defining the data..*	Dataflows and data modelling	p. 30
	Standardise access to information services on travels, standardisation of APIs: *Define exchange, interface ergonomics standards (standardisation of symbols etc.) such as dialogs between travellers and ISPs or between two ISPs.*	Kiosk, HIM Exchanges between ISPs, and between ISP, terminal and users	p. 55

Study E : Law Enforcement	(no standardisation need has been identified in this study)		
Study F : Emergency Call management	Standardise and automate information exchanges: - Start with a single entry point (112) in the Emergency Call Management process to enhance coordination between the numerous terminators. - Standardisation may also concern exchanges between the emergency services themselves.	"Emergency Management" physical sub-system	p. 4
	Defining a common language for the description of incidents using the localisation standards indispensable for interpreting information transmitted by telecommunication operators	Localisation dataflows, static and dynamic data (geographic reference data)	p. 38
Study G : Protection of privacy	Development of a safety standard to which the various terminators should adhere to be compliant with the framework architecture, and to exclude terminators' loss of confidence which would lead to limited information exchange, a prerequisite for a successful architecture. The standard should be based on a structured analysis of threats and challenges and define the actions to be taken.	Dataflows and Functions	p. 5
	Development of simplified standards so that the processing of the most usual data and of those presenting a lessen threat for privacy are subject of simplified formalities.		p. 18
Study H : Short Range Communication services.	Development and standardisation of warning transmission enabling inter-vehicle communication (200 to 1000 m range).	"Emergency Management" physical sub-system	p. 26
	In the framework of the user warning system, standardisation of protocols and data structures, including change of protocol version to enable the system upgrading.	"Emergency Management" physical sub-system	p. 59
	Transmission standardisation with regards to the ideal speed to be observed, depending on the vehicle position.		p. 60
Study I : Geo-referenced data	Standardisation of localisation data exchanges. Though the geographic information service providers are mode and more independent from network operators due to the development of their own on-field data collection network and from their teams providing feedback information, their relationships with the network operators must be encouraged. For this purpose, one could minimise the bulk of data to be transmitted during an exchange by standardising exchanges using an appropriate format such as GDF.	Geographic static data (reference data)	p. 62
	Standardisation of « Axis » and « Pole » localisation data, to guarantee a minimum interoperability between		p. 68

	« Axis » and « Pole » localisation data so as to be understandable by any receiving system. The solution would consist in designing and implementing a dynamic public service based on a request/answer formula where the requesting party sends to this service a list of localisation data to standardise.	Geographic static data (reference data)	
Study J : Dynamic positioning	Regarding dynamic positioning, basic modules necessary to create services, protocols for gathering localisation data, localisation data formats, etc. are still to be standardised. Define an open standard dedicated to the distribution of services related to navigation, telematics and geographic information. (vocation of MAGIC service) *One should focus on the way information is transmitted, hence on the development of a standard. One should namely handle the transmission of the precision associated to the indicated value.* Standardise the format of the data recorded in the last minutes (localisation, speed, date, etc.) and accessible. This will enable the setting-up of a reference, in case of dispute.	Geographic static data (reference data)	p. 5
	Standardisation shall be developed focusing on the three following points: - transmission of localisation data (precision included) - integration of a standardised localisation description within the other standards of functional data transmission - storage of localisation information.	Dataflows and data modelling Static data stores (repositories) and dynamic data stores	p. 79

In short, the standardisation needs identified in the 10 area studies relate to:

- Data modelling (definition standards, vocabulary), with a strong need regarding geographic data (both static and dynamic),
- Modelling of dataflows (definition standards: dictionaries and messages, protocols, grammar),
- Standardisation of traffic/travel management plans,
- User-friendly information display, namely for kiosks and HMIs,
- Single standards regarding Emergency Management Functions (dataflows, signals, etc.),
- Exchange security and confidentiality (for protecting privacy, namely),
- Definition of the digital tachograph.

The « global synthesis » of the report (main document) recapitulates each of these points.

7.5. Analysis of the needs identified in the 5 project case studies

Refer to § 3.5. Standardisation needs identified in the 5 project case studies» in the main document.

8. ANNEX 3 : ANALYSIS OF THE STANDARDISATION NEEDS IDENTIFIED FROM THE FRAMEWORK ARCHITECTURE

Standards identified as applicable to intelligent transport systems (refer to § 1.2.2 General approach) have been listed and linked to the framework architecture components.
This explicit modelling of the application scope of standards enables the identification of all physical flows having no associated standard. Resulting from a preliminary analysis, three main dataflow families have been identified:

- **Exchanges in connection with emergency management**:
  `EM.<target>_<name>,`
  `<source>.EM_<name>,`
  `ES.<target>_<name>,`
  `<source>.ES_<name>,`
  `EV.<target>_<name>,`
  `<source>.EV_<name>,`
- **Exchanges in connection with travel and traveller information coordination**:
  `TRC.<target>_<name>,`
  `<source>.TRC_<name>,`
  `ISP.<target>_<name>,`
  `<source>.ISP_<name>,`
- **Exchanges in connection with law enforcement** :
  `LES.<target>_<name>,`
  `<source>.LES_<name>,`
  `LEA.<target>_<name>,`
  `<source>.LEA_<name>,`
- **Exchanges between IT systems and operators or travellers**:
  `O.<target>_<name>,`
  `<source>.O_<name>,`
  `D.<target>_<name>,`
  `<source>.D_<name>,`
  `T.<target>_<name>,`
  `<source>.T_<name>,`

The acronyms used in the dataflows above are the following:

Acronym	English name	French name
EM	Emergency Management	Gestion des Urgences
ES	Emergency System	Système Urgences
EV	Emergency Vehicle	Véhicule d'Urgence
TRC	Travel Coordination	Coordination des Déplacements
ISP	Information Service Provider	Fournisseur de Services d'Information
LES	Law Enforcement System	Système d'Application de la Réglementation
LEA	Law Enforcement Agency	Organisme d'Application de la Réglementation
O	Operator	Opérateur
D	Driver	Conducteur
T	Traveller	Voyageur

For the current version of ACTIF (V2.0), the list of all physical dataflows to which no standard is associated is the following (ACTIF site gives the description of dataflows, naming rules and acronyms):

ACS.ISP_weather_data
ACS.MM_conditions
ACS.R_data
ACS.TM_weather_data
ACS.TRC_weather_information
ADM.AU_archived_data
ADM.OA_request
AE.ISP_atmospheric_pollution
AE.R_inputs
AU.ADM_request
CC.FLM_freight_data
CC.FRM_freight_transaction_data
CV.FLM_regulation_data
CV.O_output_data
CV.V_output_data
CVC.LE_fraud_notification
D.FE_input_data
D.FLM_input_data
D.FLM_payment_receipt
D.FLM_statutory_information
D.TC_inputs
D.TM_incident_notification
EM.ESP_identification_request
EM.ES_global_progress_report
EM.ES_incident_notification
EM.ES_intervention_request
EM.EV_emergency_data
EM.FLM_incident_acknowledgment
EM.ISP_route_request
EM.O_outputs
EM.PV_mayday_acknowledgment
EM.TM_emergency_route_request
EM.TM_incident_data
EM.T_mayday_acknowledgment
ES.EM_incident_notification
ES.EM_intervention_report
ES.EM_service_data
ESP.EM_identification
ESP.EM_map
ESP.FLM_resource_proposal
ESP.FRM_storage_answer
ESP.ISP_dynamic_data
ESP.ISP_static_data
ESP.PV_data
ESP.TA_service_data
ESP.TM_event_data
ESP.TM_network_data
EV.EM_progress_report
EV.R_priority_request
FE.D_output_data
FE.FEQ_output_data
FEQ.CV_input_data
FEQ.FE_input_data
FLM.D_output_data
FLM.D_work_information
FLM.EM_incident_notification
FLM.ESP_information_request
FLM.FE_equipment_raw_data_request
FLM.FRM_freight_status
FLM.ISP_hazardous_goods_info
FLM.ISP_route_request
FLM.ISP_situation_request
FLM.LEA_fleet_registration_request
FLM.O_output_data
FRM.ESP_storage_request
FRM.LEA_custom_declaration
FRM.LEA_hazardous_goods_request
FRM.O_output_data
ISP.CV_on_board_information
ISP.EM_route_plan
ISP.ESP_information_data
ISP.FLM_route_response

ISP.FLM_situation_response
ISP.O_responses
ISP.PV_during_trip_information
ISP.PV_pre_trip_information
ISP.TM_info
ISP.TRA_info
ISP.TRC_info
ISP.T_booking_data
ISP.T_trip_planning_data
IT.O_load_plan
IT.O_storage_plan
LE.CV_data_request
LE.CV_fraud_notification
LE.LEA_fraud_notification
LE.PV_fraud_warning
LE.R_fraud_warning
LEA.FLM_fleet_registration
LEA.FLM_law_violation_consequence
LEA.FRM_custom_acknowledgement
LEA.FRM_hazardous_goods_response
LEA.LE_fraud_data
LEA.LE_rules
MIM.ISP_informations
MM.ISP_data
MM.MO_activities
MM.O_responses
MM.TM_data
MM.TRC_maintenance_data_for_coordination
MMS.R_crossing_request
MMS.TM_incident_information
MMS.TM_strike_details
MMS.TRC_service_information
MO.MM_activity_status
MO.R_infrastructure_diagnosis
O.CV_requests
O.EM_inputs
O.FLM_input_data
O.FRM_input_data
O.ISP_requests
O.IT_informations
O.MM_commands
O.TA_inputs
O.TM_inputs
O.TRC_demand_management_inputs
OA.ADM_external_data
PM.ISP_carpark_occupancy
PM.ISP_parking_characteristics
PM.LE_fraud_description
PM.TM_carpark_inputs
PM.TRC_carpark_occupancy
PTM.MO_maintenance_needs
PTV.V_commands
PV.ACS_data
PV.EM_mayday_call
PV.ESP_data
PV.ISP_travel_planning_request
PV.LE_fraud_description
PV.RP_outputs
PV.RRS_data
PV.R_data
PV.TRFC_information
PV.V_outputs
R.D_info
R.D_status
R.ISP_floating_cars
R.LE_fraud_description
RP.MM_data
RP.PV_inputs
RP.R_infrastructure_data
RRS.PTM_coordination
RRS.PTM_services

RRS.PV_data

RRS.TM_environmental_data

T.EM_mayday_call

T.ISP_booking_data

T.ISP_trip_planning_data

T.PTV_inputs

T.R_pedestrian_presence

T.TM_incident_notification

TA.ESP_transaction_report

TA.ISP_service_price

TA.O_outputs

TA.TC_service_data

TA.T_outputs

TC.TM_incident_warning

TC.T_outputs

TM.EM_incident_notification

TM.ISP_environmental_info

TM.ISP_misc_infos

TM.ISP_network_characteristics

TM.LE_fraud_description

TM.LE_guidelines

TM.MMS_crossing_inhibit

TM.MM_maintenance_conditions

TM.MM_roadside_equipment_data

TM.MM_road_use_data

TM.O_outputs

TM.PM_carpark_occupancy_limits

TM.PTM_data_for_scheduling

TM.PV_regulations

TM.RRS_environmental_data

TM.TA_access_criteria

TM.TP_strat&pred_responses

TM.TRA_data

TM.TRC_environmental_data

TP.TM_strat&pred_commands

TRA.ISP_transport_policy

TRA.PTM_information_request

TRA.TRC_transport_policy

TRC.ESP_demand_data

TRC.ISP_travel_info

TRC.O_demand_management_outputs

TRC.PTM_pt_strategies

TRC.TA_charge_update_request

TRC.TM_requested_strategies

TRC.TRA_travel_info

V.CV_input_data

V.PTV_operational _data

V.PV_inputs

9. ANNEX 4: ITS STANDARDS IN THE USA: MAIN RESULTS

(Excerpt from Article « Open road : Interoperable ITS – a success story » R.J. Weiland, Traffic Technology International Aug/Sept 2001)

ITS standardisation work began in the United States in 1991 and US DOT's « ITS Standards » program in 1996. Overall, the 5 accredited US Standards Development Organizations have published 45 ITS standards, have 16 more written and in the process of approval and another 28 actively in progress. The ITS Standards Program was initiated by US Department of Transportation and its development supported by ITS America's CSO (Council of Standards Organizations).CSO members include the 5 SDOs (AASHTO, ASTM, ITE, IEEE, SAE) and numerous US associations (TIA, CEA, NEMA, SIA, NIST, etc.),

The CSO has been instrumental in fostering the establishment of a cooperative Data Registry of ITS data and messages.

From the beginning, ITS America's objectives included the development and adoption of ITS standards as a mechanism to advance ITS interoperability and build the ITS more rapidly. In 1995, it conducted a survey of the standards priorities of the North American ITS community which identify 44 highest priority standards to be developed as well as the names of ITS professionals who were candidates to form the core of standards-writing committees. ITS America and US DOT have stated their intention to conduct a new survey of North American ITS standards priorities in late 2001 and early 2002, as a check point on the program and as a guidance for the future.

Standards under development relate to :

- Traffic control devices, including actuated signal controllers and other standards related to the NTCIP
- Public Transport (TCIP)
- ITS Data Registry (www.standards.ieee.org/regauth/its)
- Incident management, including extensions for public safety and hazardous materials (IM, HG)
- Advanced traveller information systems (ATIS)
- Converting the Location Referencing Message Set (LRMS) standard to XML
- Advanced Traffic Management System, specifically the Traffic Management Data Dictionary (TMDD) and the standard for External Traffic Management Center Communications (ETMCC)
- DSRC standards in the 5.9 GhZ band
- Archive Data Management Systems (ADMS)
- Standards for the use of ITS technology at highway-rail intersections.

The US DOT's policy with regards to ITS standardisation includes:

- an active participation of the US DOT in the development of standards; nevertheless, its role will not be too strong so that standardisation is largely left to the SDOs and industry experts
- a selective funding of consultants, to carry out a set of preliminary studies supporting the initiatilisation of certain standardization works
- funding of the participation of public agencies in standards development
- support of US participation in the development of international ITS standards (ANSI representation in ISO).

While several million dollars is clearly a lot of money, it represents only a tiny percentage of each SDO's overall budget, a small percentage of each SDO's ITS budget and far fewer dollars than the value of the volunteer resources which continue to be the mainstay of the process. US DOT's ITS Standards Program has generally focused on standards that address key interfaces, the criteria for funding an SDO proposal including evidence of broad support for the proposed standard, enough interested volunteers to populate the standards writing committees and clear expected benefits in terms of regional and/or national interoperability. The 45 ITS standards approved by SDOs have taken, on average, less than three years to develop. A quick analysis revealed that many of the more slowly moving standards were infrastructure oriented. Infrastructure standards have both a small customer and a small vendor base.

However, the center of gravity of US DOT standards funding is moving from development to deployment support, i.e. making information available on ITS standards (http://www.its-standards.net), testing the standards in real-world deployment, training and technical assistance.

In January 2001, US DOT published a rule that requires that ITS project carried out using funds from the Highway Trust Funds conform to the National ITS Architecture and applicable standards. However, the current set of « applicable standards » is empty … The only rulemaking process that has been started addresses standards for DSCR associated with Commercial Vehicle Operations (CVO), but despite 10 years of work no standard for electronic toll collection has come to pass. The US DOT is however going through an extensive test activity to show how the CVO specification will work.

US DOT has made it clear that it would not even consider Federal rulemaking unless the standard was approved by an SDO, successfully tested in real-world applications, at least moderately well accepted by the community served by the standard, clearly implementable, and adequately documented to support deployment.

A more likely course for ensuring conformance to relevant standards was recommended by recent study conducted for US DOT by ITS America. Recognizing the general unattractiveness of rulemaking as a conformance mechanism, the study recommended that US DOT focus its efforts on outreach related to standards whose benefits have been clearly demonstrated in terms of system lifecycle economics and/or national/regional interoperability.

10. ANNEX 5: ITS INTEROPERABILITY AND THE ROLE OF ARCHITECTURES AND ACTIF

10.1. The challenges of interoperable ITS

10.1.1. As ITS are being developed...

Transport systems are said « intelligent » when they are able to use and exploit information. Over the last years, Intelligent Transport Systems have experienced major developments and have been implemented in numerous areas, namely in France. Their role is expected to grow in a very near future as new information technologies rapidly spread throughout our society ; that is more particularly the case in the field of Transport where there is a growing need to optimise existing infrastructures and to integrate the existing transport modes in order to enhance mobility without increasing the associated nuisances.

10.1.2. ... the need to integrate them becomes more or more evident.

Integration (and consequently architecture) needs vary depending on the application field, the geographic area and the players concerned. Furthermore, the integration level within applications or systems may be more or less important. Four major groups of players, i.e. public authorities, users, operators and industrialists, broadly influence the integration dynamics. The need for a global ITS integration becomes today more and more urgent :

- for public authorities, because they must enhance transport intermodality
- for operators, because an operator or several operators have to integrate its/their applications, within an organisation or on several sites (corporate information system)
- for individual or professional users, because user information services tend to develop more and more (information society)
- for suppliers, because systems integration solutions are today available
- internationally, because approaches similar to ours have been implemented in other countries and because an ITS market is developing.

10.1.3. Successful projects depend heavily on the system architecture...

When developing a specific system or application, architecture design is a major phase of the development process as it provides a high level description of the system, prior to technical design. Choices in terms of architecture impact very much the solutions developed afterwards. Every calling into question of these initial choices results in new, in-depth and expensive developments. Moreover, architecture faults appear only later, when the systems are upgraded. The role of architecture is thus all the more important because the system is complex, open (and hence all the more likely to be extended) and has a longer life cycle. These choices require both an anticipation effort and a global approach. Development mode and architecture are closely linked: depending on the resources and skills available, what should be specified, sub-contracted, purchased as « off-the-shelf » product ? A clear definition of the architecture facilitates indeed its distribution throughout several sites, and encourages hence both its re-use and standardisation.

10.1.4. ... however the system architecture does not solve integration issues

ITS proved that there were able to enhance the efficiency and security of transport systems while minimising nuisances. Their use is expected to increase as they are being implemented and interconnected on a large scale, i.e. networked. Today, operators, companies or services operators have implemented systems for their personal use. But ITS involve lots of players, those belonging to the transport world as well as new players such IT systems providers. Deployment on a larger scale, which would enable the market to « take off », and the systems interconnection which players now want to implement encounter difficulties: new needs not properly taken into account, namely interconnection needs with third parties, no well structured ITS components markets, poor visibility on future deployment. A framework and a vision able to encourage planning and interoperability are acutely required.

10.1.5 ...that's where the framework architecture plays a major role

A possible solution to the problem consists in designing a framework architecture which would allow for the needs of all the players (grouped in a « forum »), serve as a reference for the development of system architectures in a view to deploying new services, products or applications, then identify standards to be used or developed to encourage system interoperability and enable the drafting of recommendations for public authorities responsible for this sector. The ITS framework architecture can be compared with a « Master Plan ».

The multiplicity of players, applications and ITS to be integrated requires to work on a level higher than the system or application level . Situating at this higher level, the framework architecture targets the following objectives:

- enhance communication between players,
- plan the integration of systems to better anticipate difficulties,
- identify the technical items (interfaces) to be standardised ,
- propose a framework and an approach for each area concerned,
- work out possible deployment scenarios, in the medium term.

so as to answer to the statements we made above , i.e. :

- ITS involve a multiplicity of players,
- there is a need to integrate systems at different levels,
- numerous systems, services, standards already exist or are being developed,
- there is a need to master system and service deployment projects, on a technical level,
- the ITS « market » is today neither properly identified nor structured.

10.2. Context

10.2.1. Context

Numerous CASE tools and methodologies and even numerous standards (ISO/IEC 15288, ISO/IEC 12207, ...) are today available, which also relate to the way to describe architectures (IEEE 1471). This text does not describe a methodology and the words may be inappropriate; hopefully it will be understandable by everyone.

"System" will be used as a synonym for application (ITS); a Project Owner (an organisation) operates several applications possibly interconnected to each other (and with external ones) and these applications form its « information system ». An application encompasses both software and equipment, not only hardware stricto sensu (field equipment, micro computers, on-board terminals, smart cards, etc.). However, the document focuses on the software aspects which appear to us vital with regards to interoperability (subject of this text and prime objective of ACTIF). As a matter of fact, we address here interoperable applications, which means – when referring to Telecoms - working on « higher level » layers (corresponding to « transport » layers, in ACTIF) , though we are well aware that few lower level ITS layers (DSRC, some field protocols) are specific to ITS ; that is why the report from Mandate 270 CEN Phase 2 recommends to use generic protocols. Interoperability is here defined as the capacity for two or several systems to exchange information and to use the exchanged information.

In an ITS project, the following products are worked out more or less systematically :

- opportunity: market and case studies, watch, demonstrator, analysis of regulations, identification of needs
- feasibility / definition : list of needs, requirement specifications, contracts, specifications including data dictionaries and models, standards and protocols, recommendations with regards to ergonomics
- design / development / tests: test tools, market products, project documentation, project architecture
- operation
- maintenance and upgrades.

10.2.2. Interoperability scenarios

ITS projects scenarios may be as follows :

-1- **a Project Owner develops a system** (possible variants: upgrade the existing system) :

In the « basis » scenario, the prime focus is not interoperability but rather the re-use of generic documents or software developed in standards, area working groups, etc., for example. At the highest level, the contribution of ACTIF framework architecture is only small, and relates to the system opportunity and definition. In the long term, it is expected that ACTIF will help define ITS standard components, encourage their deployment and benefit to individual projects.

-2- **a PROJECT OWNER interconnects several corporate systems**

Regarding corporate IT systems, two levels are distinguished :

- the application (including thus the ITS application)

- the Information System « Master Plan», i.e. a consistency analysis of all the applications managed by a specific PROJECT OWNER ; this level should allow to tackle interoperability problems between applications efficiently, and also to define more systematically the interfaces with the other applications (managed by other PROJECT OWNERS). ACTIF focuses more heavily on the exchanges between Information Systems from different bodies, but the IS of an organisation will also be able to use generic standards and products (including ACTIF's ones).

-3- **two PROJECT OWNERS interconnect their systems**

This features a specific, « one to one » interoperability. If both applications exist, an exchange interface shall be specified and the associated gateway shall be developed (tested, implemented). Should one of the system has to be developed, generic specifications and products may be used, when needed.

-4- **several PROJECT OWNERS develop a common system**

This scenario can be compared to the first one, once an organisation has been defined for the PROJECT OWNER chosen as the organisation in charge of the common application (a consortium grouping together the PROJECT OWNERS concerned, for example) ; otherwise, exchanges between the Information Systems from different PROJECT OWNERS take place (see following case). A significant case is featured when a national application is developed by the French Ministry of Transport (digital tachograph, for example), where several different PROJECT OWNERS are naturally involved.

-5- **several PROJECT OWNERS interconnect their systems**

This features a specific interoperability within a closed PROJECT OWNER-users group, a regional ticketing system or an user information or traffic management system. In other words, it is a sort of « mix » of the two previous cases: there is every chance that an application part common to all partners has to be developed, and for the rest, that the applications interconnect "one to one" with the common application or otherwise directly "one to one", on a case by case basis. When the application is complex, a preliminary internal « Master Plan » approach will facilitate the identification of the current applications to be interconnected and of those still to be developed.

-6- **a "regional" PROJECT OWNER organises the systems interconnection within its « region »**

It is a « regional » architecture approach (a region may be a built-up area, or whatever relevant area with regards to transport institutions, i.e.: region, "département", country, urban communities, etc.) which the US have implemented for ITS, for example. It is the prime target of ACTIF as well as the scenario for which the use of the framework architecture should be the most natural (even if TURBO Architecture-type tools have to be implemented).

-7- **several PROJECT OWNERS want to interconnect their systems**

That is the case of ITS areas (ticketing, driver assistance, freight platform, etc.) where the « communities of players » set itself the target to define generic tools and documents enabling « open » systems to be developed, most often in connection with the standardisation work. Even if ACTIF contribution is less direct at this level, co-ordination between ACTIF and each ITS area shall be close as the framework architecture has to allow for « business » viewpoints. Generic work regarding each area is of course intended to be re-used in the six first scenarios above.

10.3. Tools promoting interoperability

As stated before, an ITS project (whatever the scenario may be, and also when those scenarios are extended to ACTIF and to standardisation working groups) is set to produce several documents and tools [11], during its life cycle.

10.3.1. Documents

Basis documents promoting interoperability focus on the data interchange and interfaces. These documents are the following, in ascending order (each document being dependent on the previous one):

- **specification of needs**

This type of document is seldom available though it serves as a basis for describing the project and applications. UML may be used for specify needs, but not necessarily.

- **glossary and " reference terms "**

Basing on the specification of needs and a brief description of the organisation (main players and users), the main terms (terminators, information, functions) can be taken out and described in plain French. A glossary of the terms explicitly defined is a valuable tool for all partners wishing to interconnect their systems.

- **dictionary**

It describes the data enabling a computerised interchange. XML can be used to describe this data ; to ensure its proper transmission, encoding rules have to be defined and complied with, in any case. At a higher level, the dictionaries shall be compiled in a data repository (refer to ITS Data Registry in the USA or UTMC Data Object Registry in the United Kingdom).

- **data model**

Actually, the various data to be interchanged are often linked to each other, within a data model. Basis data can be for example combined into more complex data, sometimes called messages, and their formation has to be specified. The model can be written in UML (if it is an « object » model).

[11] *Documents where UML and XML (standards often referred to herein) can be used are specified.*

- **(API) interface specifications**

Beyond the simple supply of « raw » data, interconnected applications can provide services (functions) to each other using interfaces (travel time, routes, etc.). The data exchanged via the interfaces are compliant with the dictionary. To describe these interfaces, a specific language, IDL, which is independent of the programming language (C, Java, etc.) is generally used. When XML is used, the interfaces could be accessed on internet via SOAP protocol.

- **reference architecture**

In the same way as pieces of information are linked to each other, the functions provided by the interfaces are often linked to each other within the same application : it is the reason why an architecture document shall describe the global rationale of the service, including the common technical mechanisms (CORBA/IIOP, WAP, SOAP, etc.) to be implemented. The architecture can be described using UML (using normally an object model describing in a consistent way the data model information and the methods or functions provided by each object).

10.3.2. Test tools

Products re-usable for interoperability are not limited to documents. Software may also be considered as a product.

- **Test software**

Whereas "individual" projects always require the development of test software, gateways or simulators, software common to a given area or a specific application may be made available for projects. This software may be freely accessible, enabling the source code to be accessed and to be customized to specific needs, if needed.

- **Certification procedure**

In addition to the test software enabling to check compliance with such or such interface, a certification procedure can be initiated (for a national project or an application area, typically, in the framework of a standard), which requires a specific organisation.

- **Demonstrators**

For a specific application, namely during the prototyping phase, it can also be of interest to provide demonstration software, freely or in open source, in order to promote the application. This practice is commonly used by software editors, but it can also be used by public or private consortiums in an ITS area.

10.3.3. Organisation of PROJECT OWNERS

Other documents which are not directly in connection with systems interoperability can make PROJECT OWNERS' work easier, i.e.:

- **Specification of technical/particular clauses and contracts**

It can be of interest to disclose those documents (only to closed players groups, possibly) and to design generic Specifications of technical clauses or typical contracts on the basis of a set of similar projects.

- **IT Master Plan**

PROJECT OWNERS (the bigger ones, especially) supply more and more often a framework document, named IT Master Plan, which maps its applications and describes the main features of its IS. This type of document may be designed using UML. Such documents may be published by PROJECT OWNERS or drafted by a collegial PROJECT OWNER in case of a major national project.

10.3.4. Generic "framework" documents

Other types of documents drafted for the ITS sector in general may be of interest to projects. ACTIF should act as leader in the working out of these documents.

- players/ projects / products / bibliog. Base; case studies and market studies :

It may be useful for a project to have information available which allow to know how it stands with regards to other applications and to the framework architecture. ACTIF may be used to capitalize this type of information.

- **navigation tool / Turbo**

It is exactly where the ITS framework architecture shall have to play its role, as it will be particularly helpful with users training and for the regional architectures we expect to be set up.

10.3.5. Other tools

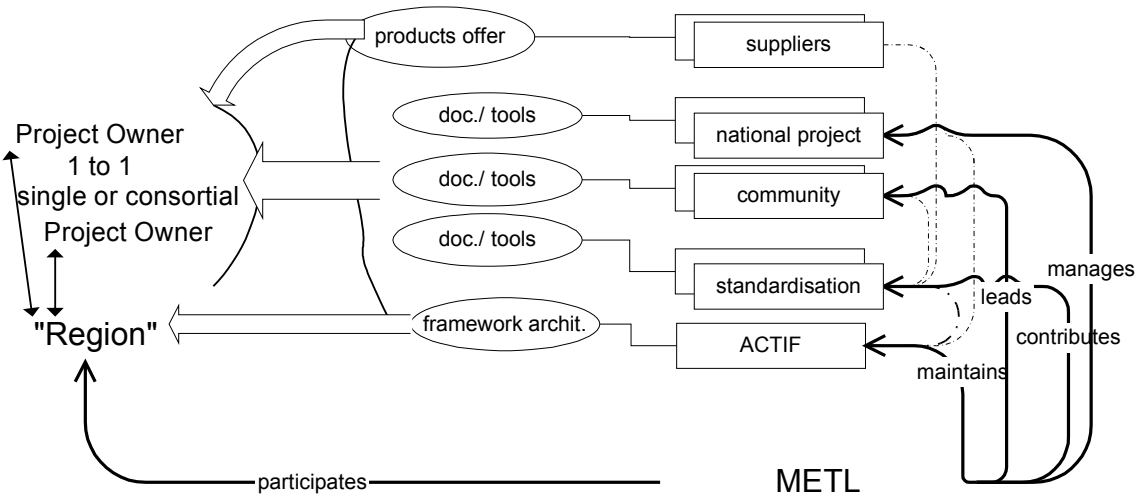
Interoperability is not the single objective of ITS projects and the services to be provided require additional generic tools, standards and documents. They can namely use (or been forced to use) other types of standards relating to methodologies, processes (quality processes, for example), security, HMI, metrology, regulations, etc. But that is not the subject of this article.

10.4. ACTIF's role

Interoperability problems between ITS result for a large part from the complexity of transport systems run by multiple PROJECT OWNERS (and private users). That is why ACTIF focuses on the interfaces between systems, but interfaces can also be a means to develop re-usable components : that is a major feature of « ACTIF approach ».

The figure hereunder briefly describes what has been said above and features the interactions between ACTIF and the various players involved in the different types of scenario, the role of the French Ministry of Transport as well as the tools and documents made available to concrete projects to encourage interoperability.

A new group of players is represented on the figure, i.e. the suppliers: they have not been mentioned before as we only considered the PROJECT OWNERS, as users of ITS ; it is obvious that they play a key role in the system development and implementation. They can re-use the documents and tools (specifications, etc., when available) produced by the standardisation work or area communities, in which development they have moreover often participated.



The French Ministry of Transport (METL):

- participates in the development of regional architectures and local projects, via its operational services namely (such as DDE, etc.),

- manages several general-purpose projects (digital tachograph, etc.),

- acts as leader in the area communities (ticketing, passenger information, freight, etc.),

- participates in the standardisation process (identification of standardisation work in ACTIF, supporting actions),

- controls and maintains ACTIF.

To simplify the figure, we did not represent the co-ordination between METL and the European level, which is implicit for the whole ITS. Moreover, we neither represented the organisation within the METL services handling ITS in general, nor the co-ordination with the transport sector's activities in general. This has to be defined as « ITS » activities cannot effectively be run if they are not linked with those transport activities.

Several areas and projects have been analysed in ACTIF/1. Basing on these studies, it could be possible in the future (ACTIF/2) to list ITS areas and applications and describe, in the form of « problem sheet », the associated interoperability problems (players, types of problem / scenarios - interoperability, further constraints, etc., geographic areas, relative importance of the 4 levels - strategic / tactical / operational / technical -, timescales, monitoring of on-going or planned actions) ; this would enable to maintain a summarized information up-to-date and to make relevant decisions regarding the joint solutions to be developed. Those sheets could be incorporated in the Base Players, Projects, Products, Bibliography, Standards. That is also the idea behind « flash » case studies, i.e. making a flash diagnosis (a single page, for example) on the situation in a specific ITS application area by describing a maximum of projects or even all projects concerned and by leading a group involving the community of PROJECT OWNERS and players of the area.

11. ANNEX 6 : GLOSSARY

ACTIF	Framework Architecture for Intelligent Transport in France (Architecture Cadre pour les Transports Intelligents en France)
AFNOR	French Standardisation Organisation (Association Française de Normalisation)
CDM	Conceptual Data Model
CEI	Commission Electrotechnique Internationale (IEC : International Electrotechnical Commission)
CEN	European Standardisation Committee (Comité Européen de Normalisation)
CENELEC	European Electrical Standards Normalisation Organisation (Comité Européen de Normalisation pour l'Electrotechnique)
DSRC	Dedicated Short Range Communication (Communications dédiées courte portée)
EFC	Electronic Fee Collection (Péage électronique)
ERTICO	European Association for Intelligent Transport Systems and Services
ETSI	European Telecommunications Standards Institute (Institut européen de normalisation des télécommunications)
FRAME	European ITS Framework Architecture Project
ISO	International Organization for Standardization (Organisation internationale de normalisation)
ITS	Intelligent Transport System
JTC 1	ISO / CEI Joint Technical Committee "Information technologies"
KAREN	European Project -Keystone Architecture for Road Network
NTIC	New Technologies of Information and Communication (Nouvelles Technologies de l'information et de la communication)
RDS-TMC	Radio Data System – Traffic Message Channel (Radiodiffusion de données – canal de messages d'information routière)
RTTT	Road Transport and Traffic Telematics (Télématique des transports routiers et de la circulation)
TC	Technical Committee (Comité technique)
TIC	Transport Information and Control (Information et exploitation routière)
TTI	Traffic and Traveller Information (Information aux voyageurs sur la circulation)
WG	Working Group (Groupe de travail)
WI	Work Item (Sujet de travail)

END OF DOCUMENT

----------TABLE DES PARAMETRES ----------

Paramètre	Champ
Référence	ARCST0074
Version	1.4
Date	21/12/2001
Titre	RAPPORT SUR LA NORMALISATION
Projet	ACTIF
Client	CETE de Lyon
Auteur	Isabelle Thomas / Antoine Popot
TDMmode	0
TDMde	1
TDMsur	1
ClientSIGLE	SIGLE
ClientSA	client
ClientLe	le
ClientLeM	Le
ClientDu	du
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----------TABLE DES PARAMETRES ----------