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Intelligent transport systems — ITS Safety and emergency messages using any available wireless media — Data registry procedures

Systèmes intelligents de transport — Messages de sûreté et d'urgence pour les SIT utilisant tous les moyens de transmission sans fil disponibles — Procédures d'enregistrement des données

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Foreword

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

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

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

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

ISO 24978 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

Introduction

The scale of death and injury on the roads of the world is recognized as a significant problem. To use a relatively safe continent, Europe, as an example, the European project Emerge calculated that in the EU, in 1998 (then including 15 countries), there were 43 000 dead and 1,7 million injured on the roads. By 2004, collated national statistics showed that the toll still exceeded 41 000 dead and 1,5 million injured. The death and injury toll in North America is at a similar level, and although, pro rata, the death and injury rates in Japan are at a slightly lower level, they remain unacceptable. Despite an aggressive road-safety policy, the statistics are slightly worse in Australia. In the emerging countries, the death and injury toll is significantly higher in almost every country.

As a result, in a series of initiatives around the world, governments have committed themselves to halving this carnage within a decade. In most of the developed world, where there have already been strenuous efforts to make the driving experience safer, it is becoming increasingly more difficult to make further improvements using traditional techniques. Intelligent transport systems (ITS) are therefore seen as being the key to achieving the ambitious targets that have been set.

Many ITS systems involve the exchange of data in order to provide services, and particularly safety services. Data is, and increasingly will be, sent from the infrastructure to the vehicle, from vehicle to infrastructure, from vehicle to vehicle, around the vehicle, and around the infrastructure. Much of this data remains within closed systems; however, an increasing amount of data can be shared to improve ITS service provision, and in particular, improve the safety of the driving experience and make a major contribution to the reduction of the death and injury toll. A number of intelligent transport systems/eSafety initiatives, such as "eCall" and "Automatic Crash Notification" crash messaging systems, are being developed. The European eCall project has an ambitious target to automatically provide, across the whole of Europe, a common 'minimum set of data' (MSD) to public service assistance providers (PSAPs) in the event of a crash.

Some of these data concepts, such as the MSD, are or will be defined and declared in International or Regional Standards, but much of the available and potentially useful data is not codified, and can be difficult to codify in standards because of differences between proprietary systems, and the speed at which the rapid evolution of systems provide data, which is much faster than the standardization process can agree and codify it.

Some of this data can be very useful to relevant third parties in crash, crash avoidance, crash mitigation and emergency systems. For example, a vehicle manufacturer can generate information about the number of persons in a vehicle, whether those persons are large or small (to ensure that airbags inflate safely), and they can monitor tyre pressure, speed of travel, etc. The available information can vary from vehicle model to vehicle model, can differ according to the manufacturer's market strategies, and will certainly differ and evolve over time so that the data available in a particular model in 2015 will be enhanced or different to that available in the same model in 2010. In these circumstances, it will be difficult or impossible to 'standardize' the available data as this would slow down the speed at which additional safety measures could be introduced, and interfere with the marketing incentives to provide additional safety services.

However, vehicle manufacturers might be able and willing to share that information with the emergency services, and might need an easy way to share information in collision avoidance and accident mitigation systems (such as ice and slippery-road alerts) and indeed might wish to collate data in order to more quickly identify and rectify design and software faults and reduce their exposure to liabilities. Road authorities might wish to make national data [such as variable message sign (VMS) information] available to vehicles in advance of international standardization of VMS messages or to deal with messages peculiar to that country.

While Europe can succeed in defining and codifying the common data concept known as the MSD, and can succeed in persuading vehicle manufacturers (by encouragement or legislation) to make this data available in the event of a crash or emergency, this will not pertain around the world. Other global initiatives, such as the 'Global Standards Cooperation' task force on automatic crash notification and emergency messages, can define additional or different data concepts. As described in the examples given in this introduction, vehicle manufacturers themselves will define data concepts that can be useful in the event of a crash or emergency, and to otherwise improve the safety of the driving experience.

As technical capability improves and as more attention is given to safety-related services, it becomes imperative that transmitted messages can be quickly and clearly understood by the recipient, or by both parties in interactive safety systems.

There can be a wide variety of message recipients. In the case of emergency crash messages, this can be a public service answering point (PSAP) which can be highly automated, or it can be a simple human respondent whose requirement is to get some precise, and accurate, human readable data to support a telephone call to the emergency services. At the other end of the scale, in respect of automated collision-avoidance systems, and other automatic safety ITS services, this can be a vehicle-vehicle, infrastructure-vehicle, or vehicle-infrastructure communication. Throughout the whole range of such messages, it is crucial that safety-related messages be quickly, clearly and unambiguously understood by the recipient.

This requires that the definition of the data be not only precise, but also freely available, whether available to system designers at the point of system design/deployment, or immediately available to a PSAP or other relevant recipient in respect of situations such as emergency crash-notification systems. This requires the availability of a common data registry as a repository for these safety-related messages and data concepts.

This International Standard provides the framework for the standardized operation and quality of service for one or more freely available data registries for ITS safety messages and data concepts.

The definitions in this International Standard are consistent with ISO 14817 (ITS Data Registries) and ISO/IEC 11179 (General principles for data registries).

In respect of automatic safety systems, such messages are normally determined at the point of system specification. However, in practice, in-vehicle technology is already developing rapidly, and will continue to do so, and new and additional data can well become available during the life of a system. In case of emergency, vehicles will have available data on board that can be useful, indeed vital, to PSAPs. For liability reasons, now that vehicles are data rich, vehicle manufacturers can well equip vehicles with an "Event Data Recorder" (EVR), the equivalent of the aircraft "Black Box". Such a device can identify factors such as the speed of the vehicle immediately before the crash, acceleration/deceleration rates, whether anti-lock or traction control systems were activated, etc. Future vehicles can also carry data from collision-avoidance warnings and collision-avoidance technology: how many passengers, what gear the car was in, etc. Where these systems (or other useful and related information) are available, they can provide very useful and timely information to a relevant recipient such as a PSAP; it cannot, however, be "required" as part of a "Standard" message.

The resultant "ITS Emergency and Safety Data Registry/Registries" are therefore likely to contain a mix of standardized data concepts, proprietary data concepts, and data concepts designed for national or regional use.

Additionally, there is the important consideration that equipment introduced into vehicles in 2010 can still be operational in 2040, whereas wireless communications media have much shorter life expectations. So in addition to new and additional data concepts, the means of carrying these across wireless media will also change. This International Standard is therefore media independent. It does not specify any particular means of data transfer; it simply enables data that is transferred to be unambiguously understood by the recipient.

To improve the veracity of receipt of crash information, rather than relying on a single media, it is felt that, in many circumstances, such vital information is sent, where possible over multiple media, indeed using each and every available media.

It is also not the intention that there will necessarily be a single global ITS emergency and safety message data registry, although this can be desirable for specific reasons. Regional or national instantiations can also be supported by this International Standard.

This International Standard provides the framework in which to operate such a data registry. It does not mandate the use or provision of any data concepts, nor involve itself with the security of transmission, issues of privacy, nor technical means of data transfer. It simply provides the rules to operate, with a high quality of service, a data repository to enable relevant parties to immediately, usually by automatic means, understand the precise and unambiguous meaning of an emergency safety-related message.

It is recognized that, in most implementations, tools will be required to use the contents of the data registry. However, this International Standard defines only the procedures for such a registry and the definition of such tools is outside the scope of this International Standard.

Intelligent transport systems — ITS Safety and emergency messages using any available wireless media — Data registry procedures

1 Scope

This International Standard deals with intelligent transport systems.

This International Standard provides a standardized set of protocols, parameters, and a method of management of an updateable "Data Registry" to provide application layers for "ITS Safety messages" using any available wireless media.

2 Conformance

In order to claim conformance with this International Standard, wireless communication shall be established in full compliance with local telecommunication regulations, procedures and protocols for that media using the appropriate International or Regional Standards, and shall be able to demonstrate that they provide the mandatory data, and can provide any standardized optional data elements to the extent that such data is available, and there is an available medium to transmit the message.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

ISO/IEC 8824-1:2002, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO/IEC 8824-2:2002, *Information technology — Abstract Syntax Notation One (ASN.1): Information object specification — Part 2*

ISO 11179 (all parts), *Information technology — Metadata registries (MDR)*

ISO 14817:2002, *Transport information and control systems — Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries*

IEEE 1489:1999, *IEEE standard for data dictionaries for intelligent transportation systems*

4 Terms and definitions

For the purposes of this document, the terms and definitions of ISO 14817 and ISO 11179 and the following apply.

4.1
automatic crash notification
automatic system to provide data notification to public-safety answering points, by means of any available wireless communications media, that a vehicle has crashed, and to provide coordinates and other relevant information in a message of standardized data concepts, not limited in length

4.2
eCall
⟨generic⟩ system to provide notification and relevant coordinate information to public-safety answering points, by means of wireless communications, that there has been an incident that requires a response from the emergency services

4.3
eCall
⟨ITS Specific⟩ user instigated or automatic system to provide notification to public-safety answering points, by means of wireless communications, that a vehicle has crashed, and to provide coordinates and a defined minimum set of data

5 Abbreviated terms

5.1
CCC
change control committee

5.2
ETSI
European Telecommunications Standards Institute

5.3
EU
European Union (EU15 implies the 15 countries that formed the European Union prior to 2005)

5.4
GPS
global positioning system

5.5
ID
identity

5.6
ITS
intelligent transport system

5.7
m
mandatory

5.8
o
optional

5.9
OID
object identifier

5.10
PSAP
public service answering point

6 Requirements for "ITS Safety Messages Data Registry" management

6.1 Concept of operation

This clause provides a summary overview of "ITS Safety messages" data dictionary and "Data Registry" operations. It identifies the parties involved in "ITS Safety messages" data dictionary and "Data Registry" operations, and specifies the responsibilities of each of the parties involved.

6.2 Summary

The "ITS Safety Messages Data Registry" shall support the harmonization of data concepts (e.g. data elements) from different stakeholder groups. It shall be consistent with ISO 14817 (Requirements for an ITS central "Data Registry" and ITS "Data Dictionaries"), and it and/or its entries are able to be submitted as (a) candidate(s) for an "ITS Data Registry" that is in accordance with ISO 14817.

The definition of key data elements may arise from numerous sources: PSAPs, automotive manufacturers, regulators, etc. Moreover, different groups will have an interest in the definition of the same data concept, which could lead to the prospect of duplicate or similar definitions being developed.

An ITS Safety or emergency data concept is data in a predefined and registered concept, recorded in such a manner that it is unambiguous and can be interpreted by reference to the data registry. The nature of form of the emergency or safety message is not defined by this International Standard, nor are the circumstances in which such a message is transmitted nor are the destination of the messages defined. This International Standard provides a specification of a process to register such data concepts in accordance with internationally recognized quality and implementation procedures as defined in International Standards, within the context of ITS. The procedures for submission and an acceptance process are defined herein.

A central "ITS Safety Messages Data Registry", or regional and national variants, of which the concept of operations are defined herein, supports standardization and harmonization processes that facilitate the different interested parties to share data element definitions and avoid duplication, yet enable the prompt admission of clearly defined and unambiguous entries from recognized sources, even where consensus and common data-concept definitions between interested parties have not yet been agreed upon.

The operational concept of the data registration is described in the following subclauses. See Annex C for specific procedural details.

NOTE There may be regional and national variations of this concept for operations.

6.3 Framework

The overall framework for the "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries" is presented in Figure 1. It illustrates the relationships between

— the ITS safety services architectures (and information models),

— the "ITS Safety messages data dictionaries" (that are intended to include all data concepts),

— an "ITS Safety Messages Data Registry", and

— the ITS safety services applications.

For each of these physical elements, the diagram in Figure 1 also lists their key functions. For "Data Dictionaries", the "Data Registry" and the applications, it further identifies the key stakeholders or stakeholder groups that participate in or manage their operations. Finally, the diagram illustrates the information exchanged between these operational elements.

"ITS Safety messages data dictionaries" shall contain data concepts based on information flows documented in an "ITS Safety Messages Architecture". Each data concept in a data dictionary shall reference one or more

flows of information between specific objects documented in a specific version of an "ITS Safety Messages Architecture", the primary architecture being as defined in this International Standard. Regional and National architectures are permissible.

The "ITS Safety Messages Data Registry" shall be the repository for submitted data concepts. Through the efforts of the data "Stewards", the "Registrar" and the data registry "Change Control Committee" (CCC) support identification of harmonization opportunities, recommendations for harmonization, and promotion of data concepts to higher quality levels where warranted. Finally, the "Data Registry" can provide data concepts to developers and other users for use in ITS applications.

Where considered appropriate by the sponsors, the day-to-day operational role of the CCC may be delegated to a single registry administrator in order to efficiently maintain the registry in a timely manner and to assist users in uploading and downloading data concepts.

Developers and other users should preferably use data concepts from the "Data Registry" at the highest (Preferred) quality level. The data concepts at this level are described unambiguously, harmonized across ITS sectors, and are considered representative of published data standards.

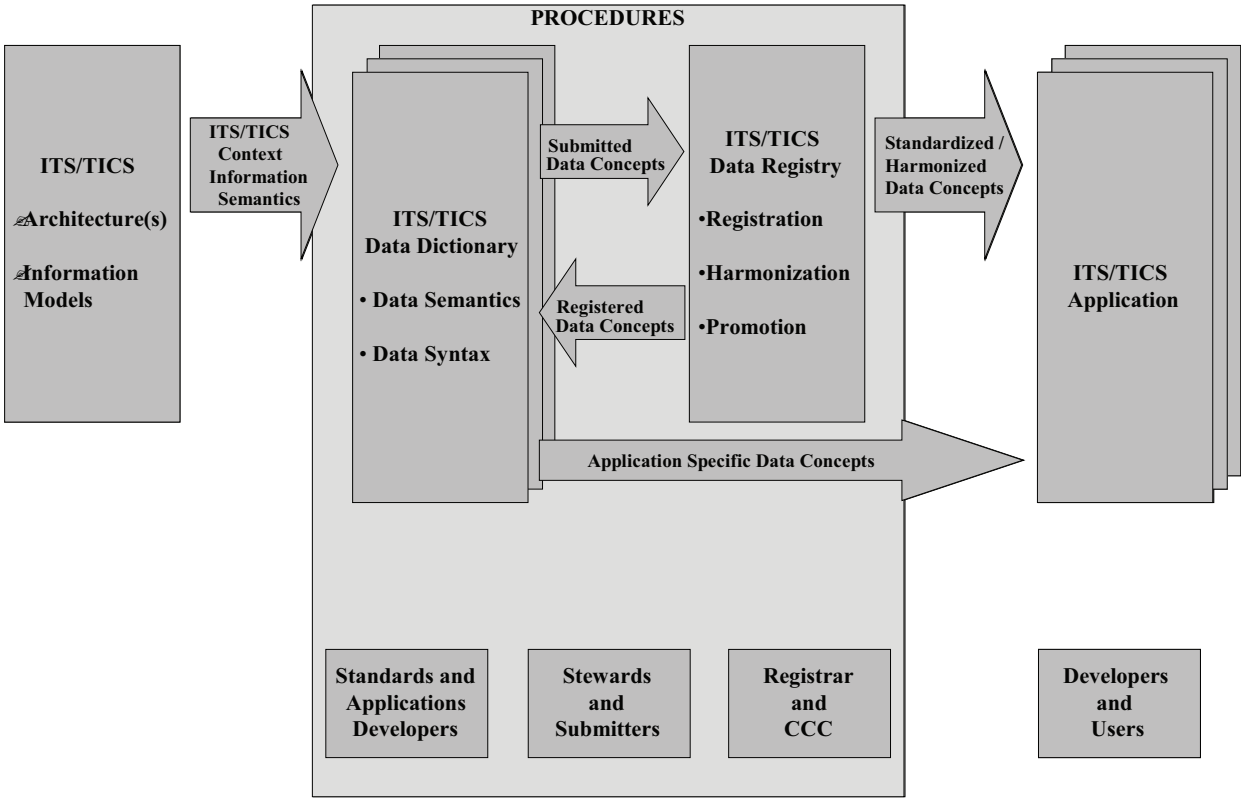

Figure 1 — "ITS Data Registry" operational framework

Table 1 presents a summary of the distinguishing characteristics between a "Data Dictionary" and a "Data Registry".

Table 1 — "Data Dictionary"/"Data Registry" distinguishing characteristics

"ITS Safety messages data dictionary"	"ITS Safety Messages Data Registry"
Multiple "Data Dictionaries"	One (International) "Data Registry"
Covers single functional area	Covers multiple sources
Managed by a functional area steward	Managed by the CCC
Harmonized within the functional area	Harmonized across the ITS sector
Unique ID within functional area	Unique ID across the ITS sector

6.4 Organizational roles

6.4.1 Overview

Organizational roles associated with the ITS safety messages data registration process shall be established. The organizational roles shall include the "ITS safety Messages data registry" "Executive Board" (EB), the ITS safety messages Change Control Committee (CCC), the ITS safety messages "Registrar", ITS safety messages "Stewards" and ITS safety messages "Submitters". A summary of each role is provided in this subclause. Annex C provides a description of the purpose, specific responsibilities, and membership or selection criteria for each role.

Figure 1 provides a high-level view of how these organizational roles are related within the context of the "ITS Safety Messages Data Registry".

6.4.2 Registration authority

The "ITS Safety Messages Registration Authority" shall be in accordance with the ISO/IEC Directives, Part 1 (2008), H.4.

6.4.3 Registrar

The "Registrar" shall be an organizational element, expert in data registration processes, responsible for facilitating the registration of ITS safety messages data concepts and making those data concepts widely accessible and available to the ITS safety messages community. The "ITS Safety Messages Registration Authority" shall appoint the "ITS Safety Messages Registrar".

6.4.4 Steward

An "ITS Safety Messages Steward" shall be an organizational element of the ITS safety messages community, such as an ISO WG Convenor or his designated representative. "Stewards" are responsible for the accuracy, reliability, and currency of descriptive metadata for data concepts at a registration status level of "Qualified" or above within an assigned functional, regional or national area. "ITS Safety Messages Stewards" are approved by a process defined by the registration authority.

6.4.5 Submitter

An "ITS Safety Messages Submitter" shall be an organizational element recommended by an "ITS Safety Messages Steward" and approved by a process defined by the "ITS Safety Messages Registration Authority". A "Submitter" is authorized to identify and report data concepts suitable for registration. Such "ITS Safety Messages Submitters" may be organizations representing Regional or National Governments, organizations representing PSAPs, organizations representing automotive manufacturers, or automotive manufacturers directly. Publication of a "Card" level submission shall be at the discretion of the "ITS Safety Messages Steward".

6.4.6 Read-only user

An "ITS Safety Messages Read-only User" shall be an organizational element or individual that is approved to review the contents of the "ITS Safety Messages Data Registry". A read-only user submits a request for access. Access is approved by the CCC or organizational element designated by the executive board. A read-only user has access to all the ITS Sector contents in the "ITS Safety Messages Data Registry", but is not permitted to submit, alter or delete the contents.

6.4.7 ITS safety messages change control committee

The "ITS Safety Messages Change Control Committee" (CCC) shall be the organizational element that is constituted to provide technical direction and harmonization of data contents for the "ITS Safety Messages Data Registry". The structure, staffing, procedures and membership of the CCC are determined by the ITS safety messages executive board. The membership of the CCC is to include the "ITS Safety Messages Stewards".

6.4.8 ITS safety messages executive board

The "ITS Safety Messages Executive Board" shall be an organizational element established by ISO/TC 204 and/or the sponsors of the data registry, or by the operators of an ITS safety messages data registry. In the case of an ISO/TC 204 official ITS safety messages data registry, it shall be responsible for administering responsibilities and authority delegated by ISO/TC 204. Responsibilities of the executive board shall include overall metadata registration policies and business direction of the "ITS Safety Messages Data Registry". In the case of an ISO/TC 204 official ITS safety messages data registry, the reporting responsibilities to ISO/TC 204 shall be specified and approval of executive board procedures and practices shall be subject to review and approval by ISO/TC 204 or its designated organizational component.

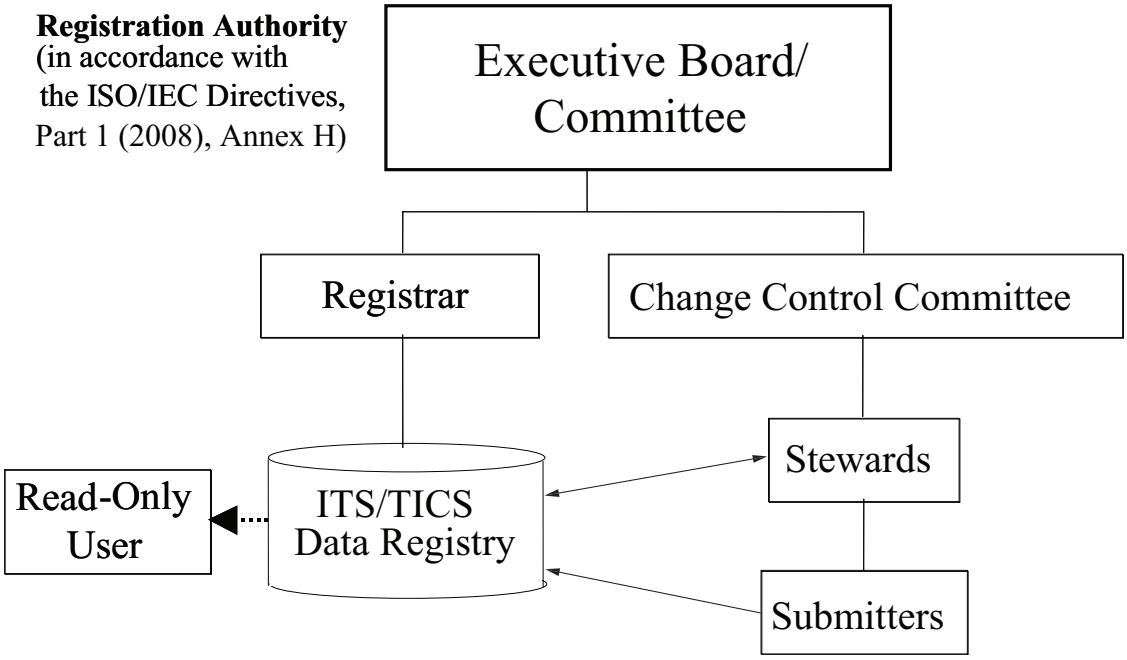

Figure 2 — Organizational roles to the "ITS Data Registries" and their relationships
(Source ISO 14817:2002)

6.5 Registration status levels

6.5.1 Summary of registration status levels

Registration status levels shall apply to individual data concepts that have been entered into the "ITS Safety Messages Data Registry". There shall be five data-concept registration status levels:

- "Card"
- "Draft"
- "Recorded"
- "Qualified"
- "Preferred"

The relationships between these status levels, along with the requirements for a data concept to achieve a particular registration status level, are presented in Table 2.

Table 2 — ITS safety messages registration status levels and criteria

Data-concept status level	Status criteria
Preferred	"Change Control Committee" confirmation that a data concept is "Preferred" for use in the ITS safety messages community.
Qualified	"Change Control Committee" confirmation that all mandatory attributes are completed and conform to quality requirements.
Recorded	All mandatory meta-attributes for the data concept have been input.
Draft	At least the meta-attributes "Descriptive Name" and "Submitter Organization" have been completed.
Card	At least the meta-attributes "Descriptive Name", "Submitter Organization", "Submitter Phone Number" have been completed.

While the general intention is to progress as many data concepts as possible from "Draft" to the "Preferred" registration status, progression to a status higher than "Recorded" or "Qualified" may not always be appropriate. That is, necessary meta-attribute documentation for a data concept may not be available to establish required documentation for the "Recorded" status, may not be of the quality necessary for the "Qualified" status, or identification as the "Preferred" data concept may not be appropriate. Such data concepts shall be held at their current status level in the "ITS Safety Messages Data Registry" to facilitate understanding of and access to these data concepts by the ITS safety messages community.

6.5.2 Description of registration status levels

The status level of a data-concept entry shall be based upon the completeness of the data entered, its accuracy, and its conformance to the established format and syntax. The registration status levels shall be as listed below.

a) **Card** A data concept in the "Card" status shall indicate that the "Submitter" wishes to make the ITS safety messages community aware of the existence of a data concept in their local domain. A data concept in the status of "Card" in the "ITS Safety Messages Data Registry" shall be maintained under version control within the "Submitters" data dictionary. The "Submitter" may remove a data concept in the status of "Card" from the "ITS Safety Messages Data Registry" at any time. The minimum meta-attribute documentation for the "Card" status in the "ITS Safety Messages Data Registry" shall be: "Descriptive Name", "Submitter Organization Name", "Submitter Phone Number", and "Submitter Email Address".

b) **Draft** A data concept in the "Draft" status shall indicate that the "Submitter" wishes to propose it for progression up the "ITS Safety Messages Data Registry" registration levels. Data concepts in the "Draft" status are not maintained under version control, which means that updates will completely replace the

original entry without retaining a record of the original. The "Submitter" may request the retirement of a data concept in the "Draft" status at any time, which will completely remove the data concept from the active "ITS Safety Messages Data Registry". The minimum meta-attribute documentation for the "Draft" status is "Descriptive Name" and "Submitter Organization Name".

c) **Recorded** A data concept in the "Recorded" status shall indicate that the "Submitter" has completed entries in all mandatory meta-attributes. A data concept in the "Recorded" status implies that the data concept may be shared across ITS domains. The contents of the mandatory meta-attributes may not conform to quality requirements. The "Submitter" may retire a data concept in the registration status of "Recorded" at any time. Data concepts in "Recorded" registration status, or higher, are maintained under version control.

d) **Qualified** A data concept in the "Qualified" status shall indicate that the CCC has confirmed that the mandatory meta-attributes are complete and conform to applicable quality requirements. In the event that a data concept is not approved by the CCC for the "Qualified" registration status level, it shall remain at the "Recorded" registration status level.

e) **Preferred** A data concept in the "Preferred" status indicates that the CCC confirms that the data concept is "Preferred" for use in the ITS safety messages community. The "Descriptive Name" and "ASN.1 Name" shall both conform to the ITS safety messages requirements.

6.6 Procedures

The "ITS Safety Messages Registration Authority" shall establish the necessary procedures to accomplish the following functional activities.

a) **Submission of data concepts for registration** "Submitters" shall submit data concepts for entry into the "ITS Safety Messages Data Registry". These data concepts may be "Recorded" as "Card" or "Draft" registration status, as the "Submitter" deems appropriate. A registration status of "Card" implies usage restricted to the "Submitter's" domain while being posted for informational purposes. The "Draft" status implies that the "Submitter" intends to progress the data concept to higher ITS safety messages registration status levels. "Submitters" or "Stewards" may progress data concepts in the "Draft" status to the "Recorded" registration status by completing all mandatory meta-attributes required for that data concept.

b) **Progression of data concepts** "Submitters" shall progress data concepts to "Recorded" status. Progression of data concepts to registration status of "Qualified" or higher shall require the sponsorship of a "Steward" and approval of the "Change Control Committee".

c) **Harmonization of data concepts** The objective of harmonization is to resolve any potential duplicate or overlapping of data concepts. Procedures shall be established to facilitate data-concept harmonization and reuse.

d) **Modification of data concepts** Procedures shall be established to change data concepts.

e) **Retirement of data concepts** Procedures shall be established to retire data concepts.

f) **Administrative processing** The "ITS Safety Messages Data Registrar" may assign administrative registration statuses in order to track an interim state of a data concept.

NOTE This subclause introduces the requirements for procedures associated with the "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries". These procedures require organizational participation of certain roles, as specified in 6.3, in dealing with data concepts to be registered in the "ITS Safety Messages Data Registry", as identified in Clause 7. Annex C provides representative procedures to address these functional requirements. Annex E provides guidance on the documentation of data concepts in preparation for submission to the "ITS Safety Messages Data Registry" for registration.

6.7 Version control

6.7.1 Version maintenance

This subclause presents the requirements for synchronization of the meta-attribute structures of the "ITS Safety messages data dictionaries" and "ITS Safety Messages Data Registry".

Configuration versions of the "ITS Safety Messages Data Registry" shall be maintained for meta-attributes.

A ‘Current Version’ and a ‘Development Version’ shall be established and maintained for attributes of the "ITS Safety Messages Data Registry". The versioning procedures in 6.7.2 and 6.7.3 shall apply.

6.7.2 Current version

The current version shall consist of those attributes approved by the CCC for current use in "ITS Safety messages data dictionaries" and the "ITS Safety Messages Data Registry".

6.7.3 Development version

The development version shall consist of those meta-attributes under development, together with pertinent current version meta-attributes, for use in "ITS Safety messages data dictionaries" and the "ITS Safety Messages Data Registry" as the next current version. The CCC controls the release of each development version as the new current version.

6.8 Summary of data concepts

NOTE The term 'data concept(s)' is used throughout the document to mean 'types of data concept(s)'.

This subclause defines and explains the nine data concepts applicable to this International Standard. These data concepts are consistent with ISO 14817. Data concepts refer to abstractions and things in the natural world that can be identified with explicit boundaries and meaning. The properties and behaviour of these fundamental constructs all follow the same set of rules. Within ITS, there may be data concepts to represent, for example, a Bus "Route" and relevant information about it. Specifically within ITS safety messages, they relate to information that may be of use to PSAPs in responding to an emergency situation which has been alerted via an ITS safety-messages message.

Data concepts include interface dialogue, message, data frame, object class, association, property, data element concept, value domain, and data element. See Figure 3 for an ASN.1 Information Object Specification (IOS) for an ITS safety messages data concept. Figure 3 presents a framework for data concepts and how they relate to one another. For illustration purposes, the braces, i.e. { and }, portray the particular relationships between the data concepts. The numeric annotation associated with each brace indicates the number of each data concept that may be realized. For example, there may be from 2 to n messages within an interface dialog, where n is any integer number. As another example, a message may consist of 0 to n data elements and 0 to n data frames.

Figure 4 presents interface data concepts and their relationships. Information interchange between two ITS safety messages system components shall be characterized from the top down as an interface dialogue or a set thereof. Interface dialogues shall be a set of messages whose order and timing for transmission is predicated upon a defined operational concept or scenario containing timing information. Messages shall be a collection of data elements and/or data frames which contain the substantial data to be exchanged.

Figure 5 presents model data concepts and their relationships. In support of the information interchange data concepts, additional data concepts for modelling are provided. These modelling concepts support the realization of the organization of the various data concepts by characterizing key relationships between the data concepts. See Annex E.

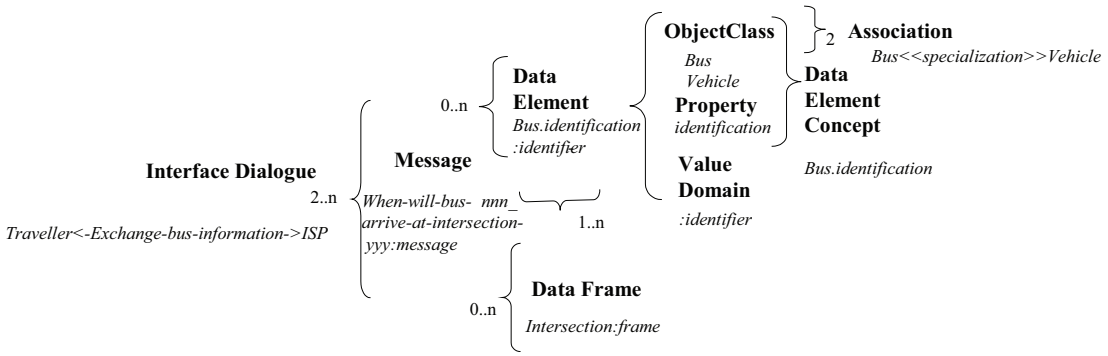

Figure 3 — ITS safety messages data concepts framework (ITS example from ISO 14817:2002)

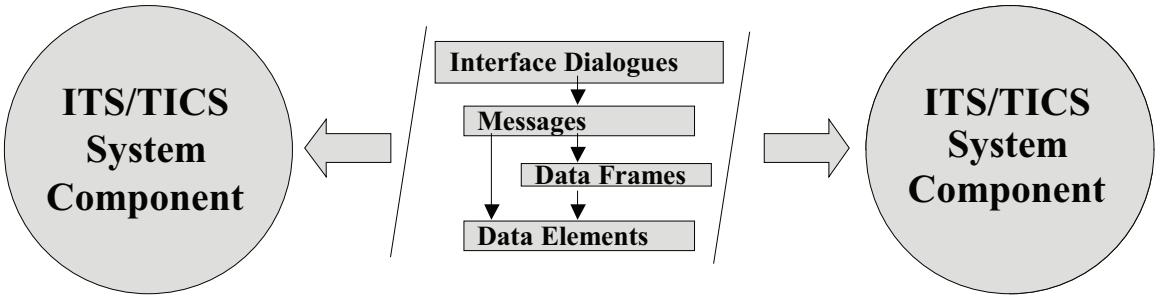

Figure 4 — ITS interface data concepts

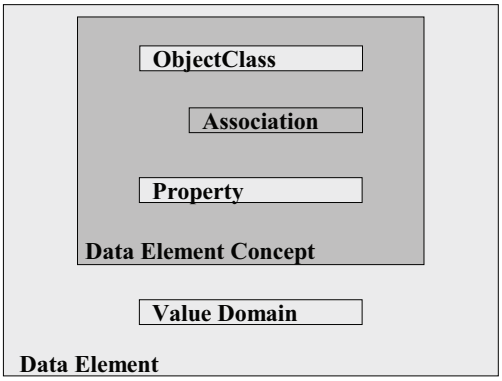

Figure 5 — ITS/ITS safety messages model data concepts

6.9 Interface dialogue

An interface dialogue shall be a temporal sequence of messages, including variants, among two or more system components that are used to accomplish a service/observable result. In Figure 3, the interface dialogue example is "Traveller<-Exchange-bus-information->ISP". A specific example of an ITS safety message might be, "Vehicle<-Exchange-location-information->ISP".

6.10 Message

A message shall be a structured grouping of data elements and/or data frames. In Figure 3 the message example is "When-will-bus-number-nnn-arrive-at-intersection-yyy:message." See Annex E for an example of "ASN.1 Information Object Specification" of a message.

6.11 Data frame

A data frame shall be a structured grouping of data elements primarily for the purpose of referring to a group with a single name to efficiently reuse such groups of data elements that commonly appear together in a message specification. In Figure 3 the data frame example is "Intersection:frame." See Annex E for an example of "ASN.1 Information Object Specification" of a data frame.

6.12 Object class

An "Object Class" shall be a description of a set of objects that share the same properties, relationships and semantics within a given domain of discourse about which there is a need to represent some information. Modifiers that qualify or further specialize the object class may be used. An "Object Class" is one of three data concepts used to characterize a data element. In Figure 3, the object classes illustrated are "Bus" and "Vehicle".

6.13 Association

An "Association" shall be a structured relationship between two "Object Classes". A particular type of association is called a "Composition" in which an object of the “whole” class is in a “whole/part” relationship with objects of the “parts” class. Modifiers may be used to show a "Composition". In Figure 3, the association example is "Bus<<specialization>>Vehicle."

When an object class participates in an association, it has a specific role that it plays in that relationship. See Annex E for information modelling considerations.

6.14 Property

A "Property" shall indicate information of interest that applies to one or more "Object Classes". The information of interest might be a fact, proposition or observation about each object of the class. A "Property" is one of three data concepts used to characterize a data element. In Figure 3, the property example is "identification".

6.15 Data element concept

A "Data Element Concept" shall consist of an "Object Class" and a "Property". While in a form similar to a "Data Element", a "Data Element Concept" is devoid of a value domain or representation. In Figure 3, the "Data Element Concept" example is "Bus.identification".

6.16 Value domain

A "Value Domain" shall be a term that indicates, precisely and unambiguously, the format and syntactic form for "Data Concept" instance values. A "Value Domain" is one of three data concepts used to characterize a "Data Element". In Figure 3, the "Value Domain" example is ":identifier".

6.17 Data element

A "Data Element" shall be a formalized representation of some information (i.e. a property; e.g. a fact, proposition or an observation) about an "Object Class" (e.g. a person, place, process, concept, association, state, or event), with an explicit "Value Domain". A "Data Element" (a substantive instantiation of a data concept) shall be characterized by three data concepts (see Figure 3): object class, property, and an explicit value domain "Descriptive Name" (and value domain reference, where applicable, describing the physical form of the information). In Figure 3, the data element example is "Bus.identification:identifier". See Figure 4 for an example of "ASN.1 Information Object Specification" of a data element.

7 Data-concept meta-attributes

7.1 Basic meta-attributes of data concepts

7.1.1 Meta-attribute categories

The basic meta-attribute categories of identification, definitional, relational and representational shall be used in the "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries". The definition of each meta-attribute is provided in Annex D. See Annex E for meta-attribute applicability to various data concepts.

These basic meta-attributes may be represented in one or more (meta) data models to reflect more completely the relationships between the data. While selected meta-attributes are based upon ASN.1 syntax for data representation, alternative (meta) data models may result in alternative syntax. Consequently, additional meta-attributes to support other syntaxes (e.g. XML Schema, CORBA IDL, EDIFACT Graphical Syntax) may be added in future revisions and some existing mandatory attributes may become optional.

7.1.2 Identification meta-attributes

Identification meta-attributes shall differentiate one data concept from another. For example, the "Data Concept Identifier" together with "Data Concept Version" is a unique identification “tag” for a data concept within the ITS safety messages "Data Registry". The "ASN.1 Object Identifier" is also a unique identifier for each data concept. Other identification meta-attributes may be used, e.g. "Descriptive Name" and "Synonymous Descriptive Name", for identification purposes but may be less precise. See E.2.

The identification meta-attributes shall be as identified below.

— Data-concept identifier

— Data-concept version

— Descriptive name

— Synonymous descriptive names

— Symbolic names

— ASN.1 name

— ASN.1 object identifier

— Uniform resource locator

7.1.3 Definitional meta-attributes

Definitional meta-attributes shall describe the semantic aspects of a data concept. These meta-attributes may directly address semantic meanings (e.g. "Definition", "Remarks", "Abstract") or indirectly provide insights into the semantic aspects of a data concept (e.g. "Descriptive Name" context, "Source", "Data Concept Type"). See E.3.

The definitional meta-attributes shall be as identified below.

— Definition

— "Descriptive Name" context

— Symbolic name usage

— Source

— Architecture reference

— Architecture name

— Architecture version

— Data-concept type

— Remarks

— Context

— Standard

— Metadata source

— Priority

— Frequency/message mode

— Delivery verification

— Data quality

7.1.4 Relational meta-attributes

Relational meta-attributes shall document associations among or between data concepts. See E.4.

The relational attributes shall be as identified below.

— Precursor

— Successor

— Synonym

— Abstract

— Roles

— Multiplicity

— Association constraints

— Aggregate

— Role key

— Referenced messages

— Referenced data frames

— Referenced data elements

— Referenced object classes

— Referenced associations

7.1.5 Representational meta-attributes

"Representational Meta-Attributes" shall describe requirements for physical representation of "Data elements" and "Value Domains". These "Representational Meta-Attributes" shall define how "Data Elements" or "Value Domains" appear in databases or user interfaces, and constrain allowable processing activities. See E.5.

The representational meta-attributes shall be as identified below.

— Data type

— Format

— Unit of measure

— Valid value rule

7.2 Administrative meta-attributes

"Administrative Meta-Attributes" shall describe management and control aspects associated with a "Data Concept". For example, "Last Change User" identifies the user that last changed a data concept. "Registration Status" identifies the status level of a data concept.

The administrative meta-attributes identified below shall be used in the "ITS Safety Messages Data Registry" to facilitate administrative management of "ITS Safety Messages Data Concepts". These administrative meta-attributes are optional for the "ITS Safety messages data dictionaries". See E.6 for descriptions of these administrative meta-attributes.

— Registration status

— Date registered

— Last change date

— Last change user

— Registrar organization name

— Registrar phone number

— Steward organization name

— Steward phone number

— Submitter organization name

— Submitter phone number

— User

— View

— Related groups

— Security class

8 Data-concept names

8.1 Descriptive names

Descriptive names shall be formulated when developing data concepts. Requirements for developing descriptive names for data concepts, their component parts and their abbreviations are described in Annex F. These requirements shall apply to the entire ITS safety messages data environment.

The "Descriptive Name" shall be a name that represents the meaning of a data concept. The "Descriptive Name" often serves as a synopsis of the data concept's definition. Abbreviated names are used primarily as physical names, and are also referred to as symbolic names, internal names, or access names in application database environments and application program interfaces or messages. When names are formulated by combining multiple terms that provide a more complete characterization of the data concept being named, then separators shall be used in various combinations to enhance readability. The use of these separators: period, colon, left caret, right caret and dash is defined in Annex F.

The "Descriptive Name" shall be unique.

8.2 Data-concept "Descriptive Name" formats

Descriptive names shall be constructed by combining the relevant component descriptive names with specific separators. The formats are shown in Table 3.

Table 3 — "Descriptive Name" formats for ITS safety messages data concepts

Data concept	"Descriptive Name" format
Object class	ObjectClassTerm
Property	propertyTerm
Value domain	value-domain-term
Data element concept	ObjectClassTerm.propertyTerm
Data element	ObjectClassTerm.propertyTerm:value-domain-term
Data frame	DataFrameTerm:frame
Message	MessageTerm:message
Interface dialog	SourceName<-InterfaceDialog->DestinationName
Association	RoleAObjectClassTerm <<associationtype>>RoleBObjectClassTerm

9 Meta-attribute requirements for ITS safety messages data concepts

The "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries" shall consist of meta-attributes for each data concept as delineated in Annex B. Annex C specifies the applicability of the meta-attribute to each data concept. Clause E.2 provides specific requirements for the "ITS Safety Messages Data Registry". Clause E.3 provides specific requirements for an ITS Safety messages data dictionary.

10 International relationships

This International Standard recognizes that, while the ITS Sector is global in scope, national and regional "ITS Safety messages data dictionaries" and "ITS Safety Messages Data Registries" are developed according to individual national and/or regional requirements, as well as national and regional conditions. Indeed, because ITS safety-messages messages are safety related and potentially life saving, automotive manufacturers may choose to make their company-specific ITS safety-messages messages available well ahead of the consensus forming process.

11 Privacy

Privacy and data ownership and use rules, which are complex and vary by country, must be addressed before implementation of ITS safety messages.

Data concepts submitted to the data registry are, in their design, free of any specific values and therefore are free of personal data; for this reason, the data registry should be free of privacy issues. However, in the instantiation of eSafety data in operational systems using these data concepts, the assigned values may, in some cases, carry personal data. Local regulation will determine what data can be transmitted, what has to be encrypted and what privacy protection is provided.

Annex A
(informative)

"ITS Safety Messages Data Registry", functional operating procedures

A.1 Introduction

This annex defines the overall concept of operations for the "ITS Safety Messages Data Registry". It identifies specific ITS safety messages roles and responsibilities and provides specific functional operating procedures for the use of the "Data Registry" (DR) and interactions with the ITS safety messages DR functional or national "Data Dictionaries". It also identifies roles and responsibilities associated with the "ITS Safety Messages Data Registry".

A.1.1 Registrar

The "Registrar" provides a single individual point-of-contact responsible for managing and maintaining information about ITS safety messages data in the "ITS Safety Messages Data Registry", under the authority of the "ITS Safety Messages Registration Authority". The "Registrar" is responsible for the following.

a) Monitoring and managing the "ITS Safety Messages Data Registry" contents.

NOTE The "ITS Safety Messages Data Registry" is established, operated, and maintained by the "ITS Safety Messages Registration Authority").

b) Enforcing policies, procedures, and formats for populating and using the "ITS Safety Messages Data Registry".

c) Proposing procedures and standard formats for the "ITS Safety Messages Data Registry" to the ITS safety messages DR CCC for consideration.

d) Recording current registration status for data concepts in the "ITS Safety Messages Data Registry".

e) Ensuring access for authorized users to contents in the "ITS Safety Messages Data Registry".

f) Assisting in the progression of data concepts through the registration status levels.

g) Assisting in the identification and resolution of duplicate or overlapping data concepts in the "ITS Safety Messages Data Registry".

h) Acting on direction from the "ITS Safety Messages Registration Authority".

i) Effecting registration of ITS safety messages data concepts in external data registries or data dictionaries.

j) Enforcing data registration procedures for submitting data concepts to the "ITS Safety Messages Data Registry", e.g.

   1) How to prepare, submit, and process submissions of data concepts.

   2) How the "ITS Safety Messages Data Registry" is used to avoid duplicate data-concept submissions to the "ITS Safety Messages Data Registry".

   3) How the "ITS Safety Messages Data Registry" is used to effect harmonization of data across "ITS Safety messages data dictionaries" of participating organizations.

   4) How external registries are used as a source of data concepts for reuse in the "ITS Safety Messages Data Registry".

k) Maintaining a separate document recording the appropriate contact information for all members of the CCC and the executive board.

l) Adding new users or organizational entities that may become authorized to access the "ITS Safety Messages Data Registry".

m) Maintaining other controlled word lists of the "ITS Safety Messages Data Registry".

A.1.2 Stewards

"ITS Safety Messages Stewards" provide specific expert points of contact responsible for coordinating the identification, organization, and establishment of registered data for use throughout the ITS safety messages enterprise within an assigned area.

"ITS Safety Messages Stewards" are responsible for the following.

a) Co-ordinating the identification and documentation of data concepts within their assigned area.

b) Ensuring that appropriate data concepts in their assigned area are properly registered.

c) Co-ordinating with other "ITS Safety Messages Stewards" to attempt to prevent or resolve duplicated efforts in defining data concepts.

d) Reviewing all data concepts once they are in the "Recorded" status to identify and attempt to resolve conflicts among data concepts with other "ITS Safety Messages Stewards" responsible areas.

e) Ensuring the quality of meta-attributes for data concepts they propose for the "Qualified" registration status level, reusing standardized data from external data registries where applicable.

f) Proposing "Preferred" registration-status-level data concepts in their assigned area.

g) Ensuring that data registration procedures and formats are followed within their assigned functional area.

h) Recommending "Submitters" to the "ITS Safety Messages Registration Authority".

A.1.3 Submitters

"ITS Safety Messages Submitters" are organization elements that are familiar with or engaged in development and operational environments. "ITS Safety Messages Submitters" maintain current data concepts and are engaged to describe and submit new data concepts following the ITS safety messages data registration requirements.

An "ITS Safety Messages Submitter" is responsible for the following.

a) Identifying himself to the "ITS Safety Messages Registrar" in writing.

b) Identifying and documenting data concepts appropriate for registration in the "ITS Safety Messages Data Registry".

c) Submitting data concepts to the "ITS Safety Messages Data Registry".

d) Ensuring the completeness of mandatory meta-attributes for ITS safety messages data concepts proposed for the "Recorded" registration status level.

A.1.4 Read-only users

A "Read-only User" is an organizational element approved by the "ITS Safety Messages Registrar" to review the contents of the "ITS Safety Messages Data Registry". "Read-only Users" may not add to, delete from, or otherwise modify the contents of the "ITS Safety Messages Data Registry".

A.1.5 Change control committee

The ITS safety messages DR CCC provides overall technical direction of, and resolution of, technical issues associated with the "ITS Safety Messages Data Registry", its contents and its technical operations.

The ITS safety messages DR CCC is responsible for the following:

a) Overall conduct of ITS safety messages registration operations.

b) Promoting the reuse and sharing of data in the "ITS Safety Messages Data Registry" within and across ITS safety messages functional-areas, and among external interested parties to the ITS safety messages enterprise.

c) Progressing data concepts through "ITS Safety Messages Data Registry" registration "Qualified" and "Preferred" status levels.

d) Identifying data concepts to be registered in external data registries or "Data Dictionaries".

e) Resolving technical issues associated with registered data concepts, e.g. overlap, duplication, etc.

f) Approving updates to data concepts previously placed in the "ITS Safety Messages Data Registry" in the "Qualified" or "Preferred" registration status levels.

g) Proposing "ITS Safety Messages Data Registry" policies to the executive board for approval.

h) Approving authorized "Submitters", "Read-only Users", and types of users, of the "ITS Safety Messages Data Registry".

i) Approving "ITS Safety Messages Data Registry" content, procedures and formats.

j) Submitting management-related recommendations and issues to the executive board.

k) Acting on directions from the executive board.

l) Meeting periodically in face-to-face meetings, with additional meetings and teleconferences held as needed.

The CCC shall normally fulfil its responsibilities via consensus building in accordance with an established procedure. Intransigent issues may be resolved by an established procedure.

A.1.6 "Executive Board" (EB)

The ITS safety messages executive board is responsible for overall policy and business direction for the "ITS Safety Messages Data Registry", to include the following.

a) Establishing overall "ITS Safety Messages Data Registry" policies.

b) Resolution of all business management issues pertaining to the "ITS Safety Messages Data Registry", e.g. copyrights, stewardship, funding, executive board membership, etc.

c) Ensuring the long-term success and performance of the "ITS Safety Messages Data Registry".

d) Establishing and updating the "ITS Safety Messages Data Registry" charter and strategic plans.

e) Meeting at least semi-annually in face-to-face meetings, with additional meetings and/or teleconferences held as needed.

The executive board will normally fulfil its responsibilities via consensus building. Intransigent issues may be resolved by simple majority vote, one vote per member organization.

A.2 Registration concept of operations

A.2.1 Overview

The operational procedures for the "ITS Safety Messages Data Registry" are summarized in this subclause. These procedures describe registration and harmonization practices for the "ITS Safety Messages Data Registry". See Clause 9 for organizational roles and responsibilities (and their relationships), and for registration-status-levels definitions. This subclause describes the registration activities associated with "Submitters", "Stewards", and the "ITS Safety Messages Registrar" and CCC roles. Figure A.1 summarizes these functional activities.

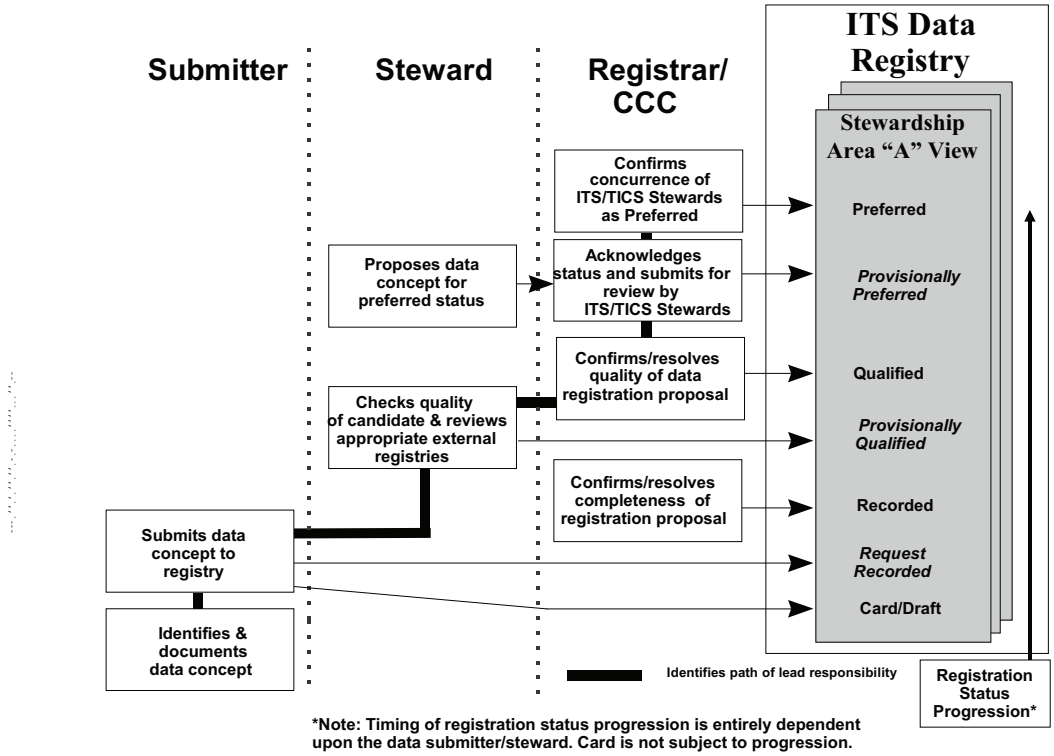

Figure A.1 — Registration functional activities for ITS data registries

A.2.2 Registration initiation

All "Submitters" accomplish the "Submitter" registration activities in the same way in accordance with these functional operation procedures so that data concepts are consistently and accurately registered. The responsibility of the "Submitter" is to propose and document data concepts for registration in the registration status of "Draft", and, if desired, propose data concepts for the registration status of "Recorded". A "Submitter" acquires an understanding of "ITS Safety Messages Data Concepts", their context and sources, and their significance in the course of accomplishing normal operational, design, development or management activities.

A.2.3 Quality review

The responsibility of the "ITS Safety Messages Steward", for data concepts in an assigned functional area, is to ensure that quality registration candidates are passed to the "Registrar" for presentation to the CCC to be considered as "Qualified" data concepts. "ITS Safety Messages Stewards" may also recommend data concepts for "Preferred" registration status.

A.2.4 Registry administration

The responsibility of the "Registrar" is to co-ordinate the "ITS Safety Messages Data Registry" environment and manage the "ITS Safety Messages Data Registry", making its contents as widely accessible as feasible. Administrative levels are established to track the progression of a data concept in the transition from one status level to the next.

a) "Provisionally Qualified" — A data concept in the "Provisionally Qualified" status indicates that a "Steward" has confirmed that the mandatory meta-attributes are complete and conform to applicable meta-attribute quality requirements. The "Steward" is authorized to promote data concepts at the "Recorded" status to the administrative status of "Provisionally Qualified" at a time when the "Steward" believes that all quality requirements have been achieved. "Steward Organization Name" is mandatory and the "ASN.1 Name" ***shall be unique*** in the "ITS Safety Messages Data Registry" for data concepts at "Provisionally Qualified" or higher quality status.

b) "Provisionally Preferred" — A data concept in the "Provisionally Preferred" status indicates that a "Steward" proposes the data concept as "Preferred" for general use in the ITS safety messages community; however, certification of "Preferred" status of the data concept by the CCC is not yet complete. The "Steward" is authorized to promote data concepts from the "Qualified" level to the "Provisionally Preferred" at a time when the "Steward" believes the data concept to be a "Preferred" data concept.

c) "Retired" — A data concept in the "Retired" status indicates that the CCC has approved the data concept as no longer recommended for use in the ITS safety messages community. Data concepts in the "Retired" status also include data concepts in the "Recorded" status that the "Submitter" has retired. Such data concepts are retained in the "ITS Safety Messages Data Registry" archival storage facility for historic reference purposes. The "Retired" status identifies data concepts no longer considered appropriate for use in the ITS safety messages community. "Retired" data concepts are to include a reference (e.g. Successor meta-attribute) to replacement data concepts when appropriate. Edits of "Retired" data concepts are not permitted.

A.3 ITS safety messages data registration procedures

A.3.1 Overview

The ITS safety messages data registration procedures are described in the following subclauses. The step identifications are used in Figures A.2 and A.3 which are illustrations of this part of the procedure.

A.3.2 "Card" or "Draft" status data concepts

Step 1: "Submitter" identifies data concepts appropriate for these status levels in the course of normal activities. "Submitter" prepares a registration proposal documenting as many meta-attributes as possible described in this International Standard. "Submitter" validates the ASN.1 module definitions through the use of an ASN.1 syntax checker. "Submitter" initiates this status for data concepts they submit to the "ITS Safety Messages Data Registry". Unlike other ITS data registries, because of the safety implications, the "ITS Safety Messages Data Registry" requires a precise data definition at all levels, including "Card" status.

Step 2a: "Submitter" reviews data concepts to determine whether the data concept is to be progressed from a "Draft" registration status. If the data concept is not to be progressed, it is held in the "ITS Safety Messages Data Registry" in its current status level.

Step 3a: "Steward" also reviews data concepts at least quarterly to determine, in co-ordination with an appropriate "Submitter", whether a data concept is to be progressed from a "Draft" registration status. If the data concept is not to be progressed, it is held in the "ITS Safety Messages Data Registry" in its current status level.

A.3.3 Recorded data concepts

Step 2b: "Submitter" determines that a data concept is to be progressed to "Recorded" registration status. The "Submitter" confirms that mandatory meta-attributes are complete, updating the meta-attributes as necessary (**Step 2c**). The "Submitter" then requests "Recorded" status for the data concept.

Step 3b: "Steward" determines that a data concept is to be progressed to "Recorded" registration status. For such data concepts, the "Steward" confirms that mandatory meta-attributes are complete, updating the meta-attributes as necessary (**Step 3c**). The "Steward" then requests "Recorded" status for the data concept.

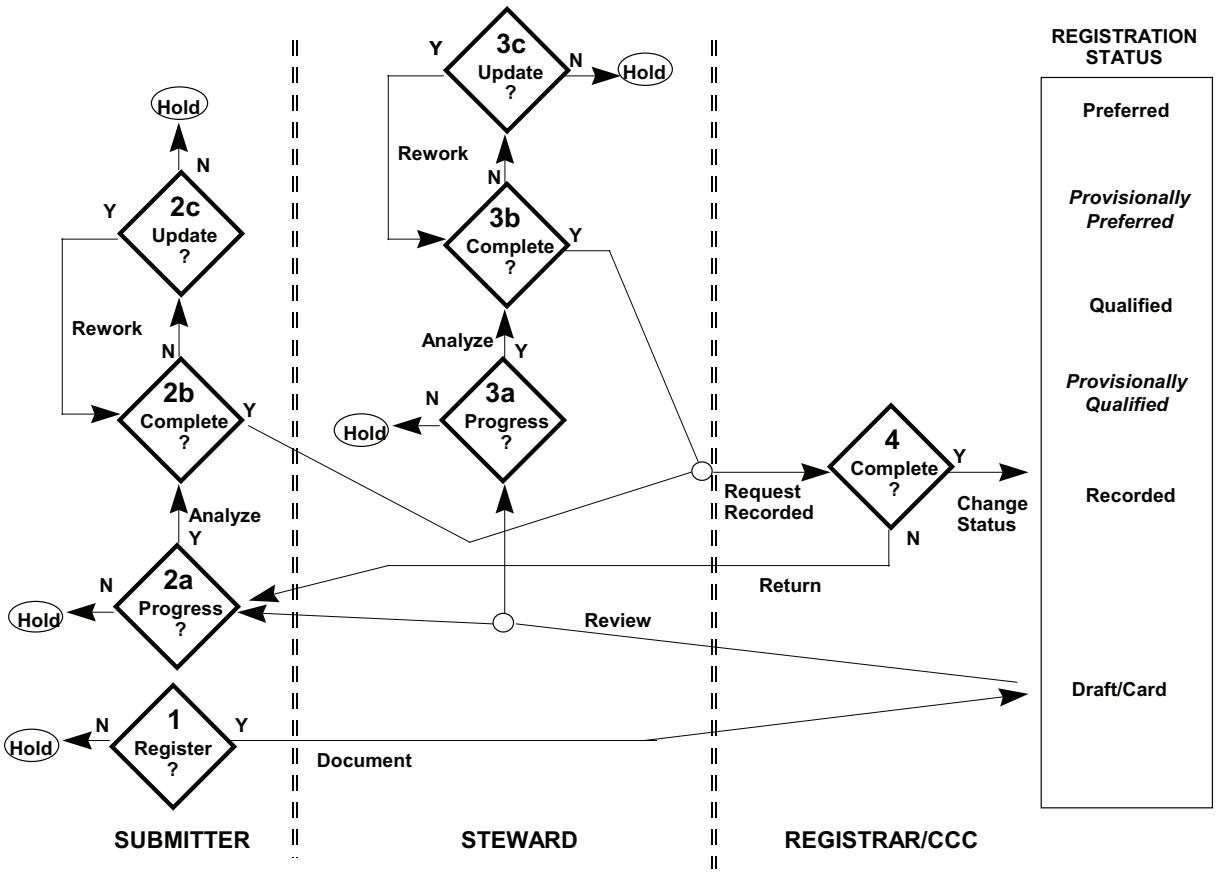

Figure A.2 — ITS safety messages data registration process flow, Part 1

NOTE 1 Where the diagram in Figure A.2 identifies a data concept going to a “hold” condition, this means that the data concept in question is held in its last approved registration status. “Hold” is not an additional registration status level.

NOTE 2 Placement of any data concept from any "Submitter" into the "ITS Safety Messages Data Registry" at "Card" or "Draft" registration status levels is entirely dependent upon the appropriate "Submitter"/"Steward" authority deciding to do so. Furthermore, progression from either of these registration status levels to any higher registration status level is also entirely dependent upon the interest of a "Submitter" or "Steward" to progress any such data concept. This means that it is up to the "Submitter" and/or "Steward" to propose promotion of data concepts when and if they choose to do so. In this International Standard, no time line is specified by which any registration status progression must happen.

NOTE 3 Any data concepts registered in the "ITS Safety Messages Data Registry" are presumed to be retained for informational purposes, regardless of whether they are ever proposed for progression so that the ITS safety messages community can be aware of data concepts for possible reuse.

WARNING — Data concepts at the "Card" or "Draft" registration status levels can be removed without notice by the original submitter.

Step 4: Upon request for "Recorded" registration status from either a "Submitter" or a "Steward", the "ITS Safety Messages Data Registry" system shall check that the mandatory meta-attributes of the data concepts, and precise data definition, are present and change the registration status to "Recorded" for data concepts with entries containing all mandatory meta-attributes. If any mandatory meta-attribute is missing an entry, the "ITS Safety Messages Data Registry" shall notify the requester of the missing meta-attribute(s).

A.3.4 Qualified data concepts

Step 5: The "Steward", for those data concepts appropriate for progression to the "Qualified" registration status level, reviews the meta-attributes for conformance to quality requirements of this International Standard and any other requirements that may be agreed to by the CCC and published as an ITS safety messages technical data management policy. If the meta-attributes do not meet these quality requirements, the "Steward" assists the "Submitter" in achieving the quality requirements (**Step 5a**) by referring the "Submitter" to appropriate policies, procedures and guidelines.

Step 6: The "Steward" may, at its discretion, check pertinent external data registries or other external "ITS Safety messages data dictionaries" to determine if a data concept has already been identified in another domain, outside of ITS safety messages, that fulfils the needs of the ITS safety messages community and is satisfactory to the original "Submitter". The extent of this check of external sources of data concepts depends upon the "Steward's" knowledge of potential appropriate external sources. The "Steward" may consult with the "Registrar", who will maintain and publish, at least quarterly, external registries or "ITS Safety messages data dictionaries" that have been found useful to the ITS safety messages community. The "Steward" shall, in any event, report all instantiations of similar ITS safety messages data concepts in the "ITS Safety Messages Data Registry" to the submitter to try to minimize multiple instantiations of similar data concepts.

When data elements from foreign registries are reused in the "ITS Safety Messages Data Registry", they may go in as "Draft" and be progressed to "Recorded" registration status in their native form (provided minimum meta-attributes for external data concepts are completed).

An overview of the external review process for "Stewards" is illustrated in Figure A.4.

NOTE Where the diagram in Figure A.3 identifies a data concept going to a “hold” condition, this means that the data concept in question is held in its last approved registration status. “Hold” is not an additional registration status level.

Step 7: If an external data concept is so identified (see Figure A.4), that external data concept is put forward and reused in lieu of the specific data concept proposed by the "Submitter". The "Steward" will complete the following minimal meta-attributes for the external data concepts reused in the "ITS Safety Messages Data Registry": "Descriptive Name", "Definition", "Registrar Organization Name" and "Registrar Phone Number" (entries are made to record the external "Registrar" or other data authority information), "Synonymous Descriptive Name" (the data concept's name in its native form as submitted by the "Submitter"), and "Source" (enter the word “External”). External data concepts may be progressed up to the registration status levels with only these minimal meta-attributes completed. Once the data concept has had all appropriate meta-attributes completed according to quality requirements, the "Steward" updates the data registration status level for that data concept to the "Provisionally Qualified" status.

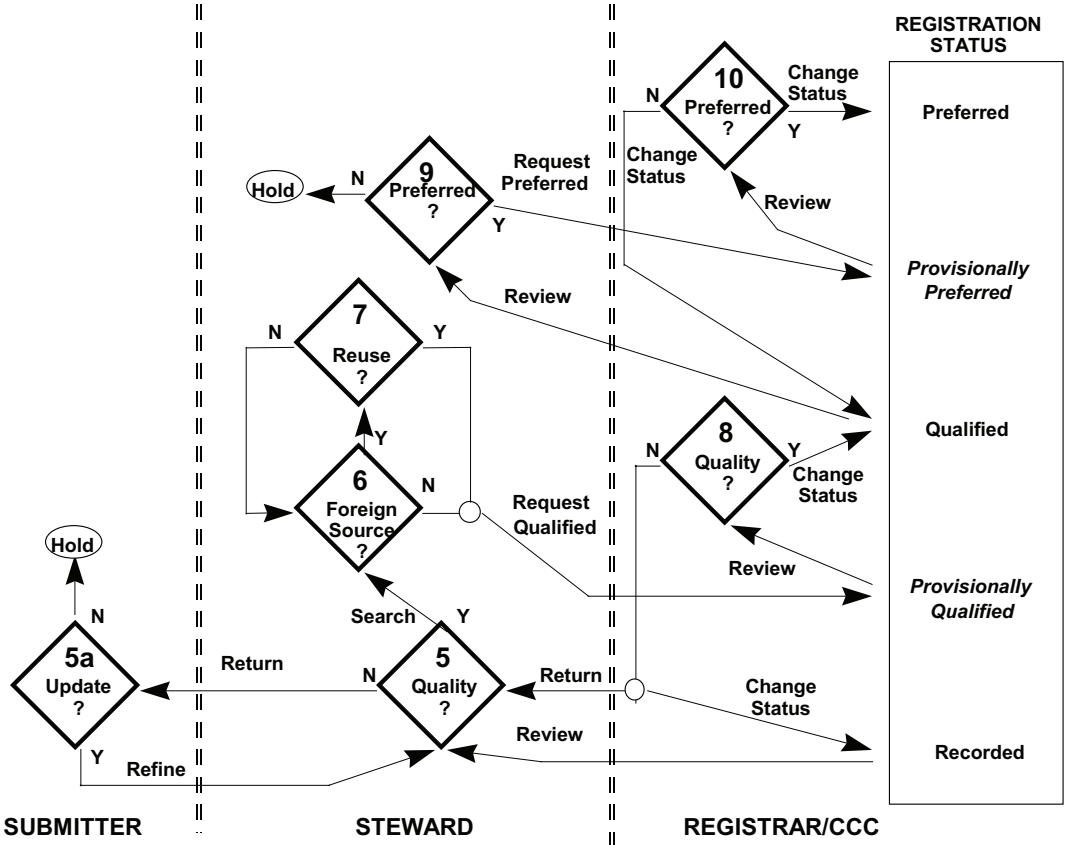

Figure A.3 — ITS safety messages data registration process flow, Part 2

Step 8: The "Registrar" reviews all "Provisionally Qualified" registration status data concepts at least quarterly to re-verify completeness of mandatory meta-attributes and to confirm quality requirements of the meta-attributes for the data concept(s), including uniqueness of its identifier and quality of its descriptive name, as well as uniqueness of its ASN.1 name.

If quality requirements are met, the "Registrar" shall progress the data concept to the "Qualified" status.

If quality requirements are not met, the "Registrar" supports the "Steward" and the "Submitter" in taking any actions necessary to bring the meta-attributes of the data concept up to quality standards, if possible. If not, the data concept is retained on hold at the "Recorded" registration status level. Once such quality standards are achieved for appropriate meta-attributes, the "Registrar" submits a listing of such data concepts proposed for "Qualified" registration status, together with all supporting meta-attributes, to the CCC periodically for the CCC face-to-face meetings (or to the CCC electronic interim meetings, as directed) for approval as "Qualified" data concepts. If data concepts are not approved by the CCC to the "Qualified" registration status level, they are reverted to the "Recorded" registration status.

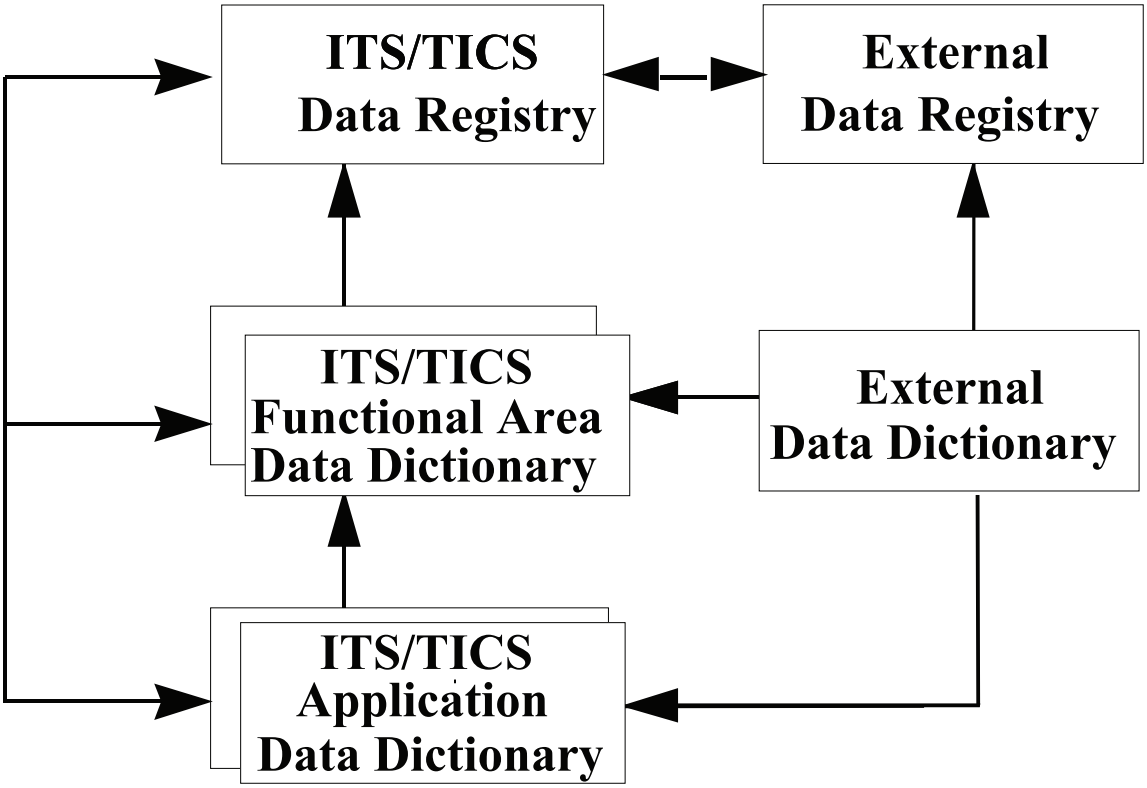

Figure A.4 — External data dictionary/"Data Registry" relationships

A.3.5 Preferred data concepts

Step 9: "Stewards" shall review "Qualified" registration-status-level data concepts at least quarterly with a view to possibly progress a data concept to the registration status level of "Preferred". For any data concepts so identified, the "Steward" updates the registration status level to "Provisionally Preferred" and provides the "Registrar" with a short statement as to why such data concepts are to be progressed to the "Preferred" registration status level.

Step 10: The "Registrar" reviews all data concepts in the "Provisionally Preferred" registration status at least quarterly to confirm it as a viable "Preferred" data concept. The "Registrar" submits a listing of all data concepts proposed for the "Preferred" registration status, together with their meta-attributes and the "Steward's" statement, to the CCC periodically at the CCC face-to-face meetings (or to the CCC electronic interim meetings, as directed) for approval as "Preferred" data. A key focus of review by the "Registrar" and the CCC is the identification and resolution of overlapping or redundant data concepts among the "Stewards". The "Registrar" then changes the registration status level of approved data concepts to "Preferred". If data concepts are not approved by the CCC to the "Preferred" registration status level, they revert to the "Qualified" registration status. If quality requirements are met, the "Registrar" shall progress the data concept to the "Preferred" status.

Final resolution as to a "Preferred" registration status level may result in confirmation of the candidate as a new "Preferred" data concept, a new version of a previously "Preferred" data concept, or recognition of the candidate as already established in the "Preferred" status. In this case, or if the registered data concept has been previously established as a "Preferred" data concept in the "ITS Safety Messages Data Registry", the "Steward" and "Submitter", as well as associated systems developers, will reuse such data concepts in their application development efforts. This resolution may also re-assign responsibility for the registered data concept to another "Steward".

Once a registered data concept is established in the "Preferred" status and if recognition of the "Preferred" data concept is desirable in external registries, the "Registrar" shall forward such "Preferred" data concepts to appropriate external registrars.

A.4 Change management procedures

A.4.1 Summary

The configurations of the contents of application "ITS Safety messages data dictionaries" or functional-area "ITS Safety messages data dictionaries" are the responsibility of the managers or administrators of those dictionaries. They may be informally managed using these change management procedures.

A.4.2 Change procedures for data concepts in the "ITS Safety Messages Data Registry"

Procedures for proposing changes to a data concept in the "ITS Safety Messages Data Registry" are the same as for new proposals, except that the "Steward" will involve the original "Submitter" of the data concept, in the event a "Submitter" other than the original "Submitter" is proposing changes. Only the original "Submitter" of a data concept, or responsible "Steward" for data concepts at a registration status of "Qualified" or higher, may edit a data concept. The "ITS Safety Messages Data Registry" will automatically notify "Stewards" recorded in the "Relevant Groups" meta-attribute of any changes to data concepts in a "Registration Status" of "Recorded" by email. Changes to data concepts in a "Registration Status" of "Qualified" or higher may not be made without CCC approval. The "Steward" mediates any conflicts between "Submitters" associated with a proposed change. Similarly, when the proposal is forwarded to the "Registrar", other relevant "Stewards" will be involved in a review of the proposal and the "Registrar" shall mediate any conflicts between the "Stewards". The "Registrar" reports data-concept-change proposals for data concepts at "Qualified" and above to the CCC with appropriate change of version or a new data concept due to substantive change in semantics or representational form of the data concept. Mere refinement of semantics, change to administrative meta-attributes, or change of registration status do not result in version changes. "Stewards" shall determine whether or not the semantics of a data concept have changed significantly enough to warrant a version change. Additions to code set values result in version changes.

A.4.3 Retirement procedures for data concepts in the "ITS Safety Messages Data Registry"

In the event that a data concept in the "ITS Safety Messages Data Registry" is proposed for retirement, the same procedures as for data concept registration change proposals are generally followed.

A data concept in the "ITS Safety Messages Data Registry" might be proposed for retirement for a number of reasons. For example, it might be superseded by a new data concept, it might be replaced by an entirely new data concept in the "ITS Safety Messages Data Registry", or it might have been inappropriately placed in the "ITS Safety Messages Data Registry". "Retired" data concepts (except those in "Card" status) will be linked to the superseding data concept, if any, by the "Submitter" or "Steward", in such a way that the effective date of superseding data is "Recorded" (with "Last Change Date") and a mapping of the old and new data concept in the "ITS Safety Messages Data Registry" is preserved.

The status of a data concept proposed for retirement is changed to "Retired" by the "Registrar" for data concepts in the "Qualified" registration status or higher after presentation to the CCC. The "Submitter" may change the registration status of data concepts at the "Recorded" levels to "Retired" at any time, without review by the CCC.

"Retired" data concepts are retained in the "ITS Safety Messages Data Registry", or the "ITS Safety Messages Data Registry" archival storage, to provide historic contextual understanding of such data concepts. When data concepts are moved to registry archival storage, their data-concept identifier and "Descriptive Name" will be retained in the "ITS Safety Messages Data Registry" itself.

A.4.4 Change management procedures

A.4.4.1 Applicability

The change management procedures of this subclause are applicable to the "ITS Safety Messages Data Registry" and, optionally, for certain configuration items in the functional-area "Data Dictionaries".

A.4.4.2 Identifying configuration items

The purpose of configuration item identification is to explicitly specify what data concepts are subject to change management.

ITS Safety messages data dictionary configuration items are of two types: ITS safety messages data concepts, and meta-attribute data concepts of the "ITS Safety Messages Data Registry", and (optionally) functional-area "Data Dictionaries". Both types of configuration items are managed in accordance with these procedures.

A.4.4.3 ITS safety messages data concepts

Formal change management of ITS safety messages data concepts is accomplished only for managing changes to ITS safety messages data concepts at the "Recorded", "Qualified" or "Preferred" registration quality levels. Changes to data concepts in the administrative registration status levels of the "Retired" status are not permitted. Data concepts at the "Card" registration quality level are not formally change managed in terms of CCC involvement or approval actions. "Card" entries are managed in their respective "ITS Safety messages data dictionaries" using ITS safety messages meta-attributes.

ITS safety messages data-concept configuration items are the data concepts documented in the "ITS Safety Messages Data Registry", i.e. data elements, data element concepts, object classes, properties, value domains, messages, data frames, dialogues and meta-attributes. Configuration identification numbers for these configuration items are their data-concept identifier plus data-concept version number.

ITS safety messages data concepts in the functional-area "ITS Safety messages data dictionaries" or application "ITS Safety messages data dictionaries" are not formally change managed under the CCC, although they may be managed by the functional-area data dictionary authority using these procedures.

A.4.4.4 Meta-attribute data concepts

Meta-data configuration items are the meta-attributes used to document ITS safety messages data concepts in the "ITS Safety Messages Data Registry" and in functional-area "Data Dictionaries". All meta-attributes are change managed for the "ITS Safety Messages Data Registry" and functional-area "Data Dictionaries". Configuration identification numbers for meta-attribute configuration items are their data-concept identifiers and version numbers.

Formal change management of meta-attribute configuration items in the functional-area "ITS Safety messages data dictionaries" may be necessary to ensure compatibility of, and thus interoperability among, functional-area "ITS Safety messages data dictionaries" and the "ITS Safety Messages Data Registry".

The "ITS Safety Messages Data Registry" is to include among its meta-attribute configuration items all meta-attributes, including any extensions therein that are approved by the CCC for inclusion in the "ITS Safety Messages Data Registry".

A.4.5 Controlling configuration items

A.4.5.1 Baselines

Change control of the "ITS Safety Messages Data Registry" and (optionally) ITS safety messages functional-area "ITS Safety messages data dictionaries" is achieved by controlling changes to configuration items and sets of configuration items established as baselines. Such control is exercised by the CCC. Proposals for configuration item changes must be submitted to the "Registrar" in sufficient time to prepare a baseline.

A.4.5.2 Configuration item baseline

Baselines are maintained for meta-attribute data concepts only. Other "ITS Safety Messages Data Registry" data concepts are not baselined.

A "Current Baseline" and a "Development Baseline" are established and maintained for meta-attributes of the "ITS Safety Messages Data Registry" and (optionally) ITS safety messages functional-area "Data Dictionaries". The "ITS Safety Messages Data Registry" and (optionally) ITS safety messages functional-area

"ITS Safety messages data dictionaries" to operate on the "Current Baseline" and synchronously implement the "Development Baseline" as a new "Current Baseline" when the "Development Baseline" is approved by the CCC as the new "Current Baseline".

The CCC controls the release of each "Development Baseline" as the new "Current Baseline" for both "ITS Safety Messages Data Registry" meta-attributes and (optionally) ITS safety messages functional-area data dictionary meta-attributes.

A.4.5.3 Configuration item change control

Changes or additions to meta-attribute configuration items are requested in accordance with the following procedures.

a) "Stewards" and the "Registrar" collect, evaluate and document requests for meta-attribute configuration item changes or additions, including changes to the standard values of the meta-attributes under controlled word list control such as "Keyword", "Data Concept Type" and "Relationship Type".

b) "Stewards" forward such documented requests to the "Registrar", along with a recommendation as to the merits of each proposal.

c) The "Registrar" presents such proposals to the CCC, along with a recommendation on the disposition of each proposal.

d) The CCC decides upon the disposition of each proposal.

e) The "Registrar" notifies the functional-area "Stewards" of the disposition of each proposal.

A.4.6 Reporting configuration status

The "Registrar" records and reports to the CCC the current status of meta-attribute configuration item baselines and ITS safety messages data-concept-change requests at least semi-annually in their face-to-face meetings, or in their interim electronic meetings, if so directed.

A.4.7 Auditing configuration items

The "Registrar" is responsible for audits of meta-attribute "Current Baseline". In implementation of this responsibility, the "Registrar" will periodically accomplish the following at least annually.

a) Evaluate the meta-attributes of the "ITS Safety Messages Data Registry" against the meta-attribute "Current Baseline" configuration items.

b) Optionally, evaluate each functional-area data dictionary meta-attribute against the meta-attribute "Current Baseline" configuration items.

The "Registrar" is to provide a report to the CCC of the results of all such evaluations, together with recommended corrective actions, if appropriate.

A.5 ITS safety messages data harmonization and reuse procedures

A.5.1 Introduction

These procedures detail how the CCC and the "Stewards" execute their responsibilities as identified in Figure A.2 regarding identification, reconciliation and documentation of data concept overlaps and duplications across "Stewards" cognizant areas (and reuse of data concepts among "Stewards" cognizant areas). See Figure A.5.

Eventually, the "ITS Safety Messages Data Registry" will contain the following data concepts: Interface dialogues, data elements, messages and data frames, as well as data element concepts, object classes, properties, value domains. Each data concept will be described by meta-attributes.

Initially, the "ITS Safety Messages Data Registry" is expected to contain only data elements; however, its contents may be expanded to include other data concepts, as noted above.

The "Stewards" and "Data Registry Manager" shall bring to the attention of the "ITS Safety Messages Data Registration Authority" instances where it appears that duplications of data concepts have been proposed.

A.5.2 Identification and resolution of ITS safety messages data issues

Procedures for identification and resolution of ITS safety messages data concept issues will begin with a "Steward"'s data elements. As the "ITS Safety Messages Data Registry" is populated with other data concepts, harmonization of these data concepts can be addressed.

Identification of potential data-concept issues may be accomplished by "Stewards", the "Registrar", or as specifically focused by CCC directives, as follows:

Step 0: The CCC may further direct the "Registrar" to focus analysis efforts within particular domain areas (e.g. location reference or incident management) or data concept (e.g. value domains).

Step 0a: "Stewards" may review the "ITS Safety Messages Data Registry" contents for potential data-concept issues.

Step 0b: "Stewards" report any potential data-concept issues to the "Registrar", specifying the data-concept identifiers of the data concepts of concern.

Step 1: The "Registrar" shall use the capabilities of the "ITS Safety Messages Data Registry" to identify potential overlapping or redundant data concepts. Identification of potential data-concept issues will result from analysis by the "Registrar" of data element names, definitions, common property/object/representation terms, and common or similar value domains.

Step 2: The "Registrar" shalll prepare a summary listing of potential data-concept issues together with all documenting meta-attributes for each data concept on the summary listing. See Table A.1 for a listing example. The listing will contain any new potential data element issues identified since the last check-pointed version, as well as any open data element issues from past months, including the latest harmonization status for previously identified data element issues. This summary listing is to include the following meta-attributes: "Data Concept Identifier", "Steward's Identifier" (if any), "Descriptive Name", "Definition", "Value domain term", "Remarks" (in which harmonization status remarks are maintained), and "View" [in which the "Steward(s)" associated with the data element issue is (are) identified]. The listing to identify the lead "Steward" (by underlining one of the "Stewards" in the "View" meta-attribute) that is expected to lead the resolution efforts as well as any "Steward(s)" associated with the potential data element issue.

NOTE There may be occasions where there is no lead "Steward" identified, if it proves useful to have a third party take the lead on the issue. Note also that the lead "Steward" can be changed with the consent of all other "Stewards" involved in the data issue at hand by notification to the "Registrar" of the agreed-upon new lead "Steward".

Step 3: The "Registrar" is to post the listing to the "ITS Safety Messages Data Registry" website.

Step 4: The "ITS Safety Messages Data Registry" Secretary is to announce availability of the issues listing via email to the "Stewards" and other CCC members.

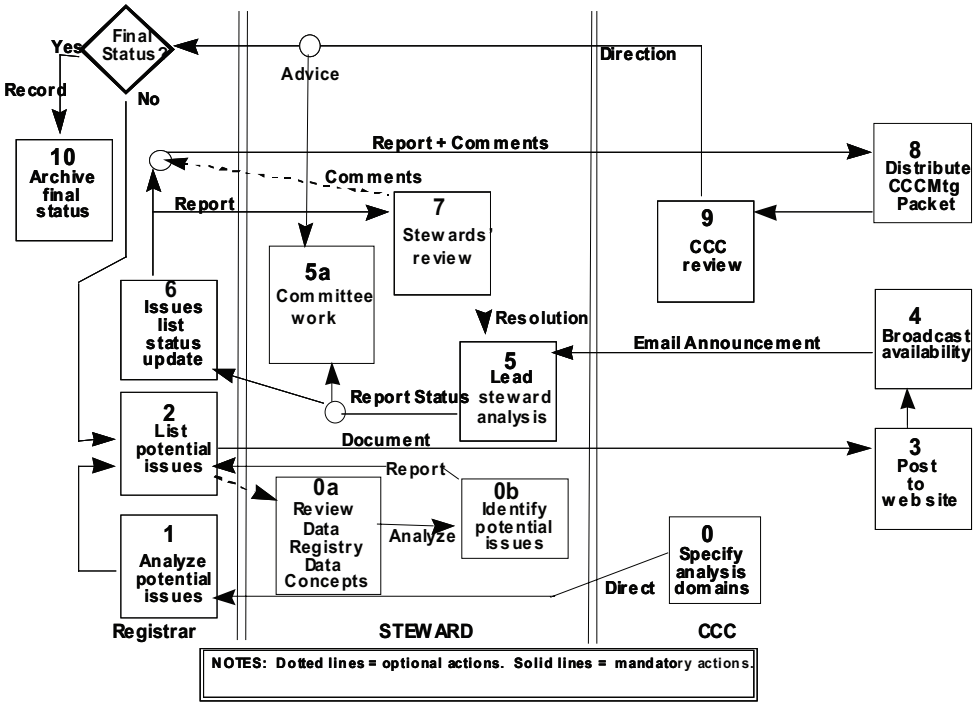

Figure A.5 — Harmonization procedure flow

Step 5: Upon receipt of this periodic listing, each lead "Steward" is to analyse the potential data element issues in their listing, consulting with any other "Steward(s)" associated with the data element at issue (as appropriate), and determine an appropriate resolution of the data element issue. The first step in this process is for each of the "Stewards" involved in a set of data concepts at issue to understand the semantics of the data concepts at issue. If the semantics are not equivalent then the data concepts shall remain separate. If they are equivalent or significantly equivalent, then the "Stewards" are to agree to use one of them, modify one of them for joint use, or mutually agree to a new data concept to supersede those data concepts at issue. After achieving semantic resolutions, the "Stewards" are to then address the "Value Domain" (if appropriate) of the data concepts at issue. The intent of this examination is to agree on a mutual solution to the dimensions of the data concepts at issue.

The resolution may be that one data concept is selected and other data concepts reference the selected data concept as superseding, that the data concepts at issue are merged into a new data element and the other data concepts at issue reference the new data concept as superseding, or that the data concepts at issue are kept separate and independent.

Each lead "Steward" may report to the "Registrar" the status of data element resolutions as soon as that resolution is determined, including any interim resolution status (such as how the resolution will be determined or inability to achieve resolution). This report is to be accomplished by electronically returning only the entries that have been changed in the summary listing to the "Registrar", with a resolution status note inserted in the "Remarks" column for each data concept. The resolution status note is to refer to the "Data Concept Identifier" of each data concept at issue and to state the harmonization status associated with that data concept. It shall also state the effective date of the harmonization status. These notes are to be placed at the beginning of the remarks section of the listing for each data element at issue. Each lead DD "Steward" is to make such a report to the "Registrar" incrementally as issues are resolved, or by the end of the third month of each quarter as a minimum.

Step 5a: Each "Steward" associated with the data issue resolution at hand is responsible for obtaining appropriate approval of their standards committee(s) (in accordance with their own internal procedures) for data element issue resolutions that require any changes or additions to their "Stewards" data elements. Interim resolution statuses are anticipated while the "Stewards" work with their own particular standards committees, if any.

Step 6: Two weeks before any CCC meeting, the "Registrar" is to distribute a summary listing of all data concepts potentially at issue, together with the current resolution status for each data concept and a complete statement of all meta-attributes for each data concept at issue. This listing is to be electronically distributed to all "Stewards".

Step 7: "Stewards" may report any issues they have with this listing to the "ITS Safety Messages Registrar" at least 1 week before the CCC meeting, in order that a complete packet be prepared for the CCC meeting reflecting the most current status of harmonization issues. The "Registrar" is to forward the master listing and any remarks received from the "Stewards" to the ITS safety messages CCC Secretary at least 1 week before the CCC meeting.

Step 8: The ITS safety messages CCC Secretary will distribute the harmonization listing to the CCC members.

Step 9: The CCC will review the harmonization results and issue directions to the "Registrar". For those data concepts at issue for which harmonization has been achieved between the relevant "Stewards", the CCC is to review and approve the "Stewards" harmonization status, or require such additional harmonization actions as may be appropriate. The CCC is to review those data concepts at issue that the relevant "Stewards" have not been able to resolve and propose resolutions, if possible. The "Registrar" is to retain each data concept at issue, together with its current harmonization status, on the harmonization listing until final resolution is accomplished, appropriate standards committees have approved of the resolution, and the CCC has approved the final harmonization status. These data concepts are to be included in the next listing of harmonization issued at Step 2.

Step 10: Data elements having such final harmonization approval are to be removed from the harmonization listing and retained in an archive file as a permanent record of the issue resolution. The "Registrar" is to ensure that all harmonization statuses for all data concepts at issue are posted to the appropriate data concepts in the "ITS Safety Messages Data Registry".

A.5.3 Reuse of ITS safety messages Data Concepts

Reuse of ITS safety messages Data Concepts is to be occasioned by one of the following three situations.

a) Reuse to result from the agreement among a number of "Stewards" that a particular data element (or other data concept) is the superseding data element (or concept) for their purposes [and appropriate standards committee actions are engaged by the appropriate "Steward(s)" to accomplish this result].

b) A standards committee is looking for an existing data concept to reuse in their own environment.

c) An application system developer, or other third party (state, city, etc.), may identify potential data issues.

In the first case, agreement among the affected "Stewards" requires that whomsoever may be involved in a particular harmonization accomplish the necessary procedural matters to effect the resolution as to reuse of the data element or other data concept within their associated standards committee environments.

In the second case, "Stewards" are to review the "ITS Safety Messages Data Registry" for possible data concepts to reuse in their domain. "Stewards" may access the "ITS Safety Messages Data Registry" to search for potential reusable data concepts, requesting the assistance, if appropriate, of the "Registrar".

In the third case, a developer or other third party is to review the contents of the "ITS Safety Messages Data Registry" to identify potential data for reuse, requesting the assistance of the "Registrar", if desired.

Table A.1 — Example of harmonization summarization listing

Data-concept identifier	DD identifier	Descriptive name	Definition	Value domain term	Remarks	View
15		CPT_DayofWeek_cd	A day of the week	code	Char format; ADUS to be the same. Dave to provide transform to/from 479	Transit
479	15	ATIS_DayOfWeek_code	Describes the day of the week, including a holiday option	code	Bit map format; NTCIP to be the same. Dave to provide transform to/from 15	Traveller informa-tion
49		CPT_PTVehicleID_nbr	A unique number assigned by the transit agency to each of their vehicles	number	TCIP to consider collapsing with 350; code as RCT?	Transit
350		IM_ResponseUnitID_nbr	Identification number of a vehicle (transit or non-transit)	number	TCIP to consider collapsing with 49; code as RCT?	Transit
504	205	VEHICLE_Identity_number	Identity of vehicle	number	ATIS to include “VIN” in definition; code as RCT	Traveller informa-tion
3274	3274	ORGANIZATION.RESOURCE_Vehicle_identifier	A unique identifier of an organization's vehicle associated with a roadway event	identifier	—	Traffic mana-gement

Annex B
(normative)

Contents of the "ITS Safety Messages Data Registry": meta-attribute definitions

B.1 Introduction

The definitions for the meta-attributes of the "ITS Safety Messages Data Registry" and "ITS Safety messages data dictionaries" are given in this annex. Meta-attributes in the identification category shall serve to identify data concepts from a number of perspectives, e.g. a unique data-concept identifier, a unique ASN.1 name, a unique descriptive name, a URL. Meta-attributes in the definitional category shall provide definitional information about a data concept. Relational meta-attributes shall define relationships between data concepts. Representational meta-attributes shall document the representation aspects of data concepts. Administrative meta-attributes shall be used to present administrative information relating to data concepts.

See Annex C (Contents of the "ITS Safety Messages Data Registry": Meta-attribute requirements for data concepts) for requirements relating meta-attributes to data concepts.

The names for the meta-attributes defined in this annex are specific to the meta-attribute definitions defined herein and are to be so defined solely within the context of this annex and the related Annex C. The general use of such terms (e.g. "Remarks") throughout the rest of this International Standard is the common, less specific, usage of the word.

The proposal and adoption of meta-attribute definitions shall be a managed process. The "Stewards" and "Data Registry Registrar" shall bring to the attention of the "ITS Safety Messages Registration Authority" instances where it appears that duplications of data concepts have been proposed.

These basic meta-attributes may be represented in one or more (meta) data models to reflect more completely the relationships between the data. While selected meta-attributes are based upon ASN.1 syntax for data representation, alternative (meta) data models may result in alternative syntax. Consequently, additional meta-attributes to support other syntaxes (e.g. XML Schema, CORBA IDL, EDIFACT) may be added in future revisions and some existing mandatory attributes may become optional.

B.2 Identification meta-attributes

B.2.1 Data-concept identifier

This is an unambiguous unique identifier allocated, by the "ITS Safety Messages Data Registry" Manager, to every data concept. For the "ITS Safety Messages Data Registry", the "Data Concept Identifier" (DCI) shall be an INTEGER UNIQUE in accordance with ASN.1 specification depending on the "ITS Safety Messages Data Registry Manager". Alpha/alphanumeric/ASCII character strings shall not be acceptable.

The value of this meta-attribute is automatically assigned for data concepts entered into the "ITS Safety Messages Data Registry".

B.2.2 Data-concept version

This is an integer reference to a revision or refinement of a data concept that does not change its semantic content or, if appropriate, its representational form.

Versions are established to record minor, non-semantic/representational changes to a data concept. Changes in the administrative meta-attributes do not result in a version change. The value of this meta-attribute is automatically assigned for data concepts entered into the "ITS Safety Messages Data Registry".

B.2.3 Descriptive name

This is a descriptive word or group of words that labels a data concept. Descriptive names shall be constructed in accordance with the requirements of Clause 9.

Descriptive names represent the meaning of the data concept and facilitate semantic understanding.

B.2.4 Synonymous descriptive names

These are names assigned to a data concept that differ from its descriptive name, but represent the same data concept.

The type of data concept specifies what "same" means. As a minimum, the data concepts shall be semantically equivalent. For instance, two data element concepts may have differently worded definitions; but, if they are equivalent semantically, their names are synonymous. Data elements, on the other hand, shall not only be semantically equivalent but they also shall have identical value domains. For instance, two data elements representing a date as "Gregorian date" and "Julian date" are two different, but related, data elements. Synonymous descriptive names do not need to conform to the naming conventions in the main body of this International Standard.

NOTE Synonymous descriptive names are to be introduced only where necessary. They can be of use, for instance, when the contents of several functional-area "ITS Safety messages data dictionaries" are synthesized into the "ITS Safety Messages Data Registry", and the same data element (from the perspective of its semantics and value domains) occurs in more than one functional-area data dictionary, but with different descriptive names. It can be useful to choose one of these names (or a "neutral" name) as the primary descriptive name, and to show one or more of the other names as synonymous descriptive name(s).

B.2.5 Symbolic name

This is the name of a data concept as used in (an) application program(s).

B.2.6 ASN.1 name

The "ASN.1 Name" shall be the name of a data concept expressed as a valid “typereference” as defined in 11.2 of ISO/IEC 8824-1:2002. The "ASN.1 Name" is to be unique within the ITS safety messages community.

The name of a data concept is expressed in ASN.1 syntax.

NOTE Information on ASN.1 naming conventions and conversion from "ITS Safety messages data dictionary" data element names to ASN.1 names can be found in Annex D.

B.2.7 ASN.1 object identifier

This is a unique "ASN.1 Object Identifier" in accordance with ISO/IEC 8824-1.

This is an OID that shall be assigned once to each specified data concept.

B.2.8 Uniform resource locator

A Uniform Resource Locator (URL) is a representation of the location and access method for a resource available via the Internet.

If a data concept, which is subjected to a URL, is not included in "ITS Safety Messages Data Registry" and/or "Data Dictionary", the URL indicates the location and access method of the data concept.

B.3 Definitional meta-attributes

B.3.1 Definition

This is a statement in natural-language text that expresses the essential meaning of a data concept and assists humans in differentiating the data concept from all other data concepts.

B.3.2 "Descriptive Name" context

This is a designation of the ITS safety messages functional area within which the "Descriptive Name" is relevant.

Legal values for this meta-attribute are the names of the functional areas (subsystems) for the ITS safety messages architecture. Multiple "Descriptive Name" contexts are allowed.

B.3.3 Symbolic name usage

These are the name(s) of the application(s) within which the data element symbolic name is used.

B.3.4 Source

This is the source document or other reference that was used to develop the pertinent data concept.

The source is a reference to the original document (e.g. white paper, architecture or standard) that defines the requirement for the data concept. For value domains, the source shall be the standard that describes the concept (e.g. for most measurements, the source is ISO 1000).

B.3.5 Architecture reference

This is the name of one or more ITS safety Messages Architecture “architecture flow”(s) with corresponding architecture source (subsystem or terminator) and architecture destination (subsystem or terminator) into which this data concept can be meaningfully categorized wholly or in part.

For classification of data concepts, the legal values for Architecture reference shall be the architecture flow names with the corresponding source and destination given in a framework ITS safety Messages Architecture, for example, a published version of the *ITS safety messages Reference Architecture*.

B.3.6 Architecture name

This is the designator (e.g. the title or number) of an ITS safety message or other Architecture that contains the Architecture reference(s).

B.3.7 Architecture version

This is the version number of an ITS safety message or other Architecture that contains the Architecture reference(s).

B.3.8 Data-concept type

This is a categorization of the kind of data concept.

Legal values for data-concept type are:

a) Object class

b) Property

c) Value domain

d) Data element concept

e) Data element

f) Data frame

g) Message

h) Interface dialogue

i) Association

B.3.9 Remarks

These are comments or other information pertinent to the data concept.

This meta-attribute is unconstrained as to its textual content.

B.3.10 Context

These are particular circumstances surrounding the data concept.

B.3.11 Standard

The alphanumeric designation of the standard, or other reference, that defines and describes the data concept. Acronyms or identifiers may be used.

The standard is to nominally be the functional data dictionary standard that defines the data concept.

B.3.12 Metadata source

The metadata source indicates where the metadata that is used to describe and interpret the data concepts resides, the values of which comprise the "Data Concept Instance" data in the message.

The default source shall be “direct”, which assumes that the receiving system knows what all the data being sent means, based on the data elements all being specified in an "ITS Safety messages data dictionary" and/or the "ITS Safety Messages Data Registry".

“Indirect” means instances of the message contain data corresponding to at least some data elements not “directly” known to the receiving system, but which are specified in other (external to ISO/TC 204 ITS Safety Messages Data Registry) systems in a compatible format. In this case, in the message specification, the source of the metadata shall be specified for any data element not found in the "ITS Safety messages data dictionary" and/or the "ITS Safety Messages Data Registry". This shall be specified as a reference to some foreign source (for example, a data dictionary or registry that is not within the ITS safety messages community).

“Embedded” means that the message instances include, as part of their message, the metadata for any data elements which are not found in an ITS safety messages functional-area data dictionary and/or the "ITS Safety Messages Data Registry", or which are not indirectly referenced in some foreign source. In this case, the metadata shall be specified in the message specification, if known at the time the specification is produced. In cases where the metadata is not known in advance (i.e. ad hoc messages, where the data and its metadata cannot be determined until the message instance is created), a placeholder (“embedded”) shall be specified for such data. The message instance shall then contain an embedded specification of its data elements. How this is accomplished varies by message implementation environment, for example, a self-describing data system.

The value of this meta-attribute shall be specified as “direct/indirect/embedded,” with the reference data or embedded metadata being specified, as appropriate.

EXAMPLE Direct.

B.3.13 Priority

This indicates whether or not a message is to receive priority treatment. If applicable, the priority scheme and/or the priority of the message may be specified.

There may be one global ITS safety messages priority scheme applicable to all ITS safety messages "broadcast" messages. There may be others specific to particular messages or message groups. Knowledge of such schemes is to be taken into account during message specification.

NOTE Wireless messages might be good candidates for a "round robin" priority scheme whereby important messages are transmitted every time, and less important messages as time permits. In this case, the priority scheme would be two-valued: urgent versus as time permits.

Specify priority/no priority. If "priority", this meta-attribute may also be used to specify the priority scheme and/or the priority of the message. Default is no priority.

EXAMPLE

— Priority, urgent versus as time permits

— Priority, urgent/normal/low

— Priority, 1-10 (10 highest priority)

— No priority.

B.3.14 Frequency/message mode

This indicates the expected timing or rate of occurrence of an instance of this message. Additionally, it indicates the message mode for periodic messages.

It also indicates whether a message instance is "periodic/event driven/user driven". If periodic guidance exists, it may be provided by the message developers as to the frequency or range of frequencies. Multiple selections are allowed, for example "periodic and event driven".

EXAMPLE

— Periodic, 20 s

— Event driven

— User driven.

B.3.15 Delivery verification

This indicates whether instances of this message shall/may require that delivery to the intended recipient be confirmed. It may include retry criteria.

If used, specify "shall" or "may." The message developers are to provide guidance to the implementer as to how this meta-attribute is to be used.

EXAMPLE

— Shall, critical for financial transactions, retry for 4 h.

— Shall, attempt delivery while "Traffic_incident" is true.

B.3.16 Data quality

Indicates that data has a data quality description.

This meta-attribute shall be used to specify the details of data quality for a data element. Multiple items may be required to describe data quality, with some items being qualitative (e.g. free text) and others quantitative. These items are to be clearly defined so that data users can determine whether the data in question are of the required quality for the intended purpose.

EXAMPLE For measured data such as sensor outputs:

— Performance in the time domain: measurement timing or cycle.

— Accuracy: number of significant digits, rate of error, or range of measurement.

— Data generation method: method of measurement, including instrument name.

— Reliability: Levels 1/2/3, where Level 1 indicates that data loss is not allowed at all, and that the data are used by services that have a heavy responsibility such as lifesaving; Level 2 indicates that lost data are to be compensated appropriately, although some data loss is allowed; Level 3 indicates that some data loss is allowed.

B.4 Relational meta-attributes

B.4.1 Modelling-related meta-attributes

The first three relational meta-attributes ("Precursor", "Successor", "Synonym") are introduced to identify certain stereotype association relationships (extensions in the vocabulary of the UML) that operate at the meta-level, i.e. they are used to define associations between data concepts, not between their instantiations. Any relationship may be described by the other meta-attributes defined here. Refer to Figure B.1 for a UML representation of selected data concepts.

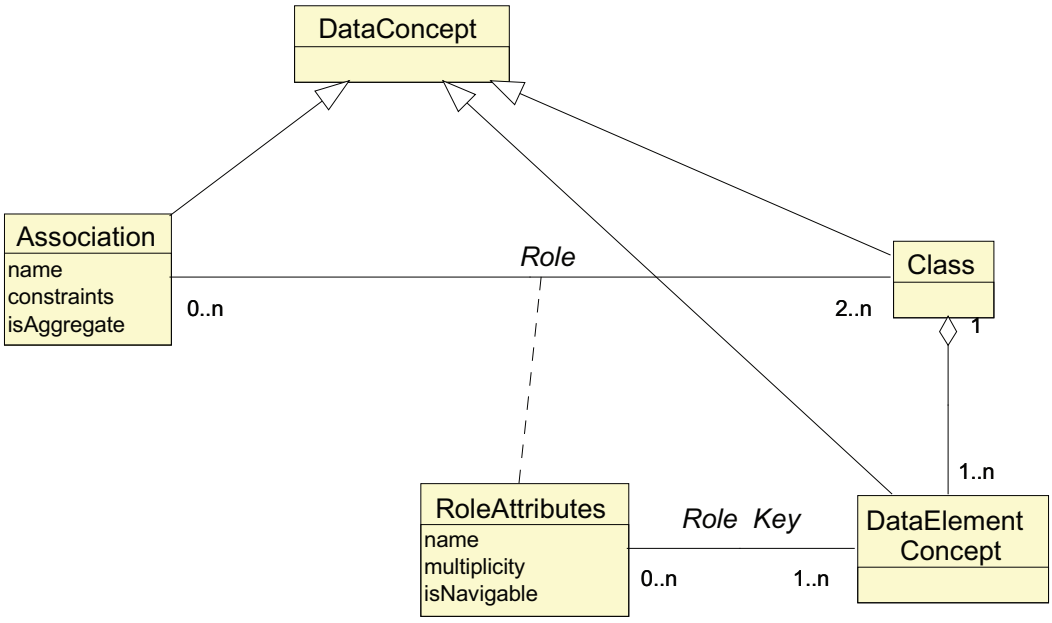

Figure B.1 — Meta-attribute relationships

B.4.2 Precursor

This is a historical, semantically similar data concept, which this data concept has replaced or is replacing.

Multiples are allowed. Applies to all data concepts. This shall be the "Descriptive Name" of the data concept that has been replaced.

B.4.3 Successor

This is a newer, semantically similar data concept, which has replaced or is replacing this data concept.

Multiples are allowed. Applies to all data concepts. This shall be the "Descriptive Name" of the data concept that has replaced the data concept to which this meta-attribute applies.

B.4.4 Synonym

This is a semantically similar data concept.

Multiples are allowed. Applies to all data concepts. This shall be the "Descriptive Name" of the synonymous data concept.

B.4.5 Abstract

This is an indication (true or false) of whether the object class has member objects. Abstract object classes cannot be instantiated, but they may have non-abstract specializations.

This meta-attribute only applies to object classes. It shall be defined once for each object class.

B.4.6 Roles

This identifies the object classes in an association and the "face name" that each object class presents to the other object classes(s) involved in the association.

“<object class[1] name>”,”<role[1] name>”, “<object class[2] name>”,”<role[2] name>”, ….

In the case of a generalization relationship, <role[1] name> = parent, <role[2] name> = child.

It applies only to the association data concept.

B.4.7 Multiplicity

This is the number of instances of the subject data concept that are associated with a given data concept.

It is a specification of the range of all allowable cardinalities a data concept may assume. It applies to object class and association.

B.4.8 Association constraints

The constraints meta-attribute identifies any special constraints placed on an association. These constraints include the following terms, as defined in UML, and may consist of other terms deemed appropriate.

Implicit — relationship is only conceptual

ordered — set of objects at one end of association are in an explicit order

changeable — links may be added, removed and changed

addOnly — new links may be added from an object on the opposite end of the association

frozen — link may not be modified or deleted

xor — exactly one set for each associated object class

It applies only to the association data concept.

B.4.9 Aggregate

This indicates whether the object class designates a "whole" in a "whole-part" association. If the value is false, the association is not a whole-part.

A simple true or false. It applies only to the association data concept.

NOTE Aggregation is a special kind of association in which one object class represents a larger thing (the "whole") which consists of the aggregation of smaller things (the "parts").

B.4.10 Role key

This is the mechanism by which the role player object class in an association is identified as a specific instance of the subject object class.

It shall be specified if the role is navigable. An ordered list of data elements defined the object class of the association. It applies only to the association data concept.

NOTE A role is the face that an object class presents to an object class at the other end of an association.

B.4.11 Referenced messages

This is a set of messages which are employed in an interface dialogue.

The messages shall be identified by using the ASN.1 object ID meta-attribute for the related messages. It applies only to the interface dialogue data concept. Multiples are allowed.

NOTE When ASN.1 encoding rules are applied, there is a guarantee that values of a message are to be unambiguously transferred. When an interface dialogue needs to use a set of messages, unambiguity can be preserved by defining a single message which is a "CHOICE" of the messages in the set.

B.4.12 Referenced data frames

This is a set of data frames which are involved in elaborating other data concepts such as information dialogue and messages. Multiples are allowed.

The data frames shall be identified by using their ASN.1 object ID meta-attribute.

B.4.13 Referenced data elements

This is a set of data elements which are involved in elaborating other data concepts such as data frame or message.

The data elements shall be identified by using their ASN.1 object ID meta-attribute. Multiples are allowed.

B.4.14 Referenced object classes

This is a set of object classes which are involved in elaborating other data concepts such as associations.

The object classes shall be identified by using the ASN.1 object ID meta-attribute. Multiples are allowed.

B.4.15 Referenced associations

This is a set of associations which are involved in elaborating an interface dialogue.

The associations shall be identified by using their ASN.1 object ID meta-attributes. Multiples are allowed.

B.5 Representational meta-attributes

B.5.1 Data type

This is the logical representation of the data concept as expressed as a valid data-concept instance of an ASN.1 data type.

The form of this meta-attribute for messages, data frames, data elements and value domains is specified in B.5.1.1 to B.5.1.4.

B.5.1.1 Description for messages

The text of this meta-attribute shall consist of a complete and syntactically correct "ASN.1 Module Definition". The module identifier for this module is provided by the definer of the module, and is not the same as the "ASN.1 Object Identifier" meta-attribute that identifies the registration entry. The module definition may contain IMPORT statements, but these shall reference only modules defined in the "Data Registry" as either data elements or as data frames. It may contain multiple ASN.1 type definitions. The first type definition defines the message and shall be exported. Any other type definitions shall not be exported, and shall be referenced (directly or indirectly) by that first type definition. Within each type definition, only imported type references and the ASN.1 constructors "SEQUENCE", "SEQUENCE OF" and "CHOICE" shall be used.

The contents of a message shall be specified by elaborating which data elements (including data frames composed of groups of data elements, and in some cases, other data-concept types) are grouped or packaged into which messages, under what conditions and, where applicable, in what order. The instantiation of these data elements shall comprise the actual message for a message instance. The specifications shall be expressed in ASN.1 syntax as in ISO/IEC 8824-1 and ISO/IEC 8824-2. The specifications shall use only the data elements, data frames composed of data elements and, in specifically predetermined cases, other data-concept types, specified in "ITS Safety messages data dictionaries". Exceptions are made for data elements found in external "ITS Safety messages data dictionaries" (handled indirectly, by reference), as well as those cases where metadata is embedded in the instance of the message (handled by noting that there will be embedded metadata).

Message specifications are to use only data elements (which are low-level data concepts considered atomic in some context for some purpose) and data frames. However, more complex data structures can be specified in a message by building up groups of data elements using ASN.1 constructors. Commonly occurring sequences or other groupings of data elements may be handled through the use of the “data frame” data concept.

The packaging or grouping of data concepts (data elements, data frames and/or other data-concept types) into messages may involve specifying any or all of the following.

— The data concepts comprising the message, including their ordering or sequence, where applicable.

— Repeatability of data concepts within a sequence, or of segments of sequences, comprising the message.

— Optionally, default values and conditionality (i.e. dependency) among data concepts comprising the message.

— Repeating sequences of data concepts are allowed as part of a message specification.

B.5.1.2 Description for data frames

The text of this meta-attribute shall consist of a complete and syntactically correct "ASN.1 Module Definition". The module identifier for this module is provided by the definer of the module, and is not the same as the "ASN.1 Object Identifier" meta-attribute that identifies the registration entry. The module definition may contain IMPORT statements, but these shall reference only modules defined in the "Data Registry" as either data elements or as data frames. It shall contain a single ASN.1 type definition. This type definition defines the data frame and shall be exported. Within that type definition, only imported type references and the ASN.1 constructors "SEQUENCE", "SEQUENCE OF" and "CHOICE" shall be used.

B.5.1.3 Description for data elements

The text of this meta-attribute shall consist of a complete and syntactically correct "ASN.1 Module Definition". The module identifier for this module is provided by the definer of the module, and is not the same as the "ASN.1 Object Identifier" meta-attribute that identifies the registration entry. The module definition may contain IMPORT statements, but these shall reference only modules defined in the "Data Registry" as value domains. The module shall contain a single ASN.1 type definition. This type definition defines the data element and shall be exported. Within that type definition, only the ASN.1 constructors "SEQUENCE", "SEQUENCE OF" and "CHOICE" shall be used, together with the "base ASN.1 types" defined below, possibly with a constraint applied to them or to uses of the "SEQUENCE OF" construction.

Within this context, the term "base ASN.1 type" shall mean one of the following data types, which are a subset of the ASN.1 types specified in ISO/IEC 8824-1. The data types are listed here with the formal definitions given in ISO/IEC 8824-1.

NOTE The following notation conforms to the rules specified in ISO/IEC 8824-1:2002, Clause 5.

```
ITS-DD-Type ::=
ITS-DD-BuiltinType     |
ITS-DD-ReferencedType  |
ITS-DD-ConstrainedType

ITS-DD-BuiltinType ::=
BooleanType                | -- see ISO/IEC 8824-1, Clause 17
IntegerType                | -- see ISO/IEC 8824-1, Clause 18
EnumeratedType             | -- see ISO/IEC 8824-1, Clause 19
RealType                   | -- see ISO/IEC 8824-1, Clause 20
BitStringType              | -- see ISO/IEC 8824-1, Clause 21
OctetStringType            | -- see ISO/IEC 8824-1, Clause 22
NullType                   | -- see ISO/IEC 8824-1, Clause 23
TaggedType                 | -- see ISO/IEC 8824-1, Clause 30
ObjectIdentifierType       | -- see ISO/IEC 8824-1, Clause 31
BMPString                  | -- see ISO/IEC 8824-1, Clause 36
IA5String                  | -- see ISO/IEC 8824-1, Clause 36
NumericString              | -- see ISO/IEC 8824-1, Clause 36
UTF8String                   -- see ISO/IEC 8824-1, Clause 36

ITS-DD-ReferencedType ::=
typereference              | -- see ISO/IEC 8824-1, Clause 11.2
Externaltypereference      | -- see ISO/IEC 8824-1, Clause 13.4
GeneralizedTime            | -- see ISO/IEC 8824-1, Clause 41
ObjectDescriptor             -- see ISO/IEC 8824-1, Clause 43

ITS-DD-ConstrainedType ::=
ITS-DD-Type Constraint       -- see ISO/IEC 8824-1, Clause 44.5
                             -- for definition of constraint
```

If the Type is a “typereference” or “Externaltypereference,” the typereference shall be the "ASN.1 Name" of a defined reference value domain.

A fixed-point decimal may be represented by an integer type if the definition meta-attribute indicates the offset of the decimal.

A floating-point decimal may be derived from real type.

UTF8String shall be used for the character string type in the case of international information exchange. BMPString and IA5String may be used in regional/country "Data Registry"/"Data Dictionary".

BMPString type and IA5String type are subsets of UTF8String type. The use of constraints to restrict the alphabets of BMPString (for Unicode) and IA5String (for ASCII) may result in more efficient encoding than the use of UTF8String, while, if no constraint is present, UTF8String may result in more efficient encoding than BMPString.

Permissible ranges of values, lists of values for enumerated types, or rules for determining valid values for the value domains of data elements shall be specified for the data elements as part of the metadata about them in an ITS safety messages functional-area data dictionary and/or the "ITS Safety Messages Data Registry", as well as being present in the "ASN.1 Module Definition".

Data types and size-related constraints shall be specified for the data elements as part of the metadata about them in an ITS safety messages functional-area data dictionary and/or the "ITS Safety Messages Data Registry". Placing limits on the size of integers, the length of strings, and the number of iterations in a "SEQUENCE OF", typically with an extension marker to allow for expansion in a later version, is likely to result in more efficient bits-on-the-line.

Any metadata related to data elements in a message specification that is in addition to the information in an ITS safety messages functional-area data dictionary and/or the "ITS Safety Messages Data Registry" is to be maintained in coordination with the data dictionary and/or registry to ensure consistency.

NOTE "Submitters" of version 1 ASN.1 definitions are strongly encouraged to provide extension markers where appropriate. For example, in an element "vehicle-type ENUMERATED {unknown, car, heavy-goods-vehicle, public-service-vehicle, ...}" the ellipsis is certainly to be included to indicate possible additions in version 2.

B.5.1.4 Description for value domains

The text of this meta-attribute shall consist of a complete and syntactically correct "ASN.1 Module Definition". The module identifier for this module is provided by the definer of the module, and is not the same as the ASN.1 Module Identifier meta-attribute that identifies the registration entry. The module definition shall not contain an IMPORT statement. The module shall contain a single ASN.1 type definition. This type definition defines the value domain and shall be exported. Within that type definition, only the ASN.1 constructors "SEQUENCE", "SEQUENCE OF" and "CHOICE" shall be used, together with the "base ASN.1 types" defined in B.5.1.3, possibly with a constraint applied to them or to uses of the "SEQUENCE OF" construction.

The definition of a value domain differs from the definition of a data element only in that the semantics associated with the different values may be absent, and provided when the value domain is used in the definition of a data element.

B.5.2 Format

This is a natural language description of the logical layout of the data concept in relation to interchange of data. The format meta-attribute shall not be interpreted to override the restrictions in either the data type or valid value rule meta-attribute.

The specific layout depends upon the data type of the value domain.

B.5.3 Unit of measure

Units shall be defined in accordance with ISO 1000. For units of enumeration, such as equipment or units of issue, the standard measure shall be defined using this meta-attribute.

It indicates the appropriate measurement framework (i.e. approved names for standard measures of extent, quantity, amount, distance, dimensions, capacity, etc.) for the measurement numbers associated with a data concept.

B.5.4 Valid value rule

This is a natural language text definition of the rule(s) by which permissible legal instances of a data element or a value domain are identified. In no case shall the valid "Value Rule" allow values that are not in accordance with the "Data Type" meta-attribute.

While the precise abstract data exchange format is defined by the "Data Type" meta-attribute, a valid value rule may be used to further constrain valid values (e.g. due to relationships to other data concepts) or to provide a natural language text definition of the data format.

B.6 Administrative meta-attributes

B.6.1 Registration status

This is an administrative or qualitative level assigned to a data concept according to its status in a qualitative hierarchy (or interim administrative status in between qualitative levels).

Legal values for the qualitative registration status levels are "Card", "Draft", "Recorded", "Qualified" and "Preferred". Legal values for the administrative registration status levels are "Provisionally Qualified", "Provisionally Preferred" and "Retired".

B.6.2 Date registered

This is the date that a data concept is initially entered into the "ITS Safety Messages Data Registry", regardless of its registration status at the time it was entered.

The value of this meta-attribute is assigned automatically by the "ITS Safety Messages Data Registry".

B.6.3 Last change date

This is the date that the last version of the data concept was "Recorded" in the "ITS Safety Messages Data Registry".

The value of this meta-attribute is assigned automatically by the "ITS Safety Messages Data Registry".

B.6.4 Last change user

This is the access name of the person who made the last change to the data concept.

The value of this meta-attribute is assigned automatically by the "ITS Safety Messages Data Registry".

B.6.5 Registrar organization name

This is the reference to the authority under which the data concept was registered.

When a functional-area data dictionary reuses a data concept from a foreign data dictionary, the source authority for the external data concept is "Recorded" in this meta-attribute, otherwise the "ITS Safety Messages Registration Authority" is recorded.

B.6.6 Registrar phone number

This is the telephone number (country code, city code, area code, exchange number, telephone number, extension number) of the authorized registrar.

When a functional-area data dictionary reuses a data concept from a foreign data dictionary, the source authority for the foreign data concept is "Recorded" in this meta-attribute; otherwise, the "ITS Safety Messages Registration Authority" is recorded.

B.6.7 Steward organization name

This is a reference to the authority responsible for a data concept.

This is the organization assigned responsibility for managing data concepts within a defined data subject area.

B.6.8 Steward phone number

This is the telephone number (country code, city code, area code, exchange number, telephone number, extension number) of the authorized data "Steward".

B.6.9 Submitter organization name

This is a reference to the authority responsible for submitting a data-concept proposal for registration.

This is the organization assigned responsibility for identifying, documenting and proposing data concepts for registration.

B.6.10 Submitter phone number

This is the telephone number (country code, city code, area code, exchange number, telephone number, extension number) of the responsible "Submitter" organization.

B.6.11 User

This is an access name of a person who is authorized read-only access to the data dictionary or "Data Registry".

The values of this meta-attribute are maintained via a controlled word list of authorized users.

B.6.12 View

This is a logical grouping of the data dictionary or "Data Registry" contents by data subject area, functional area, standard application, application or other demarcation.

B.6.13 Related groups

This is a designation of the ITS safety messages data "Stewards" that may be impacted by changes to a given data concept.

B.6.14 Security class

This is a level of degree of protection of information against unauthorized access, associated with a data concept.

Such protection relates to the degree of access permissible for a data concept.

NOTE Most security issues are envisioned as being specific to the use of a data element within an application context, but only if there are general security criteria pertinent to a data element or other data concept, such as read/write/update rights.

EXAMPLE Personal privacy issues, proprietary data, financial data, etc.

Annex C
(normative)

Contents of the "ITS Safety Messages Data Registry": Meta-attribute requirements for data concepts

C.1 Introduction

This annex presents a set of tables that delineate the requirements for inclusion of meta-attributes in the "ITS Safety Messages Data Registry" for each data concept. A second set of tables delineate the requirements for inclusion of meta-attributes in an "ITS Safety messages data dictionary" for each data concept. The definition of the meta-attributes in this annex are to be found in Annex B (Contents of the "ITS Safety Messages Data Registry": Meta-attribute definitions).

Rows denote the meta-attributes required for each data concept. The first column of each row provides the name of the meta-attribute. The subclause number in which the meta-attribute is defined is given in the second column. The next nine columns list the data concepts that may be documented in a "Data Registry" or a Data Dictionary. The last column is for any notes pertinent to the meta-attribute and its relationship to each of the data concepts.

Each cell of the table contains a code that indicates whether the meta-attribute on a particular row is mandatory, optional, contingent, indicative, automatically assigned, or not applicable for the data concept in a particular column. These codes are as follows:

— "M" = mandatory. Mandatory meta-attributes are required for the referenced data concept, without exception.

— "O" = optional. Optional meta-attributes may be implemented if desired by the functional-area data dictionary.

— "C" = contingent. Contingent meta-attributes are those that depend upon the implementation of an optional meta-attribute. They are required when the optional meta-attribute upon which they depend is implemented.

— "I" = indicative. Indicative meta-attributes depend upon an "if" condition that is independent of any other meta-attribute. If the "if" condition is applicable, then the "I" coded meta-attribute is mandatory; otherwise, it is not applicable.

— “A” = assigned. The value of this meta-attribute is automatically assigned for data concepts entered into the "ITS Safety Messages Data Registry".

— "N/A" = not applicable.

The note column of each table explains the nature of each contingent or indicative meta-attribute and provides other explanatory information.

NOTE Only single values are permitted for each meta-attribute, unless specifically identified as “Multiples are allowed”.

C.2 Meta-attribute requirements for the "ITS Safety Messages Data Registry"

Table C.1 defines which of the basic meta-attributes are required for data concepts in the "ITS Safety Messages Data Registry". Data registries are intended to document all data concepts for an enterprise.

Table C.2 shows the administrative meta-attribute requirements for data concepts in the "ITS Safety Messages Data Registry".

Table C.1 — Basic meta-attributes for the "ITS Safety Messages Data Registry"

	DATA CONCEPTS										
META-ATTRIBUTE	**Subclause**	**Object Class**	**Property**	**Value Domain**	**Data Element Concept**	**Data Element**	**Data Frame**	**Message**	**Interface Dialogue**	**Association**	**NOTES**
Data-concept identifier	B.2.1	A	A	A	A	A	A	A	A	A	The value of this meta-attribute is maintained automatically by the "ITS Safety Messages Data Registry".
Data-concept version	B.2.2	A	A	A	A	A	A	A	A	A	The value of this meta-attribute is maintained automatically by the "ITS Safety Messages Data Registry".
Descriptive name [a]	B.2.3	M	M	M	M	M	M	M	M	M	—
Synonymous descriptive names	B.2.4	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Symbolic name	B.2.5	N/A	N/A	N/A	N/A	O	O	O	O	N/A	Multiples are allowed.
ASN.1 name [a]	B.2.6	N/A	N/A	M	N/A	M	M	M	M	N/A	—
ASN.1 object identifier	B.2.7	M	M	M	M	M	M	M	M	M	—
Uniform resource locator	B.2.8	I	I	I	I	I	I	I	I	I	—
Definition [a]	B.3.1	M	M	M	M	M	M	M	M	M	—
"Descriptive Name" context [a]	B.3.2	M	M	M	M	M	M	M	M	M	Multiples are allowed.
Symbolic name usage	B.3.3	N/A	N/A	N/A	N/A	C	C	C	C	N/A	'C' = Required when B.2.5 is optioned. Multiples are allowed.
Source	B.3.4	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Architecture reference [b]	B.3.5	O	O	O	O	O	O	M	M	O	One or more framework ITS safety messages architecture reference(s) is required for messages and dialogues. Multiples are allowed.
Architecture name [b]	B.3.6	C	C	C	C	C	C	M	M	C	'C' = Required when clause B.3.5 is optioned. Multiples are allowed corresponding to multiple instances of B.3.5.

Table C.1 (*continued*)

META-ATTRIBUTE	DATA CONCEPTS										NOTES
	Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	
Architecture version [b]	B.3.7	C	C	C	C	C	C	M	M	C	'C' = Required when B.3.5 is optioned. Multiples are allowed corresponding to multiple instances in B.3.5.
Data-concept type	B.3.8	M	M	M	M	M	M	M	M	M	—
Remarks	B.3.9	O	O	O	O	O	O	O	O	O	—
Context	B.3.10	O	O	O	O	O	O	O	O	O	—
Standard	B.3.11	O	O	M	O	M	M	M	O	O	—
Metadata source	B.3.12	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	N/A	—
Priority	B.3.13	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	N/A	—
Frequency/message mode	B.3.14	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	N/A	—
Delivery verification	B.3.15	N/A	N/A	N/A	N/A	N/A	N/A	O	N/A	N/A	—
Data quality	B.3.16	N/A	N/A	N/A	O	O	N/A	N/A	N/A	N/A	—
Precursor [c]	B.4.2	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Successor [c]	B.4.3	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Synonym [c]	B.4.4	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Abstract [c]	B.4.5	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—
Roles [c]	B.4.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	—
Multiplicity [c]	B.4.7	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	—
Association constraints [c]	B.4.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	O	—
Aggregate [c]	B.4.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	—
Role key [c]	B.4.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	O	—
Referenced messages [c]	B.4.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	Multiples are allowed.
Referenced data frames [c]	B.4.12	N/A	N/A	N/A	N/A	O	O	M	O	N/A	Multiples are allowed.
Referenced data elements [c]	B.4.13	C	N/A	N/A	N/A	O	M	M	O	N/A	Multiples are allowed. 'C' = required when any referenced association exists.
Referenced object classes [c]	B.4.14	O	N/A	N/A	N/A	N/A	N/A	N/A	M	M	Multiples are allowed.
Referenced associations [c]	B.4.15	N/A	N/A	N/A	O	O	N/A	N/A	C	N/A	Multiples are allowed. 'C' = Required when any referenced association exists.
Data type [a]	B.5.1	N/A	N/A	M	N/A	M	M	M	O	N/A	Defined in ISO/IEC 8824, ASN.1.
Format	B.5.2	N/A	N/A	M	N/A	M	N/A	N/A	N/A	N/A	—

Table C.1 (*continued*)

META-ATTRIBUTE	DATA CONCEPTS: Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	NOTES
Unit of measure	B.5.3	N/A	N/A	M	N/A	M	N/A	N/A	N/A	N/A	—
Valid value rule	B.5.4	N/A	N/A	M	N/A	M	N/A	N/A	N/A	N/A	The valid value rule may be expressed as a range, a list or a function/algorithm.

[a] Considered as a minimum essential meta-attribute.

[b] Vectors interface specific to architecture/information model.

[c] Data modelling requirement.

Table C.2 — Administrative meta-attributes for the "ITS Safety Messages Data Registry"

META-ATTRIBUTE	DATA CONCEPTS: Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	NOTES
Registration status	B.6.1	M	M	M	M	M	M	M	M	M	—
Date registered	B.6.2	A	A	A	A	A	A	A	A	A	The value of this meta-attribute is maintained automatically by the "ITS Safety Messages Data Registry".
Last change date	B.6.3	A	A	A	A	A	A	A	A	A	The value of this meta-attribute is maintained automatically by the "ITS Safety Messages Data Registry".
Last change user	B.6.4	A	A	A	A	A	A	A	A	A	The value of this meta-attribute is maintained automatically by the "ITS Safety Messages Data Registry".
Registrar organization name	B.6.5	M	M	M	M	M	M	M	M	M	—
Registrar phone number	B.6.6	M	M	M	M	M	M	M	M	M	—
Steward organization name	B.6.7	M	M	M	M	M	M	M	M	M	Required for data concepts at registration quality level of "Qualified" or higher.
Steward phone number	B.6.8	M	M	M	M	M	M	M	M	M	Required for data concepts at registration quality level of "Qualified" or higher.
Submitter organization name	B.6.9	A	A	A	A	A	A	A	A	A	—

Table C.2 (*continued*)

META-ATTRIBUTE	DATA CONCEPTS										NOTES
	Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	
Submitter phone number	B.6.10	M	M	M	M	M	M	M	M	M	—
User	B.6.11	A	A	A	A	A	A	A	A	A	The value of this meta-attribute is maintained automatically by the ITS "Data Registry". Multiples are allowed.
View	B.6.12	O	O	O	O	O	O	O	O	O	—
Related groups	B.6.13	I	I	I	I	I	I	I	I	I	'I' = Required when a change in a data concept may impact other ITS functional-area "Data Dictionaries". Multiples are allowed.
Security class	B.6.14	O	O	O	O	O	O	O	O	O	—

C.3 Meta-attribute requirements for "ITS Safety messages data dictionaries"

Table C.3 defines which of the basic meta-attributes are required for data concepts in "ITS Safety messages data dictionaries". "ITS Safety messages data dictionaries" are primarily intended to document data elements, data frames and messages, although documentation of other data concepts, such as object classes, properties, value domains or data element concepts, may be included. A valid "ITS Safety messages data dictionary" shall incorporate all mandatory meta-attributes of each data element, data frame and message of the set. In addition, an "ITS Safety messages data dictionary" may include documentation of other data concepts, such as object classes, properties, value domains or data element concepts.

Table C.4 shows the administrative attribution requirements for data concepts in "ITS Safety messages data dictionaries".

Table C.3 — Basic meta-attributes for "ITS Safety messages data dictionaries"

META-ATTRIBUTE	DATA CONCEPTS										NOTES
	Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	
Data-concept identifier	B.2.1	O	O	O	O	O	O	O	O	O	ITS Safety messages data dictionary authorities are to find this meta-attribute useful.
Data-concept version	B.2.2	O	O	O	O	O	O	O	O	O	ITS Safety messages data dictionary authorities are to find this meta-attribute useful.

Table C.3 (*continued*)

META-ATTRIBUTE	DATA CONCEPTS										NOTES
	Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	
Descriptive Name [a]	B.2.3	M	M	M	M	M	M	M	M	M	Required if data concepts are contained in the data dictionary.
Synonymous descriptive names	B.2.4	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Symbolic name	B.2.5	N/A	N/A	N/A	N/A	O	O	O	O	N/A	Multiples are allowed.
ASN.1 name [a]	B.2.6	N/A	N/A	M	N/A	M	M	M	M	N/A	—
ASN.1 object identifier	B.2.7	M	M	M	M	M	M	M	M	M	—
Uniform resource locator	B.2.8	I	I	I	I	I	I	I	I	I	—
Definition [a]	B.3.1	M	M	M	M	M	M	M	M	M	—
"Descriptive Name" context [a]	B.3.2	M	M	M	M	M	M	M	M	M	Multiples are allowed.
Symbolic name usage	B.3.3	N/A	N/A	N/A	N/A	C	C	C	C	N/A	'C' = Required when B.2.5 optioned. Multiples are allowed.
Source	B.3.4	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Architecture reference [b]	B.3.5	O	O	O	O	O	O	M	M	O	One or more framework ITS safety messages architecture reference(s) is required for messages and dialogues. Multiples are allowed.
Architecture name [b]	B.3.6	C	C	C	C	C	C	M	M	C	'C' = Required when B.3.5 is optioned. Multiples are allowed corresponding to multiple instances of B.3.5.
Architecture version [b]	B.3.7	C	C	C	C	C	C	M	M	C	'C' = Required when B.3.5 is optioned. Multiples are allowed corresponding to multiple instances of B.3.5.
Data-concept type	B.3.8	M	M	M	M	M	M	M	M	M	—
Remarks	B.3.9	O	O	O	O	O	O	O	O	O	—
Context	B.3.10	O	O	O	O	O	O	O	O	O	—
Standard	B.3.11	O	O	M	O	M	M	M	O	O	—
Metadata source	B.3.12	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	N/A	—
Priority	B.3.13	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	N/A	—
Frequency/message mode	B.3.14	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	N/A	—
Delivery verification	B.3.15	N/A	N/A	N/A	N/A	N/A	N/A	O	N/A	N/A	—

Table C.3 (*continued*)

META-ATTRIBUTE	DATA CONCEPTS										NOTES
	Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	
Data quality	B.3.16	N/A	N/A	N/A	O	O	N/A	N/A	N/A	N/A	—
Precursor [c]	B.4.2	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Successor [c]	B.4.3	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Synonym [c]	B.4.4	O	O	O	O	O	O	O	O	O	Multiples are allowed.
Abstract [c]	B.4.5	M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—
Roles [c]	B.4.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	—
Multiplicity [c]	B.4.7	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	—
Association constraints [c]	B.4.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	O	—
Aggregate [c]	B.4.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	—
Role key [c]	B.4.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	—
Referenced messages [c]	B.4.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M	N/A	Multiples are allowed.
Referenced data frames [c]	B.4.12	N/A	N/A	N/A	N/A	O	O	M	O	N/A	Multiples are allowed.
Referenced data elements [c]	B.4.13	C	N/A	N/A	N/A	O	M	M	O	N/A	Multiples are allowed. C = required when any referenced association exists.
Referenced object classes [c]	B.4.14	O	N/A	N/A	O	O	N/A	N/A	M	M	Multiples are allowed.
Referenced associations [c]	B.4.15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C	N/A	Multiples are allowed. 'C' = Required when any referenced association exists.
Data type [a]	B.5.1	N/A	N/A	M	N/A	M	M	M	O	N/A	Defined in ISO/IEC 8824, ASN.1.
Format	B.5.2	N/A	N/A	M	N/A	M	N/A	N/A	N/A	N/A	—
Unit of measure	B.5.3	N/A	N/A	M	N/A	M	N/A	N/A	N/A	N/A	—
Valid value rule	B.5.4	N/A	N/A	M	N/A	M	N/A	N/A	N/A	N/A	The valid value rule may be expressed as a range, a list or a function/algorithm.

[a] Considered as a minimum essential meta-attribute.

[b] Vectors interface specific to architecture/information model.

[c] Data modelling requirement.

Table C.4 — Administrative meta-attributes for "ITS Safety messages data dictionaries"

META-ATTRIBUTE	Subclause	Object Class	Property	Value Domain	Data Element Concept	Data Element	Data Frame	Message	Interface Dialogue	Association	NOTES
Registration status	B.6.1	O	O	O	O	O	O	O	O	O	Required if data concept is in an ITS registration status of "Working Draft", "Qualified" or "Preferred".
Date registered	B.6.2	O	O	O	O	O	O	O	O	O	ITS Safety messages data dictionary authorities are to find this meta-attribute useful.
Last change date	B.6.3	O	O	O	O	O	O	O	O	O	ITS Safety messages data dictionary authorities are to find this meta-attribute useful.
Last change user	B.6.4	O	O	O	O	O	O	O	O	O	ITS Safety messages data dictionary authorities are to find this meta-attribute useful.
Registrar organization name	B.6.5	O	O	O	O	O	O	O	O	O	Required if external "Registrar" is the source.
Registrar phone number	B.6.6	O	O	O	O	O	O	O	O	O	—
Steward organization name	B.6.7	O	O	O	O	O	O	O	O	O	—
Steward phone number	B.6.8	O	O	O	O	O	O	O	O	O	—
Submitter organization name	B.6.9	O	O	O	O	O	O	O	O	O	—
Submitter phone number	B.6.10	O	O	O	O	O	O	O	O	O	—
User	B.6.11	O	O	O	O	O	O	O	O	O	ITS Safety messages data dictionary authorities are to find this meta-attribute useful. Multiples are allowed.
View	B.6.12	O	O	O	O	O	O	O	O	O	—
Related groups	B.6.13	I	I	I	I	I	I	I	I	I	'I' = Required when a change in a data concept may impact other ITS functional-area "Data Dictionaries". Multiples are allowed.
Security class	B.6.14	O	O	O	O	O	O	O	O	O	—

Annex D
(normative)

Data-concept name

D.1 Data-concept "Descriptive Name" format

D.1.1 Overview

The formulation of descriptive names shall be accomplished by first formulating the terms associated with the most elemental concepts. For example, a data element name consists of an object class term, a property term and a value domain term. Careful formulation of the names of data-concept components promotes consistency of descriptive names and helps prevent development of duplicate descriptive names (i.e. the same names for different data concepts).

A number of general requirements apply to all data-concept descriptive names. Proper names, spaces, prepositions and conjunctions or special characters (other than those noted below) are not allowed in descriptive data-concept names.

D.1.2 Object class "Descriptive Name" format

An object class "Descriptive Name" indicates the object class relevant to the data concept. The structure of the object class "Descriptive Name" shall be

ObjectClassTerm

The object class "Descriptive Name" shall be constructed as a series of one or more words, designed to quickly convey the essential meaning of the object class to the reader as a singular noun. Each word within the "Descriptive Name" shall start with an initial upper-case letter followed by lower-case letters. The words shall immediately follow one another without any space. Hyphens shall only be used when their absence may cause confusion to the reader; in this case, the second part of the hyphenated word shall start with a lower-case letter. The maximum length of an object class "Descriptive Name" shall be 64 characters.

The object class "Descriptive Name" is to consist only of alpha and numeric characters. Other than hyphens, no other character or space is permitted. The use of hyphens is discouraged because of potential conflicts with any conversion rules.

The intention of the "ITS Safety Messages Data Registry" is to convey information in an understandable format. While names may follow an object-oriented, class-hierarchical naming convention, the order of qualifiers in the object class term is not prescribed. The allocation of qualifiers between the object class and property terms is also not prescribed.

D.1.3 Property "Descriptive Name" format

A property "Descriptive Name" indicates the information of interest about an object class. The information of interest might be a fact, proposition or observation about the object class. The structure of the property "Descriptive Name" shall be

propertyTerm

The property "Descriptive Name" shall be constructed as a series of one or more words, designed to quickly convey the essential meaning of the property to the reader. An object may have multiple instances of the property, in which case it shall be in the plural form of a noun; otherwise it shall be in the singular noun form. The initial word of the "Descriptive Name" shall be in lower-case letters. Any subsequent words within the

"Descriptive Name" shall start with an initial upper-case letter followed by lower-case letters. The words shall immediately follow one another without any space. Hyphens shall never be used in the first word and shall only be used in subsequent words when their absence may cause confusion to the reader; in this case, the second part of the hyphenated word shall start with a lower-case letter. The maximum length of a property "Descriptive Name" shall be 64 characters.

The property "Descriptive Name" is to consist only of alpha and numeric characters. Other than hyphens, no other character or space is permitted. The use of hyphens is discouraged because of potential conflicts with any conversion rules.

The property "Descriptive Name" is separated from the object class term by a (".") and from its representational form (e.g. a value domain term) by a colon (":").

D.1.4 Value domain "Descriptive Name" format

A value domain "Descriptive Name" is a name that indicates, precisely and unambiguously, the format and syntactic form for value domain instance values. The explicit value domain applicable to a data element using this value domain term is to be specified in its value domain meta-attribute. The structure of the value domain "Descriptive Name" shall be

value-domain-term

The value domain "Descriptive Name" shall be constructed as a series of one or more words, designed to quickly convey the format in which the information is represented. Each word shall be in lower-case letters with hyphens separating words. The first word of the value domain "Descriptive Name" shall be one of the terms identified in this subclause, in order to identify the general nature of the value domain. The remaining words shall uniquely characterize the specific value domain. The maximum length of a value domain "Descriptive Name" shall be 32 characters.

The value domain "Descriptive Name" need not include text that uniquely characterizes the specific value domain if other fields in the "ITS Safety Messages Data Registry" convey that information.

The value domain terms and their abbreviations, as listed below, are to be the value domain terms used for naming value domains themselves. Use of any other value domain terms is to be avoided. A value domain term abbreviation is not to be further abbreviated.

amount (amt): A numeric quantification of a monetary value expressed in monetary units, such as dollars and cents. An example of an explicit value domain for this value domain term is to be $$$$.cc, where $$$$ represents dollars to whatever number of significant digits is required, and "cc" represents cents. For non-monetary numeric values, use the "quantity" value domain term.

code (cd): An alphanumeric character or symbol (or a string of characters or symbols) that represents a specific meaning, e.g. "T" for "True" and "F" for "False".

NOTE Examples of value domains: ANSI X3.38-1988, ISO 3166-1:2006, ISO 3166-2:2007, ISO 3166-3:1999, and ISO/IEC 5218:2004 are all of the representation class "code".

date (dt): A specific calendar day expressed in numeric format. The value domain reference specified for the date is to apply. No other value domains are to be used for the date value domain term.

identifier (id): A value used to uniquely identify a data-concept instance of an object class.

image (img): A graphical or pictorial item, such as a map, diagram, picture, motion picture, or icon. An example of an explicit value domain applicable to a data element using this value domain term is to be specified in its value domain meta-attribute (e.g. jpeg, mpeg, gif).

location (lctn): A three-dimensional geographical point on, under or above the earth. The value domain reference specified for latitude/longitude/altitude is to apply. No other value domains are to be used for the location value domain term.

number (nbr): A non-computational numeric or alphanumeric string used to designate an item, e.g. a serial number, telephone number, street number, apartment number or social security number. The explicit value domain for the representation class "number" is ISO/IEC 10646.

percent (pct): A ratio of two quantities expressed in numeric format as a decimal number multiplied by 100. An example of an explicit value domain for the representation class "percent" is 999.999 with, however, as many significant digits as are necessary for each of the whole number and decimal fraction portions of the number. Such percents are positive or negative integers.

quantity (qty): A non-monetary numeric value subject to computational manipulations. An example of an explicit value domain for the representation class "quantity" is the set of all real or imaginary numbers.

rate (rt): A numeric unit of measure expressing the ratio of a quantity to another quantity, for example, "kilometres per hour", "litres per hour", and "Euros per day". An example of an explicit value domain for "rate" is the positive or negative integers. The specific ratio for a data element using this representational class term is to be specified in the valid value rule meta-attribute.

sound (snd): An audio sequence with explicit beginning and end. An example of an explicit value domain applicable to a data element using this value domain term is to be specified in its value domain meta-attribute, e.g. "wav".

text (txt): An alphanumeric string (formatted or unformatted), e.g. a street name, or the contents of a document, message, or other file. An example of an explicit value domain for "text" is ISO 10646.

UTC (utc): A specific point in UTC-based time in a calendar day expressed in terms of hours, minutes, and, optionally, seconds and decimal seconds. The value domain reference specified for UTC-based time to apply. No other value domain term for that value domain reference is to be used.

GPS (gps): A specific point in GPS time in a calendar day expressed in terms of seconds since midnight on the night of 5 January 1980/morning of 6 January 1980. GPS may differ from UTC as UTC is corrected periodically with an integer number of leap seconds. The value domain reference is specified for GPS-based time to apply. No other value domain term for that value domain reference is to be used. Alternatively, employ the Global Navigation Satellite System (GNSS/gnss) as the value domain reference.

NOTE References for the "Galileo" system will be added at a later date when finalized.

D.1.5 Data element concept "Descriptive Name" format

A data element concept "Descriptive Name" is a name that identifies a data element concept. The structure of the data element concept "Descriptive Name" shall be

ObjectClassTerm.propertyTerm

D.1.6 Data element "Descriptive Name" format

A data element "Descriptive Name" is a name that identifies a data element. The structure of the data element "Descriptive Name" shall be

ObjectClassTerm.propertyTerm:value-domain-term

D.1.7 Data frame "Descriptive Name" format

A data frame "Descriptive Name" is a name that summarizes the contents of the data frame. The structure of the data frame "Descriptive Name" shall be

DataFrameTerm:frame

The structure is identical to that of the object class descriptive name, except that it may be plural and that it shall be followed by the string literal ":frame".

D.1.8 Message "Descriptive Name" format

A message "Descriptive Name" is a name that captures the essence of the purpose of the message. The structure of the message "Descriptive Name" shall be

MessageTerm:message

The structure is identical to that of the object class descriptive name, except that it may be plural and that it shall be followed by the string literal ":message".

D.1.9 Interface dialogue "Descriptive Name" format

An interface dialogue "Descriptive Name" is a name that captures the essence of the purpose of the interaction. It shall be based upon the architectural subsystems which support the interface dialogue and an identifier of that subsystem. The structure of the interface dialogue "Descriptive Name" shall be

SourceName<-InterfaceDialogue->DestinationName

D.1.10 Association "Descriptive Name" format

An association "Descriptive Name" is a name that captures the essence of the purpose of an association. The structure of the association "Descriptive Name" is

RoleAObjectClassTerm<<associationtype>> RoleBObjectClassTerm

D.1.11 Context "Descriptive Name" term format

The context "Descriptive Name" term identifies the document within which the data concept is identified. The structure of the context "Descriptive Name" term shall be

OrganizationIdentifier-DocumentIdentifier

The context "Descriptive Name" term shall consist of an organization identifier and a document identifier. The "Registrar" shall assign a globally unique organization identifier to any organization wishing to register data concepts. The organization shall then assign a document identifier to each document from which it proposes data concepts and shall ensure that each document identifier is unique within its organization. These two identifiers are then combined and separated by a hyphen. For example, the context "Descriptive Name" is

ISO-14817

All OrganizationIdentifiers shall be defined as 3-6 upper-case, alphabetic (A-Z) characters. The "Registrar" shall maintain a list of agreed-upon OrganizationIdentifiers and include them in the operating procedures.

All DocumentationIdentifiers shall be defined as 3-8 upper-case alphabetic (A-Z) or numeric characters or spaces. No special extra delimiters are permitted.

D.1.12 Fully-qualified "Descriptive Name" formats

Because there are a large number of independent groups that may develop data concepts, it would be problematic to require globally unique descriptive names for every data concept. Instead, this International Standard only requires a "Descriptive Name" to be unique within the scope of the defining standard or document. In addition, any standard or document that defines one or more data concepts to be stored in the "ITS Safety Messages Data Registry" is required to have a context descriptive name.

Whenever a reference is made to a data concept that is formally defined in another document, the reference shall use the fully "Qualified" "Descriptive Name". The fully "Qualified" "Descriptive Name" of any data concept is obtained by concatenating the context "Descriptive Name" with a double colon and the "Descriptive Name" of the data concept. Thus the structure of a fully "Qualified" "Descriptive Name" for an object class would be

OrganizationIdentifier-DocumentIdentifier::ObjectClassTerm

D.2 Abbreviations and acronyms

Abbreviations and acronyms are often required for readability. They shall only be used when the intended audience of the document is already familiar with the terms. The maximum length of abbreviated names shall be 162 characters (inclusive of separators).

D.3 Converting ITS safety messages descriptive names to ASN.1 names

D.3.1 Overview

The convention for developing descriptive names for data elements and other data-concept types represented in "ITS Safety messages data dictionaries" is given above. Data element names developed using this naming convention may differ somewhat from the names for those data elements when they are represented in a message specification using ASN.1 syntax and associated naming rules. The descriptive data element names can be converted to ASN.1 names using the guidelines described in this subclause. The ASN.1-conforming name shall be represented in an "ITS Safety messages data dictionary" using the meta-attribute called ASN.1 Name, which is a meta-attribute mandatory for all value domains, data elements, data frames, messages and interface dialogues.

D.3.2 Use of ASN.1 syntax

The ASN.1 naming rules are as follows:

— The set of characters from which names can be formed in ASN.1 are: A-Z, a-z, hyphen, 0-9.

— Typereferences are names that must start with a capital letter.

— Identifiers are names that must start with a lower-case letter.

— A name (i.e. a typereference or an identifier) cannot contain two or more contiguous hyphens, nor start or end with a hyphen. Note that ASN.1 names are case-sensitive.

— While no maximum length is placed on names by ASN.1, this International Standard limits names by way of this annex.

In the following example

```
PersonnelInfo ::= SEQUENCE {
    name          PersonName,
    age           Age,
    address       HomeAddress
}
PersonName    ::= VisibleString (SIZE(1..64))
Age           ::= INTEGER (0..160)
HomeAddress   ::= VisibleString (SIZE(1..100))
```

or alternatively,

```
PersonnelInfo ::= SEQUENCE {
   name           VisibleString (SIZE(1..64)),
   age            INTEGER (0..160),
   address        VisibleString (SIZE(1..100))
}
```

PersonnelInfo, PersonName, Age, and HomeAddress are typereferences; name, age, and address are identifiers. The typereferences for field names — properties, in "ITS Safety messages data dictionary" terminology — may be omitted, as they serve only an intermediary purpose.

NOTE For ITS safety-messages messages, the data types and field size metadata are given in the data dictionary.

An equivalent of this example in the C programming language would be:

```
typedef char            PersonName[65];
typedef unsigned short  Age;
typedef char            HomeAddress[101];

typedef struct {
     PersonName     name;
     Age            age;
     HomeAddress    address;
     }PersonnelInfo;
```

The process for converting from the "Descriptive Name" for a data concept in an "ITS Safety messages data dictionary" to an ASN.1-conforming name is as follows:

The object class term from the data dictionary "Descriptive Name" is verified as the first letter of each word in upper case and the rest in lower case. Any hyphens in terms, as well as all underscores used as separators in the case of modifiers, are removed. The modifier(s) is (are) to be placed in front of the primary object class term. The term may become a separate ASN.1 typereference, and/or when needed to avoid ambiguity, may be applied as part of the typereference created for the property term. In the latter case, the period between the class term and the property term is removed. A hyphen may be placed between the class term and the property term, including the case for use as a substitute for a removed underscore.

The property term from the data dictionary "Descriptive Name" is converted to all lower case. Hyphens are added between compound words in terms formed from compound words (unless such hyphens are already present). The term becomes an ASN.1 identifier. An optional intermediate state may be shown if the property term is explicitly specified in ASN.1 as being a field name or identifier in a sequence. As a minimum, it may be treated as a field name or identifier in a sequence associated with its class. The property term is represented in the same form as it was in the data dictionary, but in this case becomes an ASN.1 typereference. The typereference for its associated class term may be prepended to the property term to avoid ambiguity; it is then used essentially as a qualifier, and may become an indistinguishable part of the typereference for the property term (unless a hyphen is added between the class term and the property term). The typereference for the property term is mapped to the identifier for the same term.

The value domain name and the data type are not used.

Annex E
(informative)

ASN.1 information object specification for an ITS safety messages data concept

E.1 General

When ITS safety messages data concepts are documented using ASN.1 constructs, the documentation shall be in the form of ASN.1 information object specifications as defined by ISO/IEC 8824-2. The contents of the ASN.1 information object specification used for this specification shall include the following categories of meta-attributes: "Identification", "Definition", "Relation", "Representation" and "Administrative". The meta-attributes of a data concept are defined in this International Standard. Information object specifications shall be documented within ASN.1 modules.

E.2 Data-concept specification

"ITS Safety messages data dictionaries" shall represent data-concept information in a consistent format to aid the reader. Documentation for each meta-attribute of a data concept shall be included within an ASN.1 information object, as defined by ISO/IEC 8824-2. Specific data concept meta-attributes shall be in accordance with this International Standard. "ITS Safety messages data dictionaries" may include additional meta-attributes added by that data dictionary authority to account for area-specific needs. Any such extensions to the standard meta-attributes are to be added by creating a container information object.

E.3 Recommended practice

Data concepts in ISO/TC 204 International Standards are to be documented using ASN.1 Information Object Specifications when ASN.1 is employed in describing the data. E.4 provides an ASN.1 Information Object Specification for an ITS safety messages data concept in the "ITS Safety Messages Data Registry" based upon the meta-attributes presented in Tables C.1 and C.2. Those meta-attributes indicated as mandatory in the tables are required in the IOS, while optional, conditional and indicative meta-attributes are considered optional in the IOS. ISO/TC 204 International Standards using ASN.1 to be written such that each data concept is specified in a separate ASN.1 module specification. E.5 presents an example ITS-data element module prepared in accordance with the ITS safety messages data concept IOS. "ITS Safety messages data dictionaries" may be created by collecting the data element module specifications. E.6 presents an example ITS-data frame module prepared in accordance with the ITS safety messages data concept IOS. E.7 presents an example ITS safety-messages message module prepared in accordance with the ITS safety messages data concept IOS.

E.4 ITS safety messages data-concept information object specification

This clause provides the information object specification for an ITS safety messages data concept in ASN.1

```
ISO14817M1 {iso standard 14817 modules(0) class-definition(1)}


-- ASN.1 Information Object Specification for an ITS safety messages Data
-- Concept.

-- Definition of an Information Object of this class provides all the
-- information needed to register an instance of any of the ITS
-- Data Concepts specified in ISO 14817.


DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

EXPORTS ITS SAFETY MESSAGES -OBJECT-CLASS, ITS SAFETY MESSAGES -PROPERTY, ITS SAFETY
MESSAGES -VALUE-DOMAIN,
        ITS SAFETY MESSAGES -DATA-ELEMENT-CONCEPT, ITS SAFETY MESSAGES -DATA-
      ELEMENT,
        ITS SAFETY MESSAGES -DATA-FRAME, ITS SAFETY MESSAGES -MESSAGE, ITS SAFETY
      MESSAGES -INTERFACE-DIALOGUE,
        ITS SAFETY MESSAGES -ASSOCIATION;

-- Type references for commonly-used types:

Integer32       ::= INTEGER (0..2147483647)

Name            ::= UTF8String (SIZE(0..160))

OID             ::= OBJECT IDENTIFIER

Url             ::= UTF8String (SIZE(0..63))

Text            ::= UTF8String (SIZE(0..2147483647))

String          ::= UTF8String (SIZE(0..255))

DataConceptType ::= ENUMERATED { -- see clause B.3.8
      object-class,
      property,
      value-domain,
      data-element-concept,
      data-element,
      data-frame,
      message,
      interface-dialogue,
      association,
      ... }

MetaDataSource ::= ENUMERATED { -- see clause B.3.12
      direct,
      indirect,
      embedded }

DataConceptReference ::= String

RegistrationStatus ::= CHOICE { -- see clause B.6.1
      qualitative       ENUMERATED {
            card,
            draft,
            recorded,
            qualified,
            preferred },
      adminstrative     ENUMERATED {
            provisionally-qualified,
            provisionally-preferred,
            retired } }
```

```
ITS SAFETY MESSAGES -DATA-CONCEPT ::= CLASS
--    This class is used for the specification of an ITS SAFETY MESSAGES data
--    concept including:
--       Identification meta attributes, such as descriptive name;
--       Definitional meta attributes, such as definition;
--       Representational meta attributes, such as value domain; and
--       Administrative meta attributes for record keeping.

-- Version: 0.0.9
-- Date: 2002-06-28

-- NOTE:
-- The ITS SAFETY MESSAGES -DATA-CONCEPT class contains optional fields unless
Tables
-- C.1 and C.2 define the corresponding meta-attribute to be mandatory
-- for all data concepts.
-- Where the field is marked as optional, its presence or absence in
-- the definition of an instance of any given data concept depends on
-- the annotation in the corresponding cell of these tables as
-- follows:
--    M or A table entry:  Shall be present in IOS
--    N/A    table entry:  Shall be absent from IOS
--    I or C table entry:  Shall be present if and only if the
--                              condition is satisfied
--    O      table entry:  Presence is optional in IOS instance.

{

-- Identification Meta attributes
      &dataConceptIdentifier              Integer32 UNIQUE,
      &dataConceptVersion                 Integer32,
      &descriptiveName                    Name,
      &synonymousDescriptiveNames         SEQUENCE (SIZE (1..15)) OF
                                               Name OPTIONAL,
      -- The size constraint restricts the number of Names in the
      -- sequence.
      &symbolicNames                      SEQUENCE (SIZE (1..15)) OF
                                               Name OPTIONAL,
      &aSNName                            Name OPTIONAL,
      &asnObjectIdentifier                OBJECT IDENTIFIER,
      &uniformResourceLocator             Url OPTIONAL,

--Definitional Meta attributes
      &definition                         Text,
      &descriptiveNameContext             SEQUENCE (SIZE (1..15)) OF
                                               Name,
      &symbolicNameUsage                  SEQUENCE (SIZE (1..15)) OF
                                               Name OPTIONAL,
      &source                             SEQUENCE (SIZE (1..15)) OF
                                               String OPTIONAL,
      &architectureReference              SEQUENCE (SIZE (1..15)) OF
                                               Name OPTIONAL,
      &architectureName                   SEQUENCE (SIZE (1..15)) OF
                                               String OPTIONAL,
      &architectureVersion                SEQUENCE (SIZE (1..15)) OF
                                               String OPTIONAL,
      &dataConceptType                    DataConceptType,
      &remarks                            Text OPTIONAL,
      &context                            Text OPTIONAL,
      &standard                           String OPTIONAL,
      &metaDataSource                     MetaDataSource OPTIONAL,
      &priority                           String OPTIONAL,
      &frequencyOrMessageMode             String OPTIONAL,
      &deliveryVerification               String OPTIONAL,
      &dataQuality                        String OPTIONAL,
```

```
-- Relational Meta attributes
      &precursor                          SEQUENCE (SIZE (1..15)) OF
                                               DataConceptReference
                                               OPTIONAL,
      &successor                          SEQUENCE (SIZE (1..15)) OF
                                               DataConceptReference
                                               OPTIONAL,
      &synonym                            SEQUENCE (SIZE (1..15)) OF
                                               DataConceptReference
                                               OPTIONAL,
      &abstract                           BOOLEAN OPTIONAL,
      &roles                              Text OPTIONAL,
      &Multiplicity                       Integer32 OPTIONAL,
      -- The Multiplicity value set (a subtype of Integer32) field
      -- contains the allowable cardinalities - see B.4.7
      &associationConstraints             String OPTIONAL,
      &aggregate                          BOOLEAN OPTIONAL,
      &roleKey                            String OPTIONAL,
      &referencedMessages                 SEQUENCE (SIZE(1..255)) OF
                                               OID OPTIONAL,
      &referencedDataFrames               SEQUENCE (SIZE(1..255)) OF
                                               OID OPTIONAL,
      &referencedDataElements             SEQUENCE (SIZE(1..255)) OF
                                               OID OPTIONAL,
      &referencedObjectClasses            SEQUENCE (SIZE(1..255)) OF
                                               OID OPTIONAL,
      &referencedAssociations             SEQUENCE (SIZE(1..255)) OF
                                               OID OPTIONAL,
-- Representational Meta attributes
      &dataType                           Text OPTIONAL,
      &format                             Text OPTIONAL,
      &unitOfMeasure                      String OPTIONAL,
      &validValueRule                     Text OPTIONAL,
-- Administrative Meta attributes
      &registrationStatus                 RegistrationStatus,
      &dateRegistered                     GeneralizedTime,
      &lastChangeDate                     GeneralizedTime,
      &lastChangeUser                     Name,
      &registrarOrganizationName          Name,
      &registrarPhoneNumber               String,
      &stewardOrganizationName            Name,
      &stewardPhoneNumber                 String,
      &submitterOrganizationName          Name,
      &submitterPhoneNumber               String,
      &user                               SEQUENCE (SIZE (1..15)) OF
                                               Name,
      &view                               String OPTIONAL,
      &relatedGroups                      SEQUENCE (SIZE (1..15)) OF
                                               Name OPTIONAL,
      &securityClass                      String OPTIONAL
 }

WITH SYNTAX {
      DATA-CONCEPT-IDENTIFIER             &dataConceptIdentifier
      DATA-CONCEPT-VERSION                &dataConceptVersion
      DESCRIPTIVE-NAME                    &descriptiveName
      [SYNONYMOUS-DESCRIPTIVE-NAMES       &synonymousDescriptiveNames]
      [SYMBOLIC-NAMES                     &symbolicNames]
      [ASN-NAME                           &aSNName]
      ASN-OBJECT-IDENTIFIER               &asnObjectIdentifier
      [URL                                &uniformResourceLocator]
      DEFINITION                          &definition
      DESCRIPTIVE-NAME-CONTEXT            &descriptiveNameContext
      [SYMBOLIC-NAME-USAGE                &symbolicNameUsage]
      [SOURCE                             &source]
      [ARCHITECTURE-REFERENCE             &architectureReference]
      [ARCHITECTURE-NAME                  &architectureName]
      [ARCHITECTURE-VERSION               &architectureVersion]
```


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```
      DATA-CONCEPT-TYPE                &dataConceptType
      [REMARKS                         &remarks]
      [CONTEXT                         &context]
      [STANDARD                        &standard]
      [META-DATA-SOURCE                &metaDataSource]
      [PRIORITY                        &priority]
      [FREQUENCY-OR-MESSAGE-MODE       &frequencyOrMessageMode]
      [DELIVERY-VERIFICATION           &deliveryVerification]
      [DATA-QUALITY                    &dataQuality]
      [PRECURSOR                       &precursor]
      [SUCCESSOR                       &successor]
      [SYNONYM                         &synonym]
      [ABSTRACT                        &abstract]
      [ROLES                           &roles]
      [MULTIPLICITY                    &Multiplicity]
      [ASSOCIATION-CONSTRAINTS         &associationConstraints]
      [AGGREGATE                       &aggregate]
      [ROLE-KEY                        &roleKey]
      [REFERENCED-MESSAGES             &referencedMessages]
      [REFERENCED-DATA-FRAMES          &referencedDataFrames]
      [REFERENCED-DATA-ELEMENTS        &referencedDataElements]
      [REFERENCED-OBJECT-CLASSES       &referencedObjectClasses]
      [REFERENCED-ASSOCIATIONS         &referencedAssociations]
      [DATA-TYPE                       &dataType]
      [FORMAT                          &format]
      [UNIT-OF-MEASURE                 &unitOfMeasure]
      [VALID-VALUE-RULE                &validValueRule]
      REGISTRATION-STATUS              &registrationStatus
      DATE-REGISTERED                  &dateRegistered
      LAST-CHANGE-DATE                 &lastChangeDate
      LAST-CHANGE-USER                 &lastChangeUser
      REGISTRAR-ORGANIZATION-NAME      &registrarOrganizationName
      REGISTRAR-PHONE-NUMBER           &registrarPhoneNumber
      STEWARD-ORGANIZATION-NAME        &stewardOrganizationName
      STEWARD-PHONE-NUMBER             &stewardPhoneNumber
      SUBMITTER-ORGANIZATION-NAME      &submitterOrganizationName
      SUBMITTER-PHONE-NUMBER           &submitterPhoneNumber
      USER                             &user
      [VIEW                            &view]
      [RELATED-GROUPS                  &relatedGroups]
      [SECURITY-CLASS                  &securityClass]
      }

ITS SAFETY MESSAGES -OBJECT-CLASS ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Object class column of Tables C.1 and C.2

ITS SAFETY MESSAGES -PROPERTY ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Property column of Tables C.1 and C.2

ITS SAFETY MESSAGES -VALUE-DOMAIN ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Value domain column of Tables C.1 and C.2

ITS SAFETY MESSAGES -DATA-ELEMENT-CONCEPT ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Data element concept column of Tables C.1
      -- and C.2

ITS SAFETY MESSAGES -DATA-ELEMENT ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Data Element column of Tables C.1 and C.2

ITS SAFETY MESSAGES -DATA-FRAME ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Data frame column of Tables C.1 and C.2

ITS SAFETY MESSAGES -MESSAGE ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Message column of Tables C.1 and C.2

ITS SAFETY MESSAGES -INTERFACE-DIALOGUE ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Interface dialogue column of Tables C.1
      -- and C.2

ITS SAFETY MESSAGES -ASSOCIATION ::= ITS SAFETY MESSAGES -DATA-CONCEPT
      -- Constrained by the Association column of Tables C.1 and C.2

END
```

E.5 ITS safety messages data element module example

This clause provides an example of an ITS safety messages data element module for the documentation of an ITS safety messages data element. It is based upon the information object specification presented in E.4.

```
ISO14817M2 {iso standard 14817 modules(0) deexample(2)}

DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

-- This is an example of an Information Object Specification for an
-- ITS SAFETY MESSAGES data element with "ASN.1 Name"
-- "TransportObjectType".

-- Refer to ISO 14817 for descriptions of the meta attributes.
-- Version: 0.0.8
-- Date: 2002-07-01

IMPORTS ITS SAFETY MESSAGES -DATA-ELEMENT
FROM ISO14817M1 {iso standard 14817 modules(0) class-definition(1)};

transportObjectType ITS SAFETY MESSAGES -DATA-ELEMENT ::=
      {
      DATA-CONCEPT-IDENTIFIER          1234
      DATA-CONCEPT-VERSION             1
      DESCRIPTIVE-NAME
               "TransportObject.type:code"
      SYNONYMOUS-DESCRIPTIVE-NAMES
               {"TransportObjectTypeCode"}
      SYMBOLIC-NAMES                   {"TOTC"}
      ASN-NAME
               "transportObjectType"
      ASN-OBJECT-IDENTIFIER
               {iso standard 17262 modules(0) dec8(8)}
      DEFINITION
               "The transport object type is a qualifier for the type
       of unit (goods item, package or load unit, or transport means
       itself which is included in a transport chain."
      DESCRIPTIVE-NAME-CONTEXT         {"AVI/AEI"}
      SYMBOLIC-NAME-USAGE              {"Monitoring application"}
      SOURCE                           {"ISO 17262"}
      ARCHITECTURE-REFERENCE           {"Object Interaction number x"}
      ARCHITECTURE-NAME                {"AVI/AEI Intermodal Goods
                                         Transport Architecture"}
      ARCHITECTURE-VERSION             {"17261v14"}
      DATA-CONCEPT-TYPE                data-element
      REMARKS                          "A Transport Object is defined
            to represent the load being delivered by the transport
            means or the transport means itself. It has several
            attributes that describe the real world object. This
            data element addresses the type of unit. Decoding of the
            transport object identifier depends upon the type of unit.
      "
      CONTEXT                          "A TransportObject contains
            the information stored in the Transponder about the load
            unit, including this data element. This information is
            provided upon interrogation."
      STANDARD                         "ISO 17262"
      DATA-TYPE                        "
      ISO17262M1 {iso standard 17262 modules(0) dc1(1)}
           DEFINITIONS
           AUTOMATIC TAGS ::=
           BEGIN
           EXPORTS TransportObjectType;
           TransportObjectType ::= ENUMERATED {
                                       goodsItem (0),
                                       package   (1), -- or load unit
```

```
                                    transportMeans (2),
                                    ... }
        -- See ISO 17262 Clause 7.11
        END
                                   "
    FORMAT                         "ASN.1 encoding"
    UNIT-OF-MEASURE                "Not applicable"
    VALID-VALUE-RULE               "see the ASN.1 DATA-TYPE"
    REGISTRATION-STATUS            qualitative:draft
    DATE-REGISTERED                "200202200000Z"
    LAST-CHANGE-DATE               "200202200000Z"
    LAST-CHANGE-USER               "WG4 Editor"
    REGISTRAR-ORGANIZATION-NAME    "ISO TC204"
    REGISTRAR-PHONE-NUMBER         "+1 111-222-3333"
    STEWARD-ORGANIZATION-NAME      "ISO TC204 WG4"
    STEWARD-PHONE-NUMBER           "+1 111-222-3333"
    SUBMITTER-ORGANIZATION-NAME    "ISO TC204 WG4"
    SUBMITTER-PHONE-NUMBER         "+1 111-222-3333"
    USER                           {"CWLuser1"}
    VIEW                           "AVI/AEI"
    RELATED-GROUPS                 {"Freight"}
    SECURITY-CLASS                 "Type 1, Level 1"
    }

END
```

E.6 ITS safety messages data frame module example

This clause provides an example of an ITS safety messages data frame module for the documentation of an ITS safety messages data frame. It is based upon the information object specification presented in E.4.

```
ISO14817M3 {iso standard 14817 modules(0) dfexample(3)}

DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

-- This is an example Information Object Specification module for an
-- ITS SAFETY MESSAGES dataframe with the "ASN.1 Name" "TransportObjectData".

-- Refer to ISO 14817 for descriptions of the meta attributes.
-- Version: 0.0.8
-- Date: 2002-07-01

IMPORTS ITS-DATA-FRAME
FROM ISO14817M1{iso standard 14817 modules(0) class-definition(1)};

transportObjectData ITS-DATA-FRAME ::=
    {
    DATA-CONCEPT-IDENTIFIER          2345
    DATA-CONCEPT-VERSION             1
    DESCRIPTIVE-NAME                 "TransportObjectData:frame"
    SYNONYMOUS-DESCRIPTIVE-NAMES     {"LoadData"}
    SYMBOLIC-NAMES                   {"TransportObjectMessageType"}
    ASN-NAME                         "TransportObjectData"
    ASN-OBJECT-IDENTIFIER
             {iso standard 17262 registry(1) entry(14)}
    DEFINITION
             "This dataframe contains the data elements that define
              the load being delivered by the transport means, or the
              transport means itself. It contains three data
              elements, two of which identify the transport
              object.The third data element optionally provides a
              battery status if available."
    DESCRIPTIVE-NAME-CONTEXT         {"AVI/AEI"}
    SYMBOLIC-NAME-USAGE              {"Monitoring application"}
    SOURCE                           {"ISO 17262"}
```

```
DATA-CONCEPT-TYPE                data-frame
REMARKS                          " Transport Object is defined to
      represent the load being delivered by the transport means
      or the transport means itself. It has several attributes
      that describe the real world object.This data frame
      addresses the identification of the unit."
CONTEXT                          " The TransportObject contains
      the information stored in the Transponder about the load
      unit. This information is provided upon interrogation."
STANDARD                         "ISO 17262"
REFERENCED-DATA-ELEMENTS
         { {iso standard 17262 registry(1) entry(8)},
           {iso standard 17262 registry(1) entry(9)},
           {iso standard 17262 registry(1) entry(10)} }
DATA-TYPE                        "
ISO17262M2 {iso standard 17262 modules(0) dc2(2) }
     DEFINITIONS
     AUTOMATIC TAGS ::=
     BEGIN
     EXPORTS TransportObjectData;
     IMPORTS
          TransportObjectType
                  FROM ISO17262M1
                       {iso standard 17262 modules(0) dc1(1)}
          TransportObjectIdentifier
                  FROM ISO17262M9
                       {iso standard 17262 modules(0) dc9(9)}
          TransportComponentStatus
                  FROM ISO17262M10
                       {iso standard 17262 modules(0) dc10(10)};

     TransportObjectData ::= SEQUENCE {
          identifier           TransportObjectIdentifier,
          classification       TransportObjectType OPTIONAL,
          status               TransportComponentStatus OPTIONAL,
          ...
     }
     END
                                 "
REGISTRATION-STATUS              qualitative:draft
DATE-REGISTERED                  "200202200000Z"
LAST-CHANGE-DATE                 "200202200000Z"
LAST-CHANGE-USER                 "WG4Editor"
REGISTRAR-ORGANIZATION-NAME      "ISO TC204"
REGISTRAR-PHONE-NUMBER           "+1-222-333-4444"
STEWARD-ORGANIZATION-NAME        "ISO TC204 WG4"
STEWARD-PHONE-NUMBER             "+1-222-333-4444"
SUBMITTER-ORGANIZATION-NAME      "ISO TC204 WG4"
SUBMITTER-PHONE-NUMBER           "+1-222-333-4444"
USER                             {"CWLUser1"}
VIEW                             "AVI/AEI"
RELATED-GROUPS                   {"Freight"}
SECURITY-CLASS                   "type 1 level 1"
}

END
```

E.7 ITS safety-messages message module example

This clause provides an example of an ITS safety-messages message module for the documentation of an ITS safety-messages message. It is based upon the information object specification presented in E.4.

```
ISO14817M4 {iso standard 14817 modules(0) msgexample(4)}
```

```
DEFINITIONS
AUTOMATIC TAGS ::=
BEGIN

-- This is an example of an Information Object Specification for an
-- ITS SAFETY MESSAGES message with the ASN.1 name
-- "TransponderInterrogateReturn".

-- Refer to ISO 14817 for descriptions of the meta attributes.
-- Version: 0.0.8
-- Date: 2002-07-01

IMPORTS ITS SAFETY MESSAGES -MESSAGE
FROM ISO14817M1 {iso standard 14817 modules(0) class-definition(1)};

transponderInterrogateReturn ITS SAFETY MESSAGES -MESSAGE ::=
      {
      DATA-CONCEPT-IDENTIFIER          3456
      DATA-CONCEPT-VERSION             1
      DESCRIPTIVE-NAME
              "TransponderInterrogateReturn:message"
      SYNONYMOUS-DESCRIPTIVE-NAMES     {"TransportObjectMessageType"}
      ASN-NAME                         "TransponderInterrogateReturn"
      ASN-OBJECT-IDENTIFIER
               {iso standard 17262 registry(1) entry(16)}
      DEFINITION
              "This return message contains the elements that identify
               the transponder in reponse to a query. These elements
               include:
               TransportOjectIdentifier,
               TransportObjectType, and
               TransportComponentStatus which are bundled in the
               TransportObjectData data frame.
               A separate validation code has been added for
               security purposes, imported as a Data element."
      DESCRIPTIVE-NAME-CONTEXT          {"AVI/AEI"}
      SYMBOLIC-NAME-USAGE               {"Monitoring application"}
      ARCHITECTURE-REFERENCE
               {"Object interaction number 1"}
      ARCHITECTURE-NAME
               {"AVI/AEI Intermodal Goods Transport Architecture"}
      ARCHITECTURE-VERSION              {"17261v14"}
      DATA-CONCEPT-TYPE                 message
      REMARKS
              "This is a significant interface between a reader and a
               tag."
      CONTEXT
              "This message is part of a query/response dialogue
               between the Query device and the Transponder. The
               Query device continues to check for respondents until
               one is received."
      STANDARD                          "ISO 17262"
      META-DATA-SOURCE                   direct
      PRIORITY                          "routine"
      FREQUENCY-OR-MESSAGE-MODE         "on demand"
      DELIVERY-VERIFICATION             "shall, retry three times"
      REFERENCED-DATA-FRAMES
               { {iso standard 17262 registry(1) entry(14)} }
      REFERENCED-DATA-ELEMENTS
               { {iso standard 17262 registry(1) entry(21)} }
      DATA-TYPE                         "
      ISO17262M3 {iso standard 17262 modules(0) dc3(3)}
           DEFINITIONS
           AUTOMATIC TAGS ::=
           BEGIN

           EXPORTS TransponderInterrogateReturn;
           IMPORTS TransportObjectData
                         FROM ISO17262M2
```

```
                              {iso standard 17262 modules(0) dc2(2)}
                    TransportValidationCode
                          FROM ISO17262M7
                              {iso standard 17262 modules(0) dc7(7) };

          TransponderInterrogateReturn ::= SEQUENCE {
               objectdata        TransportObjectData,
               validationcode    TransportValidationCode,
               ...
          }
          END
                                          "
     REGISTRATION-STATUS                  qualitative:draft
     DATE-REGISTERED                      "200202200000Z"
     LAST-CHANGE-DATE                     "200202200000Z"
     LAST-CHANGE-USER                     "TC204 WG4 editor"
     REGISTRAR-ORGANIZATION-NAME          "ISO TC204"
     REGISTRAR-PHONE-NUMBER               "+1 222-333-4444"
     STEWARD-ORGANIZATION-NAME            "ISO TC204 WG4"
     STEWARD-PHONE-NUMBER                 "+1 222-333-4444"
     SUBMITTER-ORGANIZATION-NAME          "ISO TC204 WG4"
     SUBMITTER-PHONE-NUMBER               "+1 222-333-4444"
     USER                                 {"CWLuser1"}
     }

END
```

E.8 Sample value domains

E.8.1 The "ASN.1 Name" value domain

Meta Attribute	Instance
Data Concept Type	Value Domain
Descriptive Name	asn1Name
"Descriptive Name" Context	ITS
ASN.1 Name	Asn1Name
Definition	A valid instance of an ASN.1 typereference.
Source	ISO/IEC 8824-1:2002
Keyword	
Remarks	
Data Type	IA5String
Valid Value Rule	The string shall consist of a certain number (one or more) of letters, digits, and hyphens. The initial character shall be an upper-case letter. A hyphen shall not be the last character. A hyphen shall not be immediately followed by another hyphen. It shall not be one of the character sequences reserved by ASN.1.
Format	
Unit	N/A
Standard	ISO 14817

E.8.2 The boolean value domain

Meta Attribute	Instance
Data Concept Type	Value Domain
Descriptive Name	BOOLEAN
"Descriptive Name" Context	ITS
ASN.1 Name	Boolean
Definition	An indication of ‘true’ or ‘false’.
Source	ISO/IEC 8824-1:2002
Keyword	
Remarks	
Data Type	BOOLEAN
Valid Value Rule	The only permissible values are ‘TRUE’ and ‘FALSE’.
Format	
Unit	N/A
Standard	ISO 14817

E.8.3 The data-concept type value domain

Meta Attribute	Instance
Data-concept Type	Value Domain
Descriptive Name	data-concept-type
"Descriptive Name" Context	ITS
ASN.1 Name	DataConceptType
Definition	An enumeration for the listing of the defined types of data concepts.
Source	ISO 14817
Keyword	
Remarks	
Data Type	ENUMERATED {object-class, property, value-domain, data-element-concept, data-element, data-frame, message, interface-dialogue association, …}
Valid Value Rule	The definition of each value is given in Clause 6 of this International Standard.
Format	
Unit	N/A
Standard	ISO 14817

E.8.4 Memo value domain

Meta Attribute	Instance
Data Concept Type	Value Domain
Descriptive Name	memo
"Descriptive Name" Context	ITS
ASN.1 Name	Memo
Definition	A text field of up to 65,535 characters
Source	
Keyword	
Remarks	
Data Type	UTF8String (SIZE (0..65535))
Valid Value Rule	Free form text
Format	
Unit	N/A
Standard	ISO 14817

E.8.5 Multiplicity value domain

Meta Attribute	Instance
Data Concept Type	Value Domain
Descriptive Name	multiplicity
"Descriptive Name" Context	ITS
ASN.1 Name	Multiplicity
Definition	A representation of a range of integral values. The representation is intended to be used with the multiplicity property. Two special values exist for this usage, composite and transient-composite.
Source	UML
Keyword	
Remarks	Examples: composite transient-composite 0..5 5..10 3..* 0..* 1 5
Data Type	IA5String
Valid Value Rule	The value shall be a string of characters as per one of the following four formats: “composite” – shall indicate that there is exactly one data-concept instance of the subject element for a given paired element. In addition, the subject element is defined to be the owner of the paired element and is responsible for creation and deletion of that element. “transient-composite” – shall indicate that there is either zero or one instance of the subject element for a given paired element and when the state is one, the subject element is responsible for the deletion and/or reassignment of the paired element. M..N – where M is an unsigned integer, .. is a string literal, and N is either an unsigned integer or an asterisk *, representing an unbound number. m – where m is an unsigned integer.
Format	
Unit	N/A
Standard	ISO 14817

E.8.6 String64 value domain

Meta Attribute	Instance
Data Concept Type	Value Domain
Descriptive Name	string64
"Descriptive Name" Context	ITS
ASN.1 Name	String64
Definition	A character string of up to 64 characters
Source	UML
Keyword	
Remarks	
Data Type	UTF8String (SIZE (0..64))
Valid Value Rule	Free text
Format	
Unit	N/A
Standard	ISO 14817

E.8.7 Type value domain

Meta Attribute	Instance
Data Concept Type	Value Domain
Descriptive Name	type
"Descriptive Name" Context	ITS
ASN.1 Name	Type
Definition	A valid data-concept instance of an ASN.1 Type
Source	UML
Keyword	
Remarks	Examples: BOOLEAN ENUMERATED {a(1), b(2)} INTEGER INTEGER (0..255) String64 -- a character string of up to 64 characters
Data Type	IA5String
Valid Value Rule	
Format	
Unit	N/A
Standard	ISO 14817

Annex F
(normative)

ASN.1 data-concept specification

F.1 General

ITS safety messages data elements and references to ITS safety messages data elements shall be documented in the form of ASN.1 information object specifications as defined in ISO/IEC 8824-2:2002. The contents of the ASN.1 information object specification used for this specification shall include the following categories of attributes as delineated in ISO 11179-3: identification, definition, relation, representation, administrative as adapted to the ITS environment in ISO 14817:2002. The specific attributes of a data element and a data element reference shall be as defined in IEEE 1489:1999. These specifications shall be documented within ASN.1 modules.

The data element specification shall address the attributes in the categories of identification, definition, and relation. Administrative attributes shall be included as data element references to enter any configuration control process.

The data element reference specification shall address a subset of the attributes in the categories of identification, definition, relation and representation. Administrative attributes shall be included as data elements to enter any configuration control process.

F.2 Data element specification

"ITS Safety messages data dictionaries" shall represent data element information in a consistent format to aid the reader. Documentation for each attribute of a data element shall be included within an ASN.1 information object, as defined by ISO/IEC 8824-2. Specific data element attributes shall be in accordance with IEEE 1489:1999. "ITS Safety messages data dictionaries" may include additional attributes added by that data dictionary authority to account for area-specific needs. Any such extensions to the standard attributes is to be added by creating a container information object.

F.3 Data element reference specification

"ITS Safety messages data dictionaries" shall represent data element reference information in a consistent format to aid the reader. Documentation for each attribute of a data element shall be included within an ASN.1 information object, as defined by ISO/IEC 8824-2. Specific data element attributes shall be in accordance with IEEE 1489:1999. "ITS Safety messages data dictionaries" may include additional attributes added by that data dictionary authority to account for area-specific needs. Any such extensions to the standard attributes are to be added by creating a container information object.

F.4 Recommended practice

ISO/TC 204 ASN.1 International Standards are to be written so that each data element reference or data element is specified in a separate module specification. "ITS Safety messages data dictionaries" may be created by collecting the data element module specifications.

F.5 Information object specifications

F.5.1 Data element information object specification in ASN.1

This subclause provides the information object specification for an ITS safety messages data element in ASN.1

```
ISO14817M1

{ iso(1) standard(0) iso1417(14817) module1(1) }

DEFINITIONS

AUTOMATIC TAGS ::=

BEGIN

DATA-ELEMENT ::= CLASS

-- This class is the specification of a data element and

-- optionally, the data element's administrative attributes.

-- Version: 0.0.1

-- Date: 990923

{


-- Identifying Attributes

&descriptiveName                UTF8String (SIZE(0..160)),

&descriptiveNameContext         UTF8String (SIZE(0..63)),

&symbolicName               UTF8String (SIZE(0..160)) OPTIONAL,

&symbolicNameContext                UTF8String (SIZE(0..63)) OPTIONAL,

&aSNName                    UTF8String (SIZE(0..63))

--Definitional Attributes

&definition                 UTF8String (SIZE (0..65535)),

&formula                    UTF8String (SIZE (0..254)) OPTIONAL,

&source                 UTF8String (SIZE (0..254)) OPTIONAL,

-- Relational Attributes

&className                  UTF8String (SIZE (0..254)),

&classificationSchemeName       UTF8String (SIZE (0..254)),

&classificationSchemeVersion        NumericString (SIZE (0..7)),
```

```
&dataConceptType            UTF8String ("Data Element") OPTIONAL,
&relatedDataConcept         UTF8String (SIZE (0..254)) OPTIONAL,
&relationshipType           UTF8String (SIZE (0..254)) OPTIONAL,
&keyword                    UTF8String (SIZE (0..254)) OPTIONAL,
&remarks                    UTF8String (SIZE (0..65535)) OPTIONAL,
-- Representational Attributes
&DataType,
&representationLayout           UTF8String (SIZE (0..65535)),
&validValueRule             UTF8String (SIZE (0..65535)),
&representationClassTerm    ENUMERATED {amount, code, date, identifier, image, location, number, percent, quantity, rate, sound, text, utc, gps },
-- Administrative Attributes
&dataConceptIdentifier          INTEGER UNIQUE OPTIONAL,
&dataConceptVersion         INTEGER OPTIONAL,
&securityClass              UTF8String (SIZE (0..254)) OPTIONAL,
&registrationStatus         UTF8String (SIZE (0..63)) OPTIONAL,
&dateRegistered             NumericString (SIZE (8)) OPTIONAL,
&lastChangeDate             NumericString (SIZE (8)) OPTIONAL,
&registrarOrganization          UTF8String (SIZE (0..2554) OPTIONAL,
&registrarPhoneNumber           NumericString (SIZE (0..20)) OPTIONAL,
&stewardOrganization        UTF8String (SIZE (0..2554)) OPTIONAL,
&stewardPhoneNumber             NumericString (SIZE (0..20)) OPTIONAL,
&submitterOrganization          UTF8String (SIZE (0..2554) OPTIONAL,
&submitterPhoneNumber       NumericString (SIZE (0..20)) OPTIONAL,
&configurationBaseline          UTF8String (SIZE (0..255)) OPTIONAL,
&relevantGroups             UTF8String (SIZE (0..63)) OPTIONAL
}
WITH SYNTAX
{
DESCRIPTIVE-NAME                &descriptiveName
```

DESCRIPTIVE-NAME-CONTEXT &descriptiveNameContext

[SYMBOLIC-NAME &symbolicName]

[SYMBOLIC-NAME-CONTEXT &symbolicNameContext]

ASN-NAME &aSNName

DEFINITION &definition

[FORMULA &formula]

[SOURCE &source]

CLASS-NAME &className

CLASSIFICATION-SCHEME-NAME &classificationSchemeName

CLASSIFICATION-SCHEME-VERSION &classificationSchemeVersion

[DATACONCEPT-TYPE &dataConceptType]

[RELATED-DATA-CONCEPT &relatedDataConcept]

[RELATIONSHIP-TYPE &relationshipType]

[KEYWORD &keyword]

[REMARKS &remarks]

DATA-TYPE &DataType

REPRESENTATION-CLASS-TERM &representationLayout

VALID-VALUE-RULE &validValueRule

REPRESENTATION-CLASS-TERM &representationClassTerm

[DATA-CONCEPT-IDENTIFIER &dataConceptIdentifier]

[DATA-CONCEPT-VERSION &dataConceptVersion]

[SECURITY-CLASS &securityClass]

[REGISTRATION-STATUS &registrationStatus]

[DATE-REGISTERED &dateRegistered]

[LAST-CHANGE-DATE &lastChangeDate]

[REGISTRAR-ORGANIZATION &registrarOrganization]

[REGISTRAR-PHONE-NUMBER &registrarPhoneNumber]

[STEWARD-ORGANIZATION &stewardOrganization]

[STEWARD-PHONE-NUMBER &stewardPhoneNumber]

[SUBMITTER-ORGANIZATION &submitterOrganization]

```
[SUBMITTER-PHONE-NUMBER          &submitterPhoneNumber]
[CONFIGURATION-BASELINE          &configurationBaseline]
[RELEVANT-GROUPS                 &relevantGroups]
}
END
```

F.5.2 Data element reference information object specification in ASN.1

```
ISO14817M2
{ iso(1) standard(0) iso1417(14817) module1(1) }
DEFINITIONS
    AUTOMATIC TAGS ::=
BEGIN

DATA-ELEMENT-REFERENCE::= CLASS
-- This class is the specification of a data element reference and
-- the data element reference's administrative attributes.
-- Version: 0.0.1
-- Date: 990923

{
-- Identifying Attributes
&descriptiveName                UTF8String (SIZE(0..160)),
&descriptiveNameContext         UTF8String (SIZE(0..63)),
&symbolicName               UTF8String (SIZE(0..160)) OPTIONAL,
&symbolicNameContext                UTF8String (SIZE(0..63))   OPTIONAL,
&aSNName                    UTF8String (SIZE(0..63))
--Definitional Attributes
&definition                 UTF8String (SIZE (0..65535)),
&formula                    UTF8String (SIZE (0..254))      OPTIONAL,
&source                 UTF8String (SIZE (0..254))      OPTIONAL,
```

-- Relational Attributes

&className UTF8String (SIZE (0..254)),

&classificationSchemeName UTF8String (SIZE (0..254)),

&classificationSchemeVersion NumericString (SIZE (0..7)),

&dataConceptType UTF8String ("Data Element") OPTIONAL,

&relatedDataConcept UTF8String (SIZE (0..254)) OPTIONAL,

&relationshipType UTF8String (SIZE (0..254)) OPTIONAL,

&keyword UTF8String (SIZE (0..254)) OPTIONAL,

&remarks UTF8String (SIZE (0..65535)) OPTIONAL,

-- Representational Attributes

&DataType,

&representationLayout UTF8String (SIZE (0..65535)),

&validValueRule UTF8String (SIZE (0..65535)),

&representationClassTerm ENUMERATED {amount, code, date, identifier, image, location, number, percent, quantity, rate, sound, text, utc, gps },

-- Administrative Attributes

&dataConceptIdentifier INTEGER UNIQUE OPTIONAL,

&dataConceptVersion INTEGER OPTIONAL,

&securityClass UTF8String (SIZE (0..254)) OPTIONAL,

&registrationStatus UTF8String (SIZE (0..63)) OPTIONAL,

&dateRegistered NumericString (SIZE (8)) OPTIONAL,

&lastChangeDate NumericString (SIZE (8)) OPTIONAL,

&registrarOrganization UTF8String (SIZE (0..2554) OPTIONAL,

&registrarPhoneNumber NumericString (SIZE (0..20)) OPTIONAL,

&stewardOrganization UTF8String (SIZE (0..2554) OPTIONAL,

&stewardPhoneNumber NumericString (SIZE (0..20)) OPTIONAL,

&submitterOrganization UTF8String (SIZE (0..2554) OPTIONAL,

&submitterPhoneNumber NumericString (SIZE (0..20)) OPTIONAL,

&configurationBaseline UTF8String (SIZE (0..255)) OPTIONAL,

&relevantGroups UTF8String (SIZE (0..63)) OPTIONAL

```
}
WITH SYNTAX
{
DESCRIPTIVE-NAME            &descriptiveName
DESCRIPTIVE-NAME-CONTEXT    &descriptiveNameContext
[SYMBOLIC-NAME              &symbolicName]
[SYMBOLIC-NAME-CONTEXT      &symbolicNameContext]
ASN-NAME                    &aSNName
DEFINITION                  &definition
[FORMULA                    &formula]
[SOURCE                     &source]
CLASS-NAME                  &className
CLASSIFICATION-SCHEME-NAME      &classificationSchemeName
CLASSIFICATION-SCHEME-VERSION &classificationSchemeVersion
[DATACONCEPT-TYPE           &dataConceptType]
[RELATED-DATA-CONCEPT       &relatedDataConcept]
[RELATIONSHIP-TYPE          &relationshipType]
[KEYWORD                    &keyword]
[REMARKS                    &remarks]
DATA-TYPE                   &DataType
REPRESENTATION-CLASS-TERM&representationLayout
VALID-VALUE-RULE            &validValueRule
REPRESENTATION-CLASS-TERM&representationClassTerm
[DATA-CONCEPT-IDENTIFIER        &dataConceptIdentifier]
[DATA-CONCEPT-VERSION       &dataConceptVersion]
[SECURITY-CLASS             &securityClass]
[REGISTRATION-STATUS        &registrationStatus]
[DATE-REGISTERED            &dateRegistered]
[LAST-CHANGE-DATE           &lastChangeDate]
[REGISTRAR-ORGANIZATION         &registrarOrganization]
```

[REGISTRAR-PHONE-NUMBER &registrarPhoneNumber]

[STEWARD-ORGANIZATION &stewardOrganization]

[STEWARD-PHONE-NUMBER &stewardPhoneNumber]

[SUBMITTER-ORGANIZATION &submitterOrganization]

[SUBMITTER-PHONE-NUMBER &submitterPhoneNumber]

[CONFIGURATION-BASELINE &configurationBaseline]

[RELEVANT-GROUPS &relevantGroups]

}

END

Annex G
(normative)

Data representation in an informational model

In order to exchange information, communicating systems shall have a common understanding of the data to be exchanged; this includes a common understanding of the semantic relationships between various pieces of data. Any disagreement over these relationships is likely to be an indication of differing semantic meanings of the data, which must be resolved. However, when developing the consensus about these relationships, parties are to remember that a common understanding of data across an interface does not require identical implementations internal to a system.

The data relationships defined for an interface will be designed to support a superset of all information exchange needs across the interface. However, any given system may support only a small subset of the defined interface functions and may additionally provide other features not associated with the interface. The most appropriate design of a system is dependent on all of the functional requirements of that system, with the interface definition being just one requirement. As such, each system will likely use its own implementation-specific representation of data internally. The internal relationships are defined by a database schema, object model, or some other technique and are then translated as needed into the generic representation defined by the interface definition.

Because multiple system designers must understand the interface definition, it is critical that it is well documented. Experience has demonstrated that one of the best human-readable ways to express these relationships is through the use of information models. These information models may then be converted into computer-readable formats as needed.

This annex defines the requirements and guidelines for producing information models within the TICS domain.

This complex subject is best described through the use of an example. A single example is used in this annex to present the basic philosophy as well as to demonstrate the rules and guidelines defined by this International Standard. The example describes a generic relationship between a person and an organization. In its simplest form, this could be viewed as a simple association between the two entities, as shown in Figure G.1.

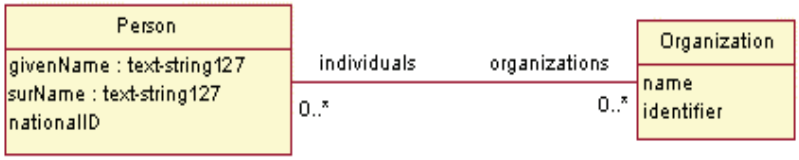

Figure G.1 — A simple association

Figure G.1 depicts two entity-types: "Person" and "Organization". The figure also depicts four properties that have been assigned to "Person": givenName, surName, nationalID and organizations. There are three properties assigned to "Organization": name, identifier and individuals. Figure G.1 also indicates that the “individuals” property of "Organization" may have any number of instances (i.e. an "Organization" may be associated with zero or more individuals) and that a "Person" may be associated with zero or more organizations. Finally, Figure G.1 indicates that the value domain “text-string127” defines the representational form of the "givenName" and "surName".

However, some systems may wish to record more detail about this particular relationship. To this end, Figure G.2 provides a different view of the same information.

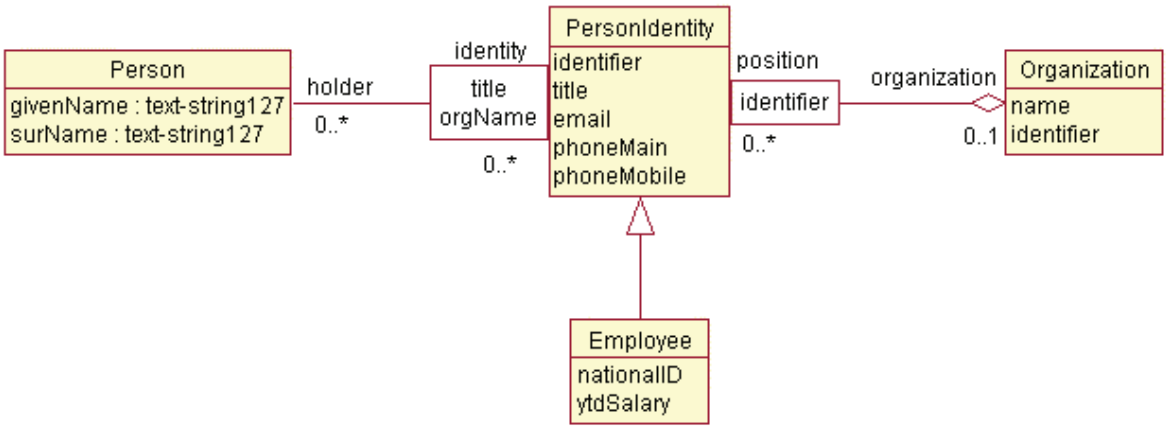

Figure G.2 — A robust solution

The design in Figure G.2 provides all of the information provided in the previous example, plus additional information about the individual's contact information in different contexts. For example, a single person, “John” may own a small firm consisting of two employees (himself and one other, “Jane”). At the same time, “John” may also be a borrower from two separate banks in order to finance the business. Thus, John is simultaneously registered with four identities and Jane with one; see Table G.1.

Table G.1

Person	PersonIdentity		Organization
givenName	**title**	**identifier**	**name**
John	owner	1	Acme Consulting
John	employee	1	Acme Consulting
John	borrower	123456789	ABC Bank
John	borrower	987654321	XYZ Bank
Jane	employee	2	Acme Consulting

The robust model also indicates that an organization identifies a person through the assigned identifier, while a person recognizes his/her various identities by the title and organization name. The robust model also indicates that a given identity (instance) may only be associated with zero or one organization. Finally, the robust model indicates that the "nationalID" is only relevant in the model if the person is an employee, in which case, the year-to-date salary is also "Recorded" for tax purposes.

A third view of this model is depicted in Figure G.3.

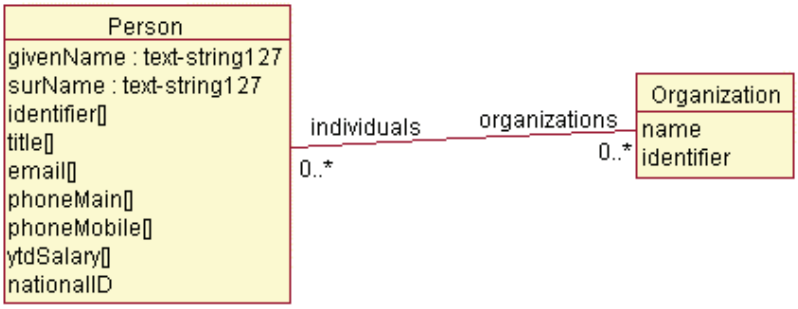

Figure G.3 — An implementer's view

Figure G.3 allows a system to store all of the information defined in Figure G.2, but does not provide the reader with some of the more specific semantic rules. For example, Figure G.3 fails to indicate any relationship between the first title and the first email address. This does not mean that none exists, but the model does not call out this important fact. Nonetheless, an implementer could easily develop a system based on the third model while applying the rules defined in the second model and be able to successfully provide the same data as provided in the first or second diagram, in Figure G.1 or G.2, respectively.

Thus, Figures G.1 and G.3 are valid implementation models for the information model defined by Figure G.2 (although the system implementing Figure G.1 would only support a subset of the defined information). The intent behind information modelling is to precisely define the data and relationships so that all parties involved understand the intent of the model but an implementation of the model is allowed to simplify the design in order to meet other system requirements.

The "ASN.1 Name" of a value domain must have an initial capital letter, but this is the same convention for an Entity type. We don't want a double definition for Car.speed:Speed, instead we want Car.speed:Speed to be an association between Car and Speed and Car.speed:speed to be a Data Element.

Further details concerning information modelling using data registry data elements can be found in ISO 14817.

Annex H
(informative)

International and regional variations

Figure H.1 shows the relationship between registered private data in a single functional area, data used in a wider context, and a single international data dictionary or registry, and the promotion from a "local" data dictionary to data registries.

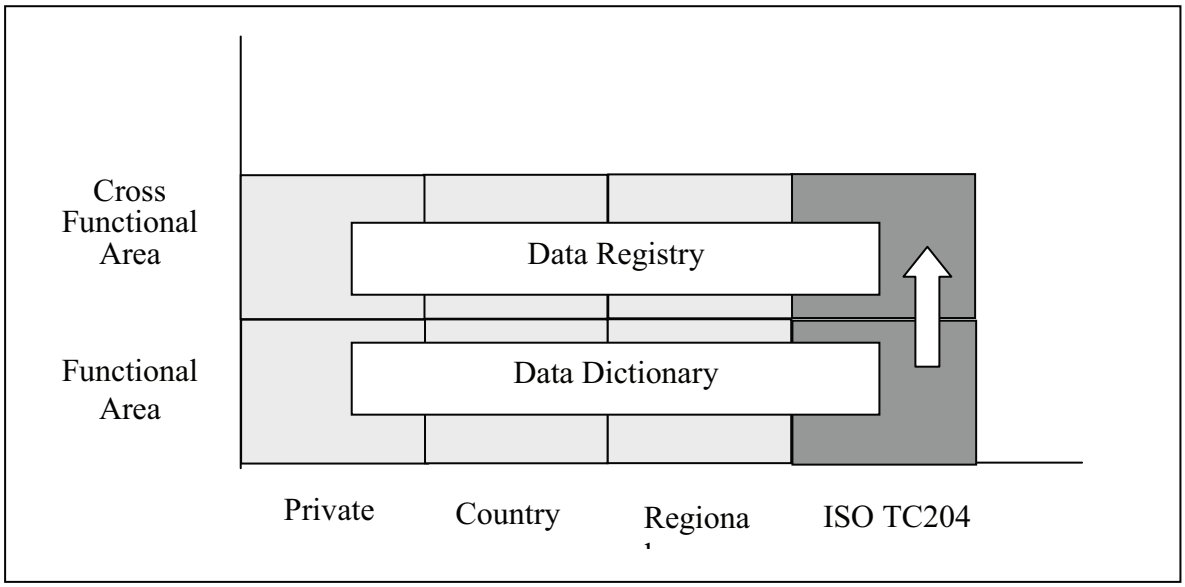

Figure H.1 — Concept of international and regional variations in ISO 14817

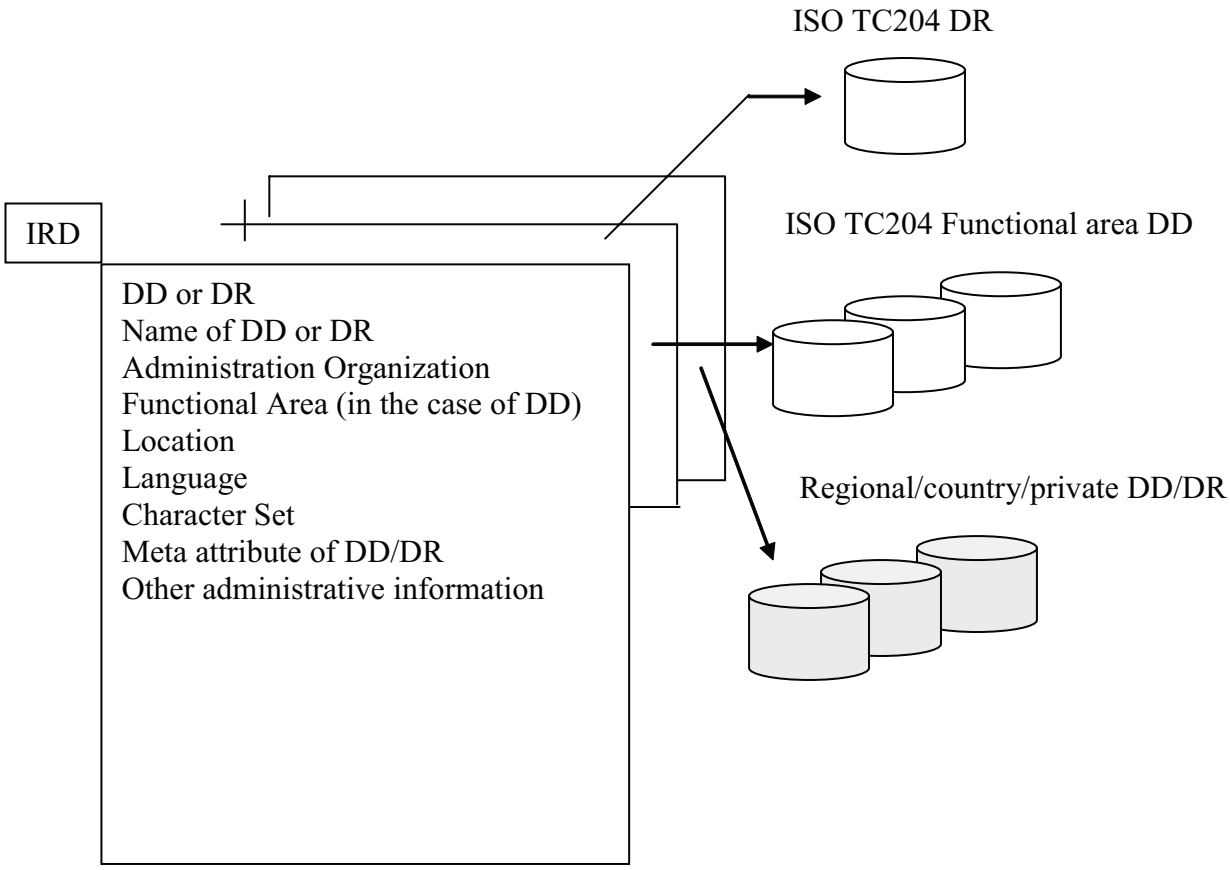

Figure H.2 — Concept of an information resource dictionary

Figure H.2 illustrates how a single data definition may find repository in local, functional data dictionaries or registries or, where appropriate, be submitted to an international data registry, for common use.

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[14] ISO/TR 14813-2:2000, *Transport information and control systems — Reference model architecture(s) for the TICS sector — Part 2: Core TICS reference architecture*

[15] ISO/TR 14813-3:2000, *Transport information and control systems — Reference model architecture(s) for the TICS sector — Part 3: Example elaboration*

---

1) The country code is to be interchanged in the two-alpha character format option of the International Standard, regardless of any display/report formats.

2) Latitude and longitude are to be interchanged in degrees, minutes, seconds and decimal seconds, with altitude in metres and decimal metres, option of ISO 6709:1983 regardless of their display/report formats; i.e. +(or –) DDMMSS.sss...+(or –)DDDMMSS.sss...+(or –) 999.999, in the sequence of latitude/longitude/altitude, with no spaces, where "DD" and "DDD" are degrees, "MM" is minutes, "SS" is seconds, and "sss..." is decimal seconds of either latitude or longitude; and 999.999 is height above sea level in metres and decimal metres.

The parentheses and "or" are not part of the format, but are used merely to indicate a choice of either positive or negative latitude, longitude and altitude.

While only three digits are shown in the format for altitude, the actual number of digits for an instance of altitude will be the number necessary to represent altitude to the number of significant digits required. The representation of decimal seconds of latitude, longitude and altitude is optional.

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