INTERNATIONAL STANDARD

ISO 26683-1

First edition
2013-04-01

Intelligent transport systems — Freight land conveyance content identification and communication —

Part 1: Context, architecture and referenced standards

Systèmes intelligents de transport — Identification et communication du contenu des marchandises transportées par voie terrestre —

Partie 1: Contexte, architecture et normes référencées

Reference number
ISO 26683-1:2013(E)

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Published in Switzerland

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

This first edition of ISO 26683-1 cancels and replaces ISO/TS 26683-1:2012.

ISO 26683 consists of the following parts, under the general title *Intelligent transport systems — Freight land conveyance content identification and communication*:

— *Part 1: Context, architecture and referenced standards*

— *Part 2: Application interface profiles*

The following parts are under preparation:

— *Part 3: Monitoring cargo stress measurement information during road transport* [Technical Specification]

— *Part 4: Security profile*

Introduction

In a scenario of international land transport and logistics, it is often difficult for a consignor and a consignee to know the physical real time location of cargo after consigning the cargo to a transport and logistics service provider. Where a cargo is transferred from one haulier to another, obtaining information of the manifest at a detailed level is often difficult. Auditing the actual content of a consignment en route and monitoring cargo stress measurement information during road transport is also difficult, especially in the case of sealed land conveyances such as sealed intermodal containers. It is a different task to that of progressing order administration from consignor to consignee.

Seamless exchange of accurate, complete, and timely data at transportation hand-offs has always been important for efficiency and accountability. There is now a growing understanding of needs for security of transport information, and for transfer of information related to security against terrorism as well as theft and traditional contraband.

There is no single organization responsible for standards through the intermodal supply chain. To achieve a coherent set of standards requires coordination among the various international organizations working on pieces of these standards.

This part of ISO 26683 specifies the data concepts applicable to the movement of freight and its intermodal transfer. This part of ISO 26683 focuses on a single "thread" of the overall end to end supply chain. These data concepts include information entities (data elements), aggregated/associated information entities (groups of data elements) and messages that comprise information exchanges at transport interfaces along the chain of participants responsible for the delivery of goods from the point of origin through to the end. This work is integrated closely with 'Universal Business Language' (UBL) espoused by OASIS and refers to the UN/CEFACT standards (Data Elements TDED, Core Components Technical Specifications and Library CCL).

ISO 17687 provides a consistent context for the presentation and storage of 'Dangerous Goods'/HAZMAT information. ISO 17687 is designed to support the automated identification, monitoring and exchange of emergency response information regarding dangerous goods carried on board road transport vehicles. However, ISO 17687 does not specify nor even imply that any particular on-board or off-board systems should be capable of performing such monitoring, data retention, or communications. ISO 17687 deals with the on board information but not the media used for transmitting the information, nor the means of collating and transferring the information. ISO 17687 identifies that such communications are beyond its scope.

However, in domestic land transport, particularly where no border crossings are involved, and except in the case of 'Dangerous Goods'/HAZMAT loads, a trucker usually does not have to report cargo manifest information to any regulator. A trucker receives an order from the client with delivery date/time and location and except in the case of 'Dangerous Goods'/HAZMAT, may not necessarily be given any detailed cargo information. The haulier may or may not use a wireless tracking system for its vehicles, and such systems may or may not carry any detailed consignment/cargo details. In these situations real time land transport cargo monitoring is not often possible, and in respect to auditing the content of the load and monitoring cargo condition information, even where possible, has limitations.

There are also many situations where the tractor and trailer combination changes during the course of a journey from consignor to consignee.

Further, even where such comprehensive systems are in place, they rely on the level of detail that exists within its controlling computer system, and without the ability to monitor the actual contents, there is no possibility to:

a) audit the actual contents of the consignment. This is particularly difficult in the case of a sealed intermodal container (ISO 668 and subsequent related international standards for freight containers);

b) monitor the condition of the contents of the consignment (cargo stress measurement information).

The ISO 26683 series is therefore complementary to the context of ISO/TS 24533 (Intelligent transport systems — Electronic information exchange to facilitate the movement of freight and its intermodal transfer — Road transport information exchange methodology) and may well provide sources of data

required by such systems, and an electronic auditing capability has yet to be embraced by ISO/TS 24533. As has been seen above, ISO 17687 does not address the means by which its data are collected. ISO 26683 is complementary to ISO 7372.

Further details concerning the complementary nature of the ISO 26683 series to ISO/TS 24533, EFM, ISO 17687, IEEE 1512.3, UN/CEFACT, particularly UN/CEFACT UMM, ISO 7372, OASIS/UBL can be found in Clauses 5 and 6 of this part of ISO 26683.

The ISO 26683 series provides a data agglomeration/aggregation capability as one means to capture and transfer information about the content of the cargo load and its condition to a central system. Therefore the ISO 26683 series can also support both ISO/TS 24533 and ISO 17687/IEEE 1512.3 instantiations. ISO 26683 is designed to present data to end-to-end cargo application systems; it does not provide end to end system (consignor to consignee) system design.

The ISO 26683 series envisages that a combination of existing technologies can be used to agglomerate/aggregate relevant data and use a tractor/truck mounted communications means to realize real time cargo visibility of land transport, and is thus not dependent on future technologies or technologies currently in research and development phases (although it will be suitable for future technical means to deliver its data).

This part of ISO 26683 is the first part of a series of standards which provides context and high level architecture for all parts of the ISO 26683 series.

Part 2 defines application interface profiles to agglomerate/aggregate and transfer land cargo transport data to provide improved land cargo transport data and specifies one or more modes of transfer using available ICT technologies.

Part 3 will specify the handling of on-board cargo stress measurement information during road transport.

Part 4 will provide a security profile requirement and definition.

Intelligent transport systems — Freight land conveyance content identification and communication —

Part 1:
Context, architecture and referenced standards

1 Scope

This part of ISO 26683 provides the context for application interface profiles for the exchange of land transport data using current technologies and existing standards for item identification, package identification, container identification, and international standards and practices regarding freight and its movement.

This part of ISO 26683 provides:

a) a context of the relationship between the ISO 26683 series and other freight and fleet standards and defines the objectives for the ISO 26683 series. The explanation is provided as to how existing International Standards and Technical Specifications can be utilized to agglomerate/aggregate data concepts by using standardised application interface profiles within the context of ISO 26683 and how ISO 26683 can be used to provide information/data to cargo management systems.

b) descriptions of use cases of providing information to cargo tracking and tracing in end-to-end transport by exploiting identifiers, data carriers, EDI messages and data elements with respect to various types of cargo and transport means within an international intermodal/multimodal cargo movement context.

c) an architecture for the collation and transfer of data agglomerated/aggregated from information contained in the transport load to transport operating systems, with the objective being to enable efficient handling of truck/trailer identification and on-board cargo information for tracking, tracing and cargo monitoring purposes in a land cargo transport situation.

NOTE ISO 26683 is designed to present information on end-to-end cargo application systems; it does not provide end to end (consignor to consignee) system design.

This part of ISO 26683 is the first part of a multi-part series which provides context, high level architecture and a list of referenced standards used for all parts of the ISO 26683 series of deliverables.

2 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.

In addition to the references listed below, Annex A identifies a large number of international standards that may be used in the identification, labelling and communication with the contents of a land conveyance. Data may conform to any of the international standards listed below, but shall conform to at least one of the international standards listed below or in Annex A.

ISO 6346, *Freight containers — Coding, identification and marking*

ISO 7372, *Trade data interchange — Trade data elements directory*

ISO 13183, *Intelligent transport systems — Communications access for land mobiles (CALM) — Using broadcast communications*

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

ISO 17261, *Intelligent transport systems — Automatic vehicle and equipment identification — Intermodal goods transport architecture and terminology*

ISO 17262, *Intelligent transport systems — Automatic vehicle and equipment identification — Numbering and data structures*

ISO 17263, *Intelligent transport systems — Automatic vehicle and equipment identification — System parameters*

ISO 17264, *Intelligent transport systems — Automatic vehicle and equipment identification — Interfaces*

ISO 17687, *Transport Information and Control Systems (TICS) — General fleet management and commercial freight operations — Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation*

ISO 21210, *Intelligent transport systems — Communications access for land mobiles (CALM) — IPv6 Networking*

ISO 21212, *Intelligent transport systems — Communications access for land mobiles (CALM) — 2G Cellular systems*

ISO 21213, *Intelligent transport systems — Communications access for land mobiles (CALM) — 3G Cellular systems*

ISO 21214, *Intelligent transport systems — Communications access for land mobiles (CALM) — Infra-red systems*

ISO 21215, *Intelligent transport systems — Communications access for land mobiles (CALM) — M5*

ISO 21216, *Intelligent transport systems — Communication access for land mobiles (CALM) — Millimetre wave air interface*

ISO 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 21218, *Intelligent transport systems — Communications access for land mobiles (CALM) — Access technology support*

ISO/IEC/IEEE 21451-1, *Information technology — Smart transducer interface for sensors and actuators — Part 1: Network Capable Application Processor (NCAP) information model*

ISO/IEC/IEEE 21451-2, *Information technology — Smart transducer interface for sensors and actuators — Part 2: Transducer to microprocessor communication protocols and Transducer Electronic Data Sheet (TEDS) formats*

ISO/IEC/IEEE 21451-4, *Information technology — Smart transducer interface for sensors and actuators — Part 4: Mixed-mode communication protocols and Transducer Electronic Data Sheet (TEDS) formats*

ISO/IEC/IEEE 21451-7, *Information technology — Smart transducer interface for sensors and actuators — Part 7: Transducer to radio frequency identification (RFID) systems communication protocols and Transducer Electronic Data Sheet (TEDS) formats*

ISO/TS 24533, *Intelligent transport systems — Electronic information exchange to facilitate the movement of freight and its intermodal transfer — Road transport information exchange methodology*

ISO 25111, *Intelligent transport systems — Communications access for land mobiles (CALM) — General requirements for using public networks*

ISO 25112, *Intelligent transport systems — Communications access for land mobiles (CALM) — Mobile wireless broadband using IEEE 802.16*

ISO 25113, *Intelligent transport systems — Communications access for land mobiles (CALM) — Mobile wireless broadband using HC-SDMA*

ISO 26683-2, *Intelligent transport systems — Freight land conveyance content identification and communication — Part 2: Application interface profiles*

ISO 29281, *Intelligent transport systems — Communications access for land mobiles (CALM) — Non-IP networking*

ISO 29282, *Intelligent transport systems — Communications access for land mobiles (CALM) — Satellite networks*

ISO 29283, *ITS CALM Mobile Wireless Broadband applications using Communications in accordance with IEEE 802.20*

IEEE 1512.3, *IEEE Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers*

OASIS Universal Business Language v2.1[1)]

OASIS UBL Common Library - - transport library

OASIS UBL-CommonAggregateComponents-2.1

CEFACT/TMG/N093, UN/CEFACT Modelling Methodology (UMM)

– UMM Foundation Module V1.0 (2006)

– UMM Base Module V1.0 (2006)

– User Guide UMM 1.0

UN/CEFACT Core Components Library CCL 10B

3 Terms and definitions

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

3.1
application interface
communication point where one part of a system communicates with another in order to service an application

Note 1 to entry: The communication point is typically but not necessarily wireless in the scenarios of ISO 26683.

3.2
application interface profile
series and sequence of behaviour and protocols including, where appropriate, the identification of chosen classes, conforming subsets, options and parameters of those base standards necessary to accomplish a defined function at an interface in a particular way such that it can be used interoperably between two parties

Note 1 to entry: Profiles, which define conforming subsets or combinations of base profiles identify the use of particular options available in the base standards, and provide a basis for the development of uniform, internationally recognized, interoperability and conformance tests.

3.3
audit
methodical examination/verification/evaluation of the information associated with items in a cargo and other relevant data

1) http://docs.oasis-open.org/ubl/prd1-UBL-2.1/UBL-2.1.xml

3.4
authority
statutory body existing within a jurisdiction and a specific area of responsibility that administers legislation to regulate trade and/or monitors compliance with existing legislation

3.5
base standard
approved international standard used as the basis of an application interface or an application interface profile

3.6
cargo
goods or produce transported, generally for commercial gain, by ship, aircraft, train, van or truck

Note 1 to entry: In modern times, containers are used in most intermodal long-haul cargo transport.

3.7
cargo stress measurement information
data collected from sensors associated with an item, container or conveyance that provides information about parameters that may affect the condition of the cargo

EXAMPLE Temperature, position/attitude (upright cargo), pressure, shock, dampness, etc.

3.8
carrier
party undertaking or arranging transport of goods between named points

[UN/TDED 3126: UN/CEFACT definition 1001 code CA]

3.9
consignment
separately identifiable amount of goods items (available to be) transported from one consignor to one consignee via one or more than one modes of transport and specified in one single transport document

3.10
consignee
party to which goods are consigned/shipped

[UN/TDED 3132: UN/CEFACT definition 3035 code CN]

3.11
consignor
shipper, sender, party which, by contract with a carrier, consigns or sends goods with the carrier, or has them conveyed by him

[UN/TDED 3336: UN/CEFACT definition 3035 code CZ]

3.12
consolidation
grouping together of individual consignments of goods into a combined consignment for carriage

3.13
container
receptacle for the transport of goods, especially one readily transferable from one form of transport to another

[UN/TDED 3336: UN/CEFACT definition 8053 code CN Container]

3.14
conveyance
means of transport

3.15
data carrier
means or function which carries data objects from one point to another point

3.16
electronic freight manifest
electronic means of generating, storing, distributing, and accessing manifest-related data along the end-to-end supply chain

3.17
forwarder
forwarding agent
person or company that organizes shipments for individuals or other companies and may also act as a carrier

3.18
freight
goods
any commodity transported

3.19
freight forwarder
party arranging the carriage of goods including connected services and/or associated formalities on behalf of a consignor or consignee

[UN/TDED 3336: UN/CEFACT definition 3035 code FW]

3.21
identifier
unique and unambiguous expression in a written format either by a code, by numbers or by the combination of both to distinguish variations from one to another among a class of substances, items, or objects

3.22
intermodal freight container
large cargo carrying object (of various formats) used for transport or storage that conforms to ISO 6346 and designed and constructed to permit it to be used interchangeably in two or more modes of transport

3.23
ISO intermodal freight container
ISO intermodal container
ISO container
large cargo carrying object used for transport or storage that conforms to ISO 668, Series 1 containers

3.24
international standardized profile
internationally agreed-to, harmonized document which describes one or more profiles

3.25
interoperability
ability of two or more systems to exchange information and to make mutual use of the information that has been exchanged

Note 1 to entry: Sometimes called “open systems”.

3.26
ITS station
communication point for ITS system

3.27
land transport
mode of transport that is effected using roads and railways and may in some cases include use of inland waterways

Note 1 to entry: See *transport*.

3.28
land transport conveyance
transport means to effect the land transport sector(s) of a cargo

3.29
manifest
specification of all cargo on board the transportation means (all modes) containing details of contents, shipper, consignee, and other details that may be required by customs or consular authorities

3.30
open system environment
comprehensive set of interfaces, services, and supporting formats, plus user aspects, for interoperability and/or portability of applications, data, or people, as specified by information technology standards and profiles

3.31
rollercage
cage with casters for transporting loose items

3.32
security
protection of information and data against danger, damage, degradation of quality, loss and criminal activity so that unauthorized persons or systems cannot read or modify them and authorized persons or systems are not denied access to them

Note 1 to entry: Security has to be compared to related concepts: Safety, continuity, reliability. The key difference between security and reliability is that security must take into account the actions of people attempting to cause destruction.

3.33
security profile
characterization of security requirements

3.34
shipment
identifiable collection of one or more goods items (available to be) transported together from the original shipper, to the ultimate consignee

Note 1 to entry: A shipment may be transported in one or a multiple number of consignments.

3.35
taxonomy
classification scheme for referencing profiles or sets of profiles unambiguously

3.36
tracing
function of retrieving information concerning goods, goods items, consignments or equipment

3.37
transport
transportation
movement of people and goods from one location to another performed by modes, such as air, rail, road, water, cable, pipeline and space and the field comprises the attributes of infrastructure, vehicles, and operations

3.38
transport means
vehicles, trailers, vessels, aircraft, or combination thereof, used for the transport of goods to perform a journey

3.39
tracking
function of maintaining status information of goods, goods items, consignments or equipment

3.40
trucker
truck driver
person who earns a living as the driver of a truck, usually a semi truck, box truck, or dump truck

Note 1 to entry: Commonly referred to as a trucker or driver in the United States and Canada; a truckie in Australia and New Zealand; a lorry driver or driver in Ireland and the United Kingdom.

3.41
visibility
ability to audit the content of a land conveyance while en-route or at strategic points of an overland journey

4 Symbols and abbreviated terms

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

3GPP	3rd generation partnership project
AEI	automatic equipment identification
AVI	automatic vehicle identification
CALM	communication access for land mobiles
CEFACT	See UN/CEFACT
CCL	Core component library
ebXML	electronic Business eXtensible Mark-up Language
EAN	European Article Numbering Association
EDIFACT	electronic data interchange for administration, commerce and transport
EFM	electronic freight management
ERI	electronic registration identification
GSM	global system mobile
HAZMAT	hazardous materials/dangerous goods
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
ITS	intelligent transport systems
JTC1	Joint Technical Committee 1
JWG	joint working group
LTE	(3GPP) long term evolution (sometimes called 4G)
OASIS	Organization for the Advancement of Structured Information Standards
OBE	on-board equipment
OBU	on-board unit
OCR	optical character recognition
PDC	personal digital cellular (Japanese advanced 2G mobile communications standard)
PHS	personal handy-phone system
RFID	radio frequency identification
RSU	road side unit
SOA	service oriented architecture
SOAP	simple object access protocol
SSL	secure sockets layer
TDED	trade data elements directory

5 Context

5.1 General context

In a scenario of land international transport and logistics, it is often difficult for a consignor and a consignee to know physical real time location of cargo after consigning the cargo to a transport and logistics service provider. Where a cargo is transferred from one haulier to another, obtaining information of the manifest at a detailed level is often difficult. Auditing the actual content of a consignment en route and monitoring cargo stress measurement information during road transport is difficult, especially in the case of sealed containers such as sealed ISO intermodal containers.

In the international context, an ocean or air carrier is required to report cargo manifest information to related authorities, according to the standards designated by IMO (International Maritime Organization), ICAO (International Civil Aviation Organization)/IATA(International Air Transport Association), therefore, a party concerned in an international air/ocean transport is able to track or trace cargo on a real time basis.

Seamless exchange of accurate, complete, and timely data at transportation hand-offs has always been important for efficiency and accountability. There is now a growing understanding of needs for security of transport information, and for transfer of information related to security against terrorism as well as theft and traditional contraband.

Transport information and control systems TICS (ITS) Reference model architecture for the TICS (ITS) sector – Part 2 Core TICS (ITS) reference architecture (ISO/TR 14813-2:2000) identifies a Commercial Vehicle functional domain including:

"Transactions to maintain the TICS (ITS) information about a shipment from the time of the order by the consignor to the reception of goods by the consignee. The key TICS (ITS) transactions are to provide registers of service providers and to enable the goods to be tracked throughout intermodal journeys."

And deliverables in the ISO 26683 series of standards shall be consistent to this definition.

5.2 Road transport information exchanges for supply chain freight time-sensitive delivery

Some international shipments are entirely by the highway mode, others begin and end with motor carrier service and travel on other modes in the course of the shipment. ISO/TS 24533 focuses attention on an international truck-air-truck thread through the supply chain where the interfacing modes' data structures and formats must accommodate each other to ensure efficiency and security from end to end, and shall be considered the reference for these aspects of road transport information exchanges for supply chain freight.

Rail, ocean transport, air and road are vital components of intermodal, international shipping. ISO/TS 24533 is focused on international end to end monitored supply chain operations where there is aggregated system visibility of all aspect of data to all parties involved.

ISO/TS 24533 specifies the data concepts applicable to the movement of freight and its intermodal transfer. It also addresses the business processes depicting the roles and responsibilities of the various participants in the international supply chain. While designed for international freight movements, it is as useable in domestic supply chains so long as the information/data are available.

ISO/TS 24533 focuses on a single "thread" of the overall end to end supply chain consisting of a road-air-road combination. These data concepts include data elements, data frames (groups of data elements) and messages that comprise information exchanges at road transport interfaces along the chain of participants responsible for the delivery of goods from the point of origin through to the final recipient as presented in Figure 1.

The scope includes motor transport data needs within the international supply chain to satisfy the requirements of both businesses and governmental organizations. ISO/TS 24533 is applicable to highway shipments that originate in one country and terminate in another. It may however also be applied to highway shipments that originate and terminate in a single country. ISO/TS 24533 is applicable to

highway freight movements that interface with other modes and incorporates requirements set for those other modes.

If goods change to or from another mode between origin and destination, ISO/TS 24533 does not establish requirements for those other modes. However, it addresses the requirements of information exchange between the truck mode and another mode (e.g. air freight). Further, ISO/TS 24533 does not constrain the requirements of customs, regulatory, and safety bodies at border crossings. However, ISO/TS 24533 does include the data elements most likely to be required by Customs.

NOTE Re Figure 1 it is intended that this thread may be generalized to address the various combination of segments that occur in the global supply chain.

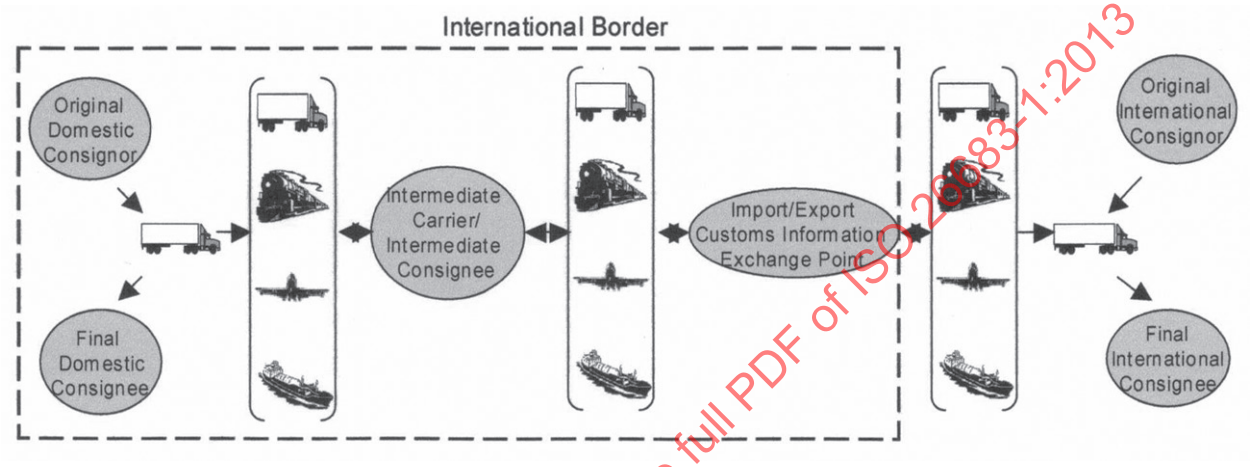

Figure 1 — ISO/TS information exchanges at intermodal interfaces (source ISO/TS 24533)

ISO/TS 24533 utilizes the (UBL) 'Universal Business Language' developed by OASIS, referring to the foundation of UN/CEFACT standards (Data Dictionary TDED, CCTS Core Components Technical Specifications…). The Universal Business Language is the product of an international effort to define a royalty-free library of XML schemas for business documents built upon a set of common components. UBL formatted electronic messages enable direct connection into existing business, legal, auditing, and records management practices, eliminating the re-keying of data in existing fax- and paper-based supply chains. It aims to provide an entry point into electronic commerce for small and medium-sized businesses. The concept being that that these information elements should all come from a single coherent superset of information elements (a consolidated library of information elements). UBL is focused to a royalty-free library of XML schemas for business documents. UBL uses XML to interchange business documents between two trading partners, but recognizes that the trading partners will have their own internal storage representations for the information found therein. When it comes time for an organization to fulfil their business reporting obligations, the information to report does not come from their business documents but from their own internal storage representations. UBL may embrace only some of the attributes commonly used in physical, and particularly, domestic land transport movements. Some of the data required for the appropriate UBL data concepts may not yet be carried in or available to the land conveyance OBE. However, where UBL is going to be used, it is important to be able to forward data collected from land conveyances to such systems in a format that is meaningful to those systems and easily translated into UBL when it comes time for an organization to fulfil their business reporting obligations.

Refer to the use cases presented in ISO/TS 24533 for examples of multi-modal freight movement.

As a complement to ISO/TS 24533/UBL, the USDoT initiative 'EFM' (EFM Design, EFM Architecture Summary, EFM_UBL_Profile_and_WSDLs, EFM_DeploymentGuide, EFM Database Schema) provides a detailed instantiation for implementation design, down to software level which is not a standard but provides a detailed model of how such systems can be applied.

Figure 2 depicts a high level logical view of the EFM architecture.

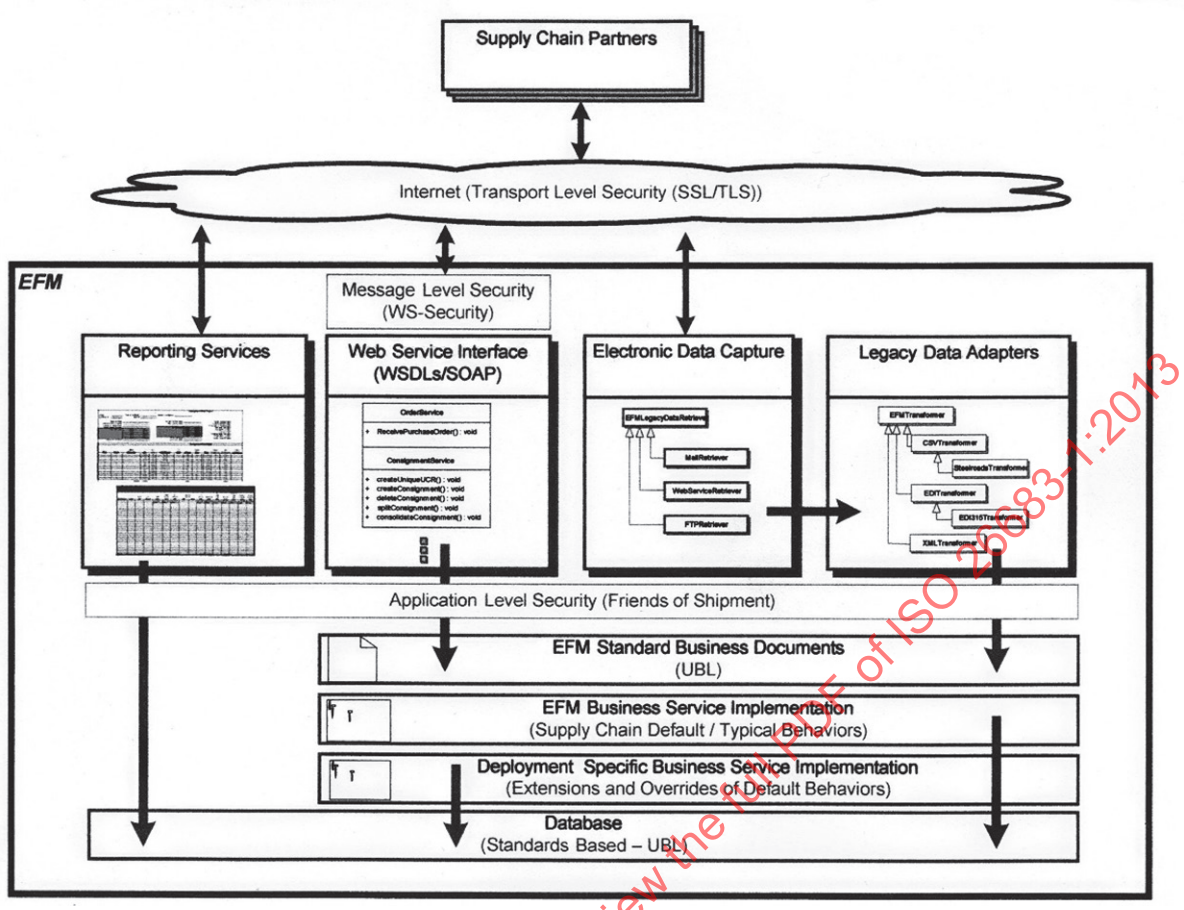

Figure 2 — EFM high level Architecture (source: EFM Design USDoT)

There is no single organization responsible for data standards through the intermodal supply chain. To achieve a coherent set of standards for information exchange processes requires coordination among the various international organizations working on pieces of these standards. TC 204 has advanced the idea of close coordination among other ISO Technical Committees, IEC, CEN, UN Centre for Trade Facilitation and Electronic Business (UN/CEFACT especially their Transport/Logistics domain), and the World Customs Organization. The ISO 26683 series shall be complementary to ISO 7372.

The vision of ISO/TS 24533 and the EFM project is to have an electronic supply chain manifest that will satisfy the needs of the transport business industry and governmental organizations that regulate the flow of commerce. ISO 26683 is designed to present information to such end-to-end cargo application systems, it does not provide end to end system (consignor to consignee) system design.

5.3 Dangerous goods

Deliverables in the ISO 26683 series shall be consistent with ISO 17687. ISO 17687 provides a consistent context for the presentation and storage of 'Dangerous Goods'/HAZMAT information. ISO 17687 is designed to support the automated identification, monitoring and exchange of emergency response information regarding dangerous goods carried on board road transport vehicles. Such information may include the identification, quantity, and current condition such as pressure and temperature of such goods as well as any relevant emergency response information. Reporting this information may occur prior to or during transportation of the goods in a manner that allows all interested parties to access and correctly interpret the information. When equipped with appropriate electronics and communications capabilities, vehicles carrying dangerous goods may respond to queries regarding their status or self-initiate a message.

However, ISO 17687 does not specify nor even imply that any particular on-board or off-board systems should be capable of performing such monitoring, data retention, or communications. The provisions of ISO 17687 cover four contextual situations:

a) General requirements;

b) On-board systems;

c) Roadside recipient to emergency control centres;

d) Emergency control centres to emergency control centres.

It is intended that the information is carried on-board the transport vehicle and may then be transferred to interested roadside systems by whatever communications means are appropriate to that roadside system.

ISO 17687 proposes that the following levels of identification and monitoring systems for 'Dangerous Goods'/HAZMAT are possible:

1. Direct supplement to existing product identification placards (which are visually oriented, non-electronic);

2. Added data beyond that contained in existing placards;

3. Interface with on-board systems;

4. Intelligence to react to product or goods conditions.

ISO 17687 states that '*with a suitable communications interface, it is possible to transmit the information to and between remote sites such as emergency service systems and centres. This information transfer may occur during normal operations or in emergency modes of operation.*'

ISO 17687 therefore deals with the on board information but not the media used for transmitting the information, nor the means of collating and transferring the information.

Using this information, ISO 17687 proposes that the following classes of services may be provided in either normal or emergency modes of operation to control dangerous goods.

Services	Remarks
1. Gathering information on vehicle conditions carrying dangerous goods. Such information may be obtained from on-board sensors.	Monitoring or tracking the dangerous goods in normal operations. Multiple tracking levels may be used.
2. Gathering information on dangerous goods load status in real time under emergency conditions.	During an emergency, the information must be obtainable automatically or on request during the event. In non-emergency situations, such capability is optional.
3. Contact emergency response authorities.	In case of emergency, appropriate authorities would be contacted automatically.

The overall concept for ISO 17687 is shown in Figure 3. ISO 17687 applies to the elements identified as "Data Dictionary and Message Sets" which exist within the communications links between the various sources and users of the dangerous goods information. This illustration is not restrictive in any way, it is intended to reflect the potential uses for the information that will be available.

In order to facilitate the deployment of on board compatible equipment using ISO 17687 (usually installed by the goods carrier), it is important to maintain compatibility with emergency response application standards linking road sites and centres and the centres themselves (usually deployed by the authorities). ISO 17687 observes that often the regulators or the emergency responders will not invest in purchasing additional software or hardware to service a small portion of the constituency (always the case when new equipment is deployed) but, where existing software can receive the information

anyway, the results are a smooth introduction and transition. Such strategy has been successful in easing the introduction of equipment linking public and private parties before.

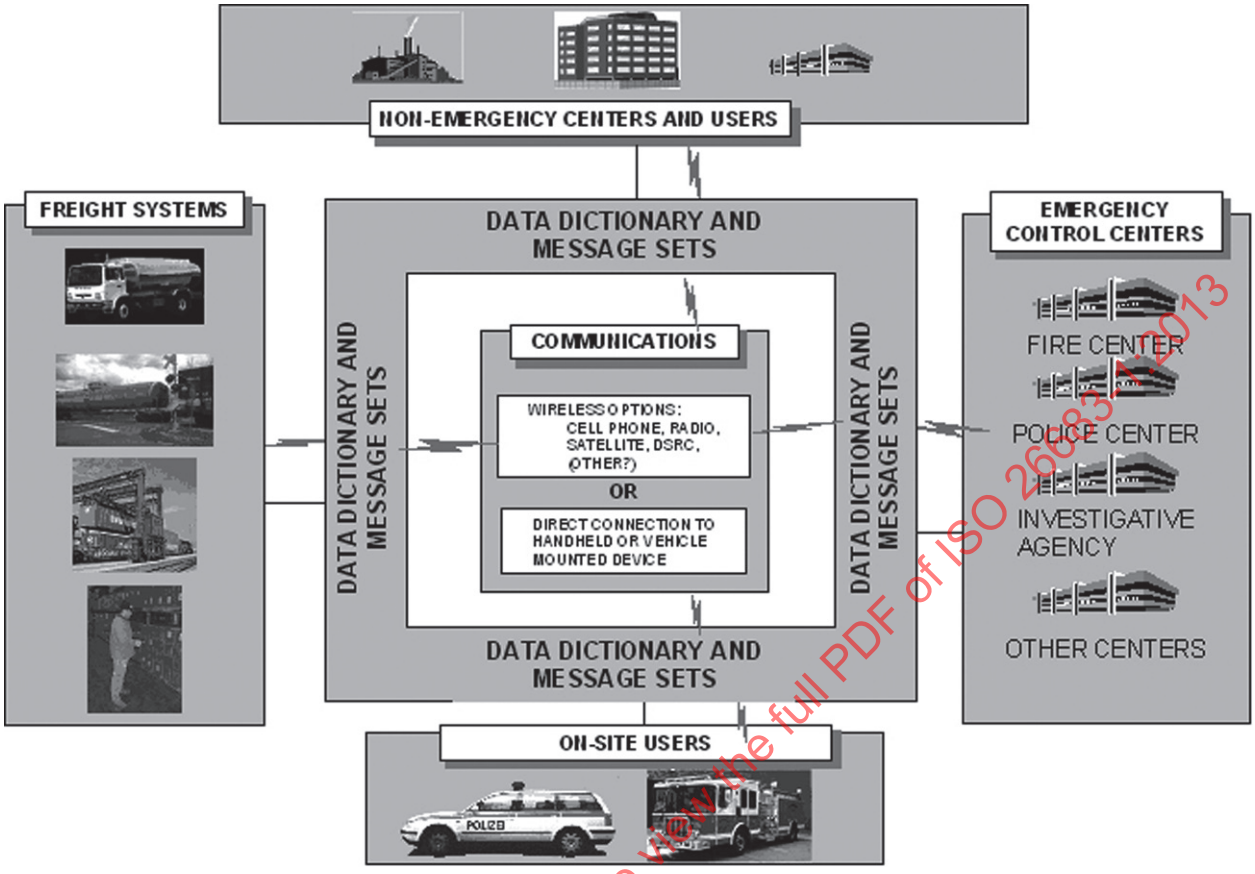

Figure 3 — ISO 17687 electronic identification and monitoring concept (source: ISO 17687)

In ISO 17687 the term "transport unit" refers to the transport vehicle as well as the containment or storage systems for the dangerous goods. The modes of transport include straight-trucks/lorries and road combination vehicles. Combination vehicles may have individual monitoring and/or reporting systems for the power unit (tractor) itself and for each trailer and/or container. Containment and storage systems can include containers as well as pallets, and even individual packages.

Figure 4, again taken from ISO 17687, illustrates the range of potential transport units. As shown, they fall into two major classes, the loads or goods to be transported, and the transport means themselves.

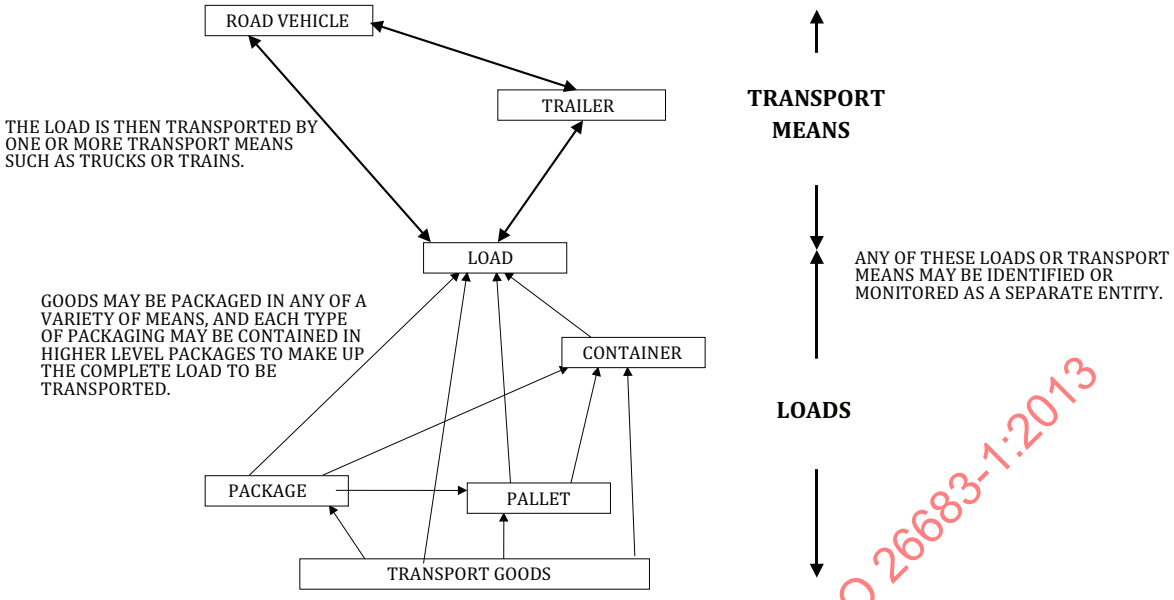

Figure 4 — ISO 17687 representative types of transport units (source: ISO 17687)

ISO 17687 identifies that there are multiple options for the on-board transport unit systems and capabilities. Vehicles may be equipped with any of a variety of trip recorders, navigation systems, and fleet management systems that can be used to record and report vehicle location and the occurrence of an accident, including accident severity. ISO 17687 makes no assumptions regarding which of these may or may not exist. It observes that a basic on-board system might consist solely of data memory containing information entered when the cargo was loaded. More complex systems might include active cargo monitoring systems, such as temperature, pressure, volume, or weight sensors depending upon the cargo involved. ISO 17687 does not specify nor require such systems, but anticipates their use in conjunction with the basic electronic dangerous goods data in the future. ISO 17687 applies only to the transfer of such information to or from the transport unit and not to the manner in which the information is generated, stored, or used on the transport unit.

ISO 17687 identifies that transport unit may have multiple options for communicating with the roadside systems. In some cases, the local roadside system may be a person standing beside or in close proximity to the transport unit. For access by emergency service personnel at an incident scene a direct-wired connection with on-board data networks or devices may be used to obtain the information. With the ability to transmit the information over wireless communications devices, there is an expanding range of options available. If the local wireless communications device is “Dedicated Short-Range Communications” (DSRC), the local system is truly local. It shall also be possible to use wireless transmissions over long-range communication devices such as cell phones or satellite systems, sending the data to a facility very far away. It shall be possible to use one or more of a whole range of such possibilities from the so called, CALM (‚Communications Access Land Mobile‘) family of Standards (ISO 21210, ISO 21212, ISO 21213, ISO 21214, ISO 21215, ISO 21216, ISO 21217, ISO 21218, ISO 25111, ISO 25112, ISO 25113, ISO 29281, ISO 29282, ISO 29283, ISO 13183 and other related standards). In such a case, the “local roadside system” may be a trucking fleet dispatcher or a remote “Emergency Control Centre”. Even though the primary intent of ISO 17687 is to support local on-site needs in the same manner as conventional visual placards, the long range reporting is also supported by the standard.

ISO 17687 does not require nor support any specific operational scenario, though it provides examples of what may exist:

— Periodic reporting;

— When requested by dispatcher;

— One event, either a dangerous goods situation (e.g. exceeding temperature or pressure threshold) or a transport unit situation (accident);

— On-site information gathering by emergency services personnel;

— Deviation from route, different route, loss of contact, theft.

ISO 17687 identifies that once the message has been received by a roadside system, it may be transferred to any/all other appropriate monitoring or response centres. In non-emergency situations, this may be from a trucking fleet dispatcher to the local police or fire department or to any other control centre that has been identified as responsible for the immediate situation.

ISO 17687 identifies that such communications are beyond the scope of ISO 17687 but the data dictionary/message sets defined in ISO 17687 are intended to be compatible with known standards that would apply (one example being IEEE 1512.3). If no such standards exist or would apply to the situation, then the data dictionary/message sets defined in ISO 17687 should be used.

Although ISO 17687 is restricted to defining data content and message transactions for dangerous goods Figure 4 above for dangerous goods information, it provides a general physical architecture that applies to most freight environments.

5.4 Domestic land transport scenarios

These existing standards designed around international freight movements in the case of ISO/TS 24533, standard electronic XML business documents in the case of UBL, dangerous goods/Hazmat in the case of ISO 17687, represent major steps to coherent freight transport information. However in land transport, particularly where no border crossings are involved, and except in the case of 'Dangerous Goods'/ HAZMAT loads, a trucker usually does not have to report cargo manifest information to any regulator. A trucker receives an order from the client with delivery date/time and location and except in the case of 'Dangerous Goods'/HAZMAT may not necessarily be given any detailed cargo information, nor be accompanied by UN/CEFACT or UBL business documents. In these situations real time land transport cargo monitoring as envisaged by ISO/TS 24533 and the EFM project (which itself provides only limited insight into the cargo), is not often possible to achieve.

However, ISO 26683 is designed to present information to application systems, including both comprehensive international end-to-end management systems and local domestic movements, ISO 26683 does not provide end to end system (consignor to consignee) system design.

There are also many situations where the tractor and trailer combination changes during the course of a journey from consignor to consignee.

Further, even where such comprehensive systems are in place, they rely on the level of detail that exists within the controlling computer system and without the ability to monitor the actual contents, there is no possibility to:

a) audit the actual contents of the consignment. This is particularly difficult in the case of a sealed container such as sealed intermodal containers (ISO 668 and subsequent related standards for freight containers);

b) monitor the condition of the contents of the consignment (cargo stress measurement information).

Refer to 6.3 and Figure 11 for a domestic use case example providing information to cargo tracking and tracing in an end to end transport environment

5.5 Complementariness of standards

The ISO 26683 series are therefore complementary to the context of ISO/TS 24533 and may well provide sources of data required by such systems, and an electronic auditing capability that has not yet been embraced by ISO/TS 24533 or the EFM instantiation. As has been seen above, ISO 17687 does not address

the means by which its data are collected and the ISO 26683 series may provide one means to capture and transfer instances of its data concepts from the vehicle to the infrastructure.

The ISO 26683 series envisages that a combination of existing technologies can be used to agglomerate/aggregate relevant data and use a tractor/truck mounted communications means to realize real time cargo visibility of land transport. As new technologies (such as LTE/4G) are adopted for ITS communications, International Standards in the series supporting ISO 21215, ISO 21217, ISO 25111, and may be used to realize the objectives of ISO 26683.

An international end to end transport often utilizes multi-transport modes. It is often likely to be a combination of multi-transport modes when a shipper consigns a cargo to transport and logistics service provider to deliver a cargo to destination. .

When physical inspections are needed, the consigner/consignee has to report to the related authorities before cargo arrival and the container/truck has to be thoroughly inspected. When the cargo journey (tracking and tracing and content) information can be stored into 'On-Board-Equipment' (OBE) in a truck with security measures for data transfer, physical inspection activities can be replaced/supplemented with electrical/electronic inspection, which can streamline intermodal/multimodal cargo movement among truckers and terminals both in domestic cargo movements and for international and cross border movements.

The OBE equipment will commonly comprise an 'On-Board-Unit' (OBU) mounted on the tractor unit or truck, with a communications means, although other configurations are possible. The OBE has the advantage of ability for data-reading and writing from the road side even if it is moving at high speed, and provides capacity for data and information storage. In the future there may be ITS specific media available for high speed data transfer (such as those provided in the CALM family of International Standards referred to above). However, as many truck monitoring systems already use wireless public land mobile networks (such as GSM/UMTS/LTE/PDC/PHS), and some use satellite mobile networks, these may also be used.

To realize real time land transport cargo monitoring, it is necessary to standardize the framework architecture for bringing on-board cargo information and truck/trailer (road transport) information into data concepts that can be transferred from the vehicle to the central system, or whereby the central system can interrogate the truck for the data that it needs. However the actual instantiation of equipment may vary and need not be standardised, only its data and its interface to the next stage.

NOTE To realize the visibility of commercial road transport information through the chain of custody from departure to destination; and taking account of the data security requirements for memory, will implicitly mean that only instantiations that are capable of holding quite significant volumes of data in operating and storage memory are suitable. This will in all probability rule out the use of some of the simpler RFID technologies from these applications.

The following table summarizes the critical differences between the freight standards referred to in this summary and the ISO 26683 series. Since the primary difference derives from who is communicating and the sources of the data, the majority of the data itself should be based on either common or compatible definitions.

It is useful to compare the contexts of ISO/TS 24533/EFM, ISO 17687, and IEEE 1512.3 with the ISO 26683 series.

Table 1 — Comparison of contexts of ISO/TS 24533, ISO 17687, IEEE 1512.3 with ISO 26683

	ISO/TS 24533/EFM	ISO 17687	IEEE 1512.3		ISO 26683
Communicants	Central system to central system	Defines Dangerous goods/HAZMAT data, not data transfer	Centre to centre. Centre to/from on-site personnel		Within vehicle (between on-board systems) collation of data. On-board to off-board
Method of obtaining vehicle and load information	Central system. Communication among communicants is through a federated system of computers interconnected through the internet. The method of obtaining vehicle and load information is thorough status reports issued at selected points along the way and provided through that same federated system of computers.	Automatic, either pre-entered or dynamically obtained sensor values	Previously entered. Observation and manual entry by emergency personnel at site		Automatic, either pre-entered or dynamically obtained sensor values with possible options for manual input of part of the data

This part of ISO 26683 is the first part of a multi-part series which provides context and high level architecture for all parts of the ISO 26683 series.

Part 2 defines application interface profiles to agglomerate/aggregate and transfer land cargo transport data to provide improved land cargo transport data and specifies one or more modes of transfer using available ICT technologies.

Part 3 will specify the handling of on-board cargo stress measurement information during road transport.

Part 4 will provide a Security profile requirement and definition.

6 Architecture

6.1 Overview

ISO 26683 is designed to present data to end-to-end cargo application systems, it does not provide end to end system (consignor to consignee) system design. However it must operate in harmony with such systems, enable the harvesting of data at appropriate points, and provide data in consistent formats.

Figure 5 depicts at a very high level, the physical movement of goods associated with the necessary 'paperwork' which is generally effected electronically through fax or phone, and these days via the internet. However there is no one mechanism that is an effective coherent approach to managing the 'administrative process' of managing and monitoring the movement of intermodal transport.

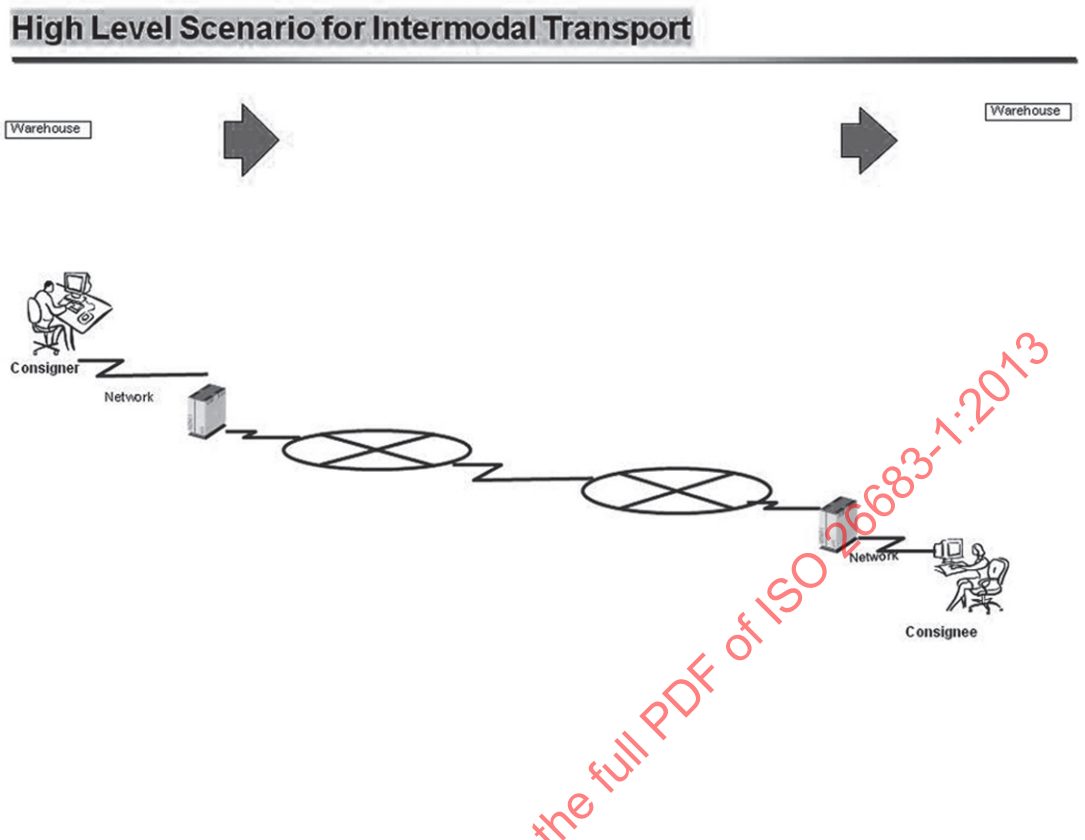

Figure 5 — High Level view of the administration of the movement of an item from consignor to consignee

A land transport may be a part of end to end transport within an international transport context, or it may be a simple domestic movement by one mode of transport, or some combination in between.

At the lowest level of a cargo there is the goods item. It has some form of identification, normally in the form of a human readable label, probably a bar code, and possibly an RFID 'tag' (transponder). Some RFID tags can only be read at very close quarters, others may be readable up to two metres, in some cases tags may be readable at considerable distances, depending on the technology used. A tag attached to an item of clothing is likely to have a read range of 2 cm to 2 m, whereas a tag placed on a vehicle, which may have to be located in a car park full of vehicles, may utilize a tag with 50 m read range. These are commercial decisions and not standardization issues within the context of ISO 26683.

Similarly a bar code may be a simple bar code that you would find on items in a supermarket, or in the case of a package to be recognized in an automatic sorting facility, may be a large ink sprayed bar code that can be read from 2 m to 3 m. Again, these are commercial decisions and not standardization issues within the context of ISO 26683.

What is important in the context of ISO 26683 is that the data can be harvested, electronically, in standard formats, at strategic points. In order to achieve this interoperably, data shall use/shall be presented using, one of the Standardised forms provided in Annex A.

Figure 6 shows the same movement and its data processing and shows, in this example a bar code, an RFID tag, and a dangerous goods label accompanying the item.

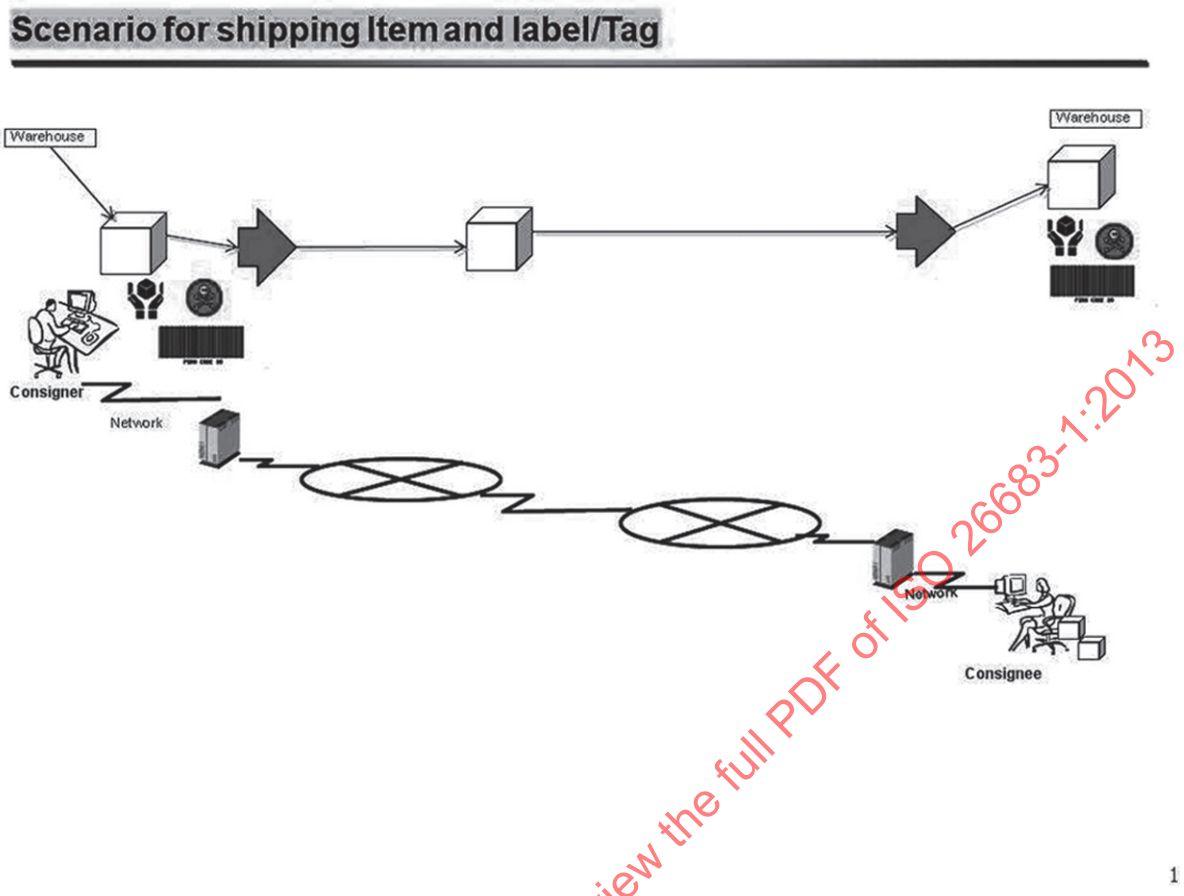

Figure 6 — High level view of the movement of a labelled/tagged item from consignor to consignee

In reality an end to end transport, even a packet sent by post or a carrier, usually utilizes multiple modes of transport. Typically road transport may be used to a rail depot, airport or port. The item will change its mode of transport from road to rail, ship or air, or even a different road haulier, this will usually happen several times/ using several modes of transport by the time it reaches the consignee.

Figure 7 shows some of the complexities of an intermodal movement of an item in the real world. For simplicity, other complexities such as single or multiple instances of freight forwarders, consolidators, shippers are not shown, but should be taken into account by the reader.

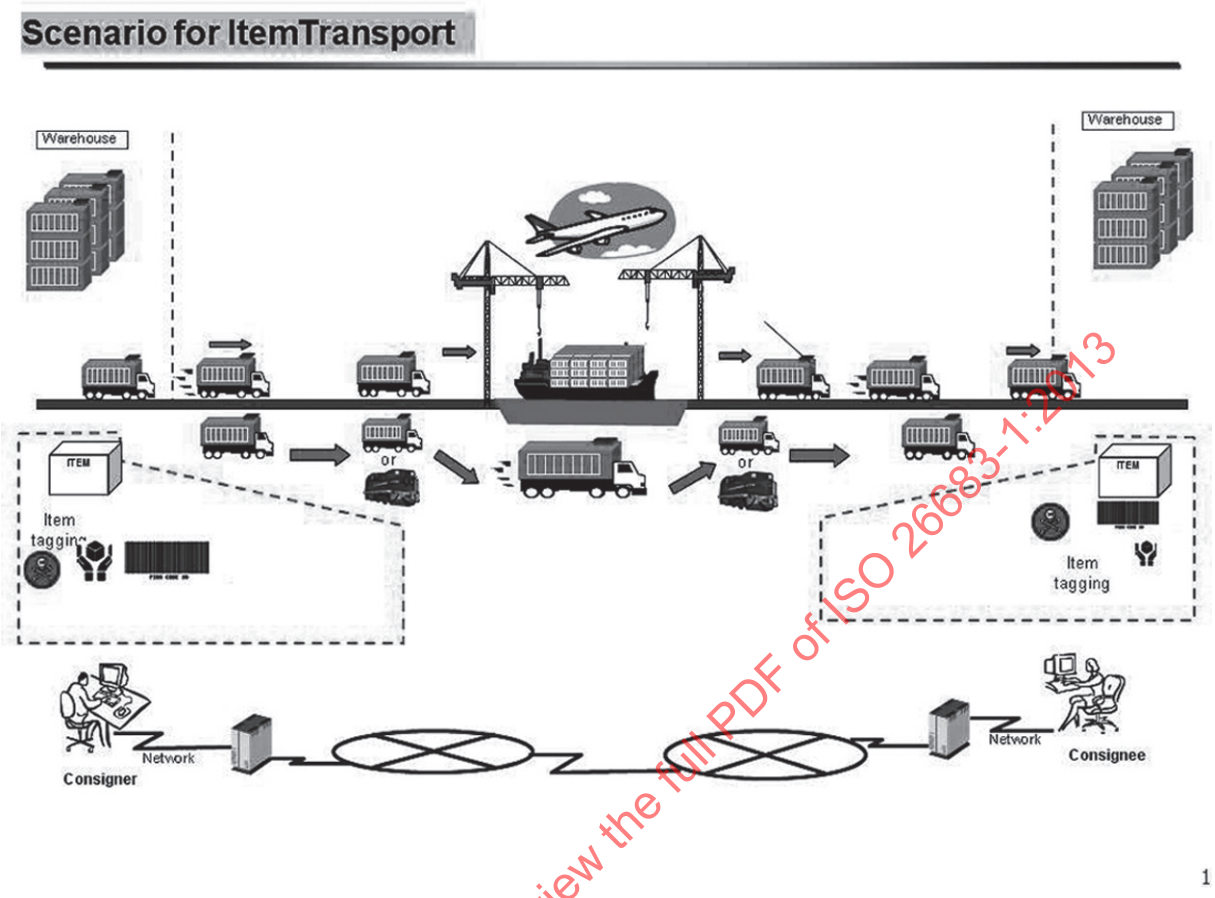

Figure 7 — Scenario for item transport using several transport modes

This in itself is still a simplification. In today's complex logistics, there will often be several instances of the same item in an order, or a mixture of items, placed into a package. Multiple packages may be shrink-wrapped into a consolidated item. A number of items/consolidated items will be loaded onto a pallet, and the consignment will start the first leg of its journey, or if the individual items have been collected by a carrier or the post, this first stage of consolidation may take place at a sorting office. In all probability, for an international movement, or major order, at some early stage in its journey, will be loaded into an ISO intermodal container, IATA Unit Load Device (ULD) or similar. At some stage it may move from road to rail. At some stage it may move to air or ship, and at a later stage return to rail or road, before it reaches the consignee.

The timing and choice of mode of transport is a commercial decision and, within the context of ISO 26683, not an issue for standardization.

Figure 8 also shows the some of the complexities of the intermodal transport scenario. For simplicity it also excludes the complexities of single or multiple freight forwarders, consolidators, shippers.

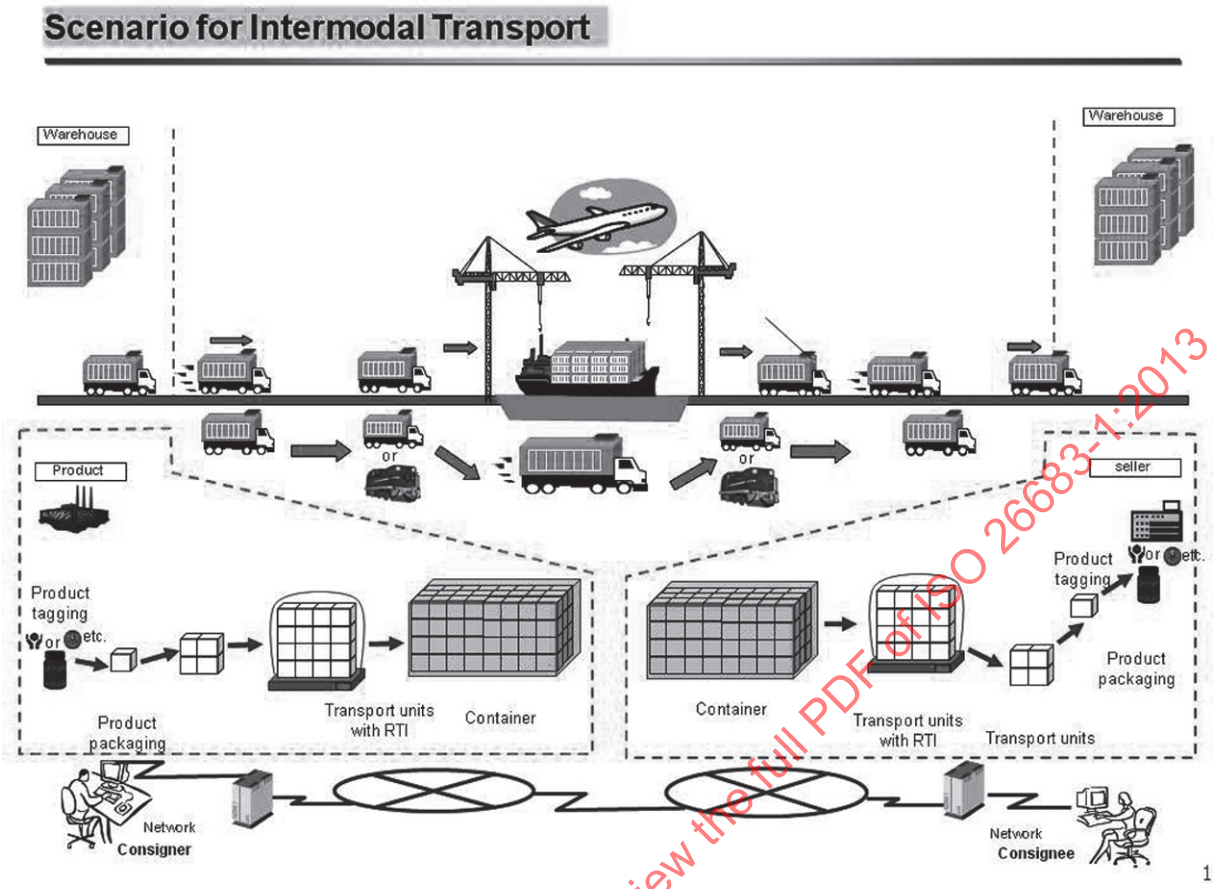

Figure 8 — Scenario for intermodal transport

6.2 Standardization aspects for intermodal transport

It can be seen from Figure 8, that this complex situation may involve many sectors, manufacturing, sales, post, couriers, road haulage, railways, air transport, marine transport, retail, customs, etc.

In order to function interoperably, these systems rely on the use of International Standards. However there is no single standards committee for the whole end-to-end operation as it involves many sectors with numerous organizations each with their own specialized Standards. Intelligent transport systems International Freight and fleet standards are developed by ISO/TC 204 WG7. Standards relating to air transport are developed by IATA and ICAO, standards developed for marine shipping jointly by ISO/TC 8 and the International Maritime Organization and cargo rail transport identifiers and security requirement by UIC (International Union of Railways). Standards developed for the automatic identification of vehicles and equipment are developed by ISO/TC 204 WG4. Standards developed for automatic identification and data capture techniques are developed by ISO JTC 1/SC 31, Standards developed for the exchange of business documents/data in the information society are developed by OASIS and by UN/CEFACT. Standards relating to freight containers are developed by ISO/TC 104, Applications for cargo layers by ISO/TC 122, standards relating to ITS wide area communications are developed by ISO/TC 204 WG16, and standards relating to telecommunications are developed by ETSI and IEEE.

Figure 9 shows some of the various committees responsible for developing standards to support the intermodal movement of an item

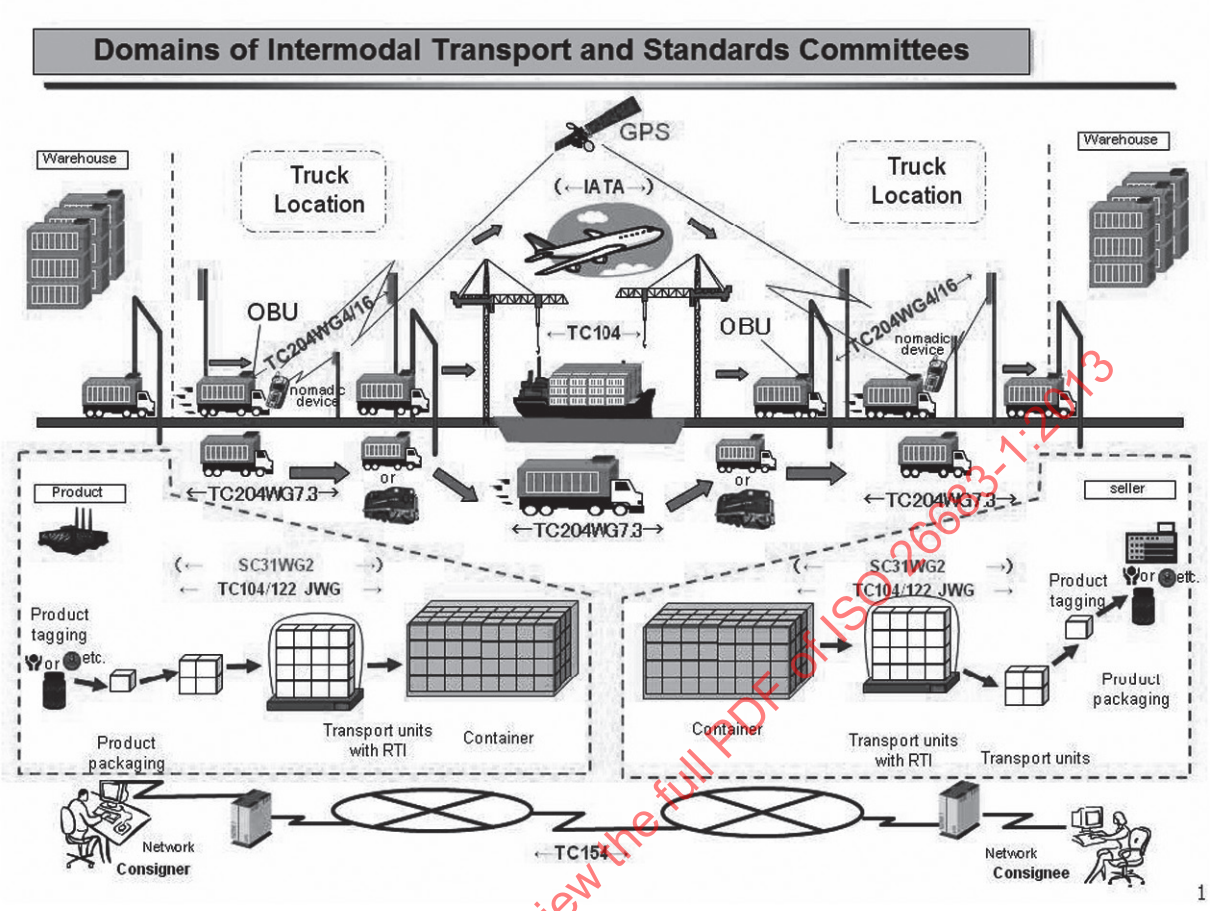

Figure 9 — Committees providing standards for Intermodal transport scenarios

Complex though the situation is, all parts of ISO 26683 are/will be compliant to the relevant standards from all of these SDOs. Indeed, ISO 26683 is founded on use of these standards to provide a number of standard 'application interface profiles' for freight land conveyance content identification and communication for land cargo transport.

The principal standards that apply to this complex scenario are shown in Figure 10.

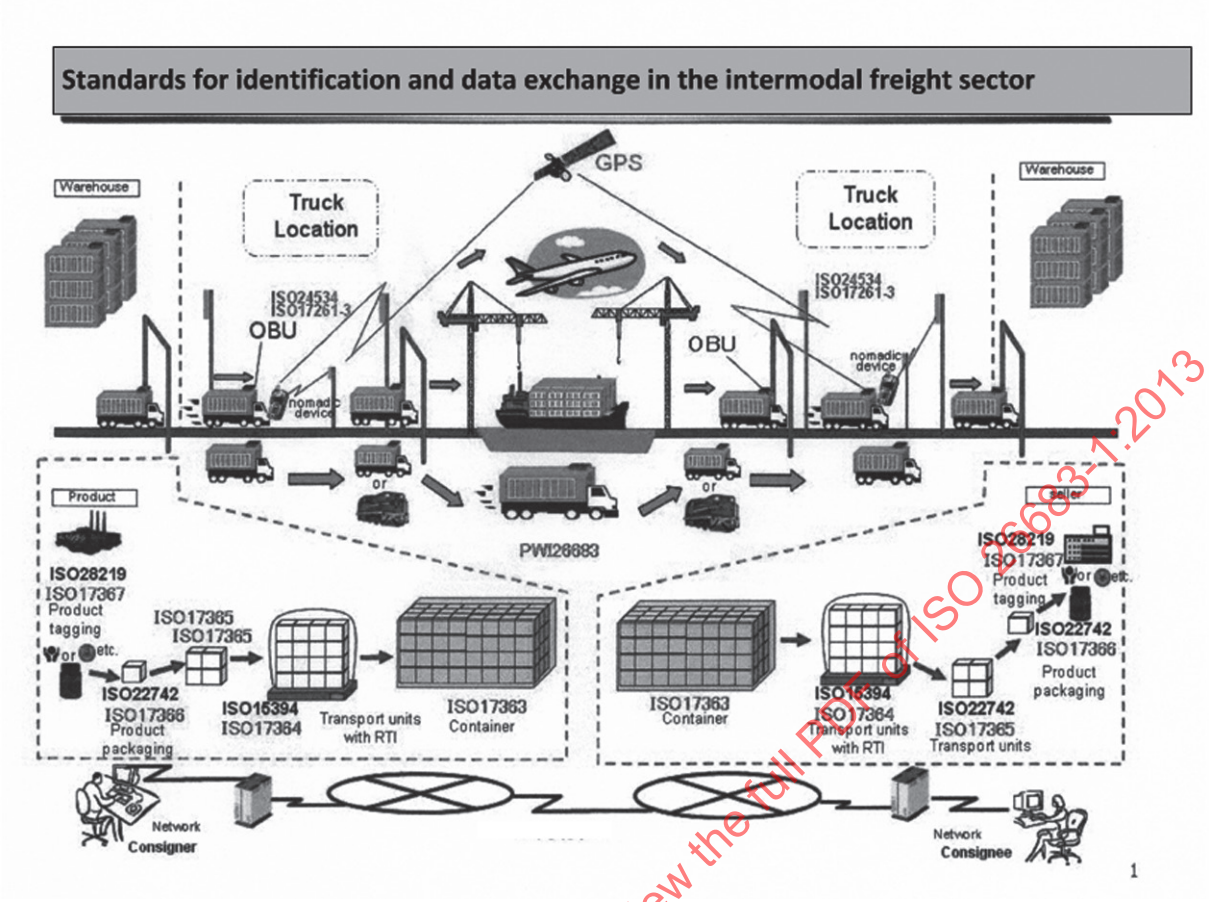

Figure 10 — Standards for identification and data exchange in the intermodal freight scenario

6.3 Make and break bulk content identification

The scenarios described above relate to the movement of entire cargos. Another scenario, particularly, though not exclusively, in domestic freight land conveyance, is where items are collected individually or in small groups, transferred to a sorting office or depot, bulked onto roller cages, or similar, which are themselves bulked to single destination land conveyance cargos. These land conveyance cargos are then moved to a second sorting office or depot, then broken into delivery rounds and delivered individually or in small groups. A good example of this would be postal or express parcel carriers, though it also applies to supermarket chains in a very similar manner. Figure 11 provides a representation.

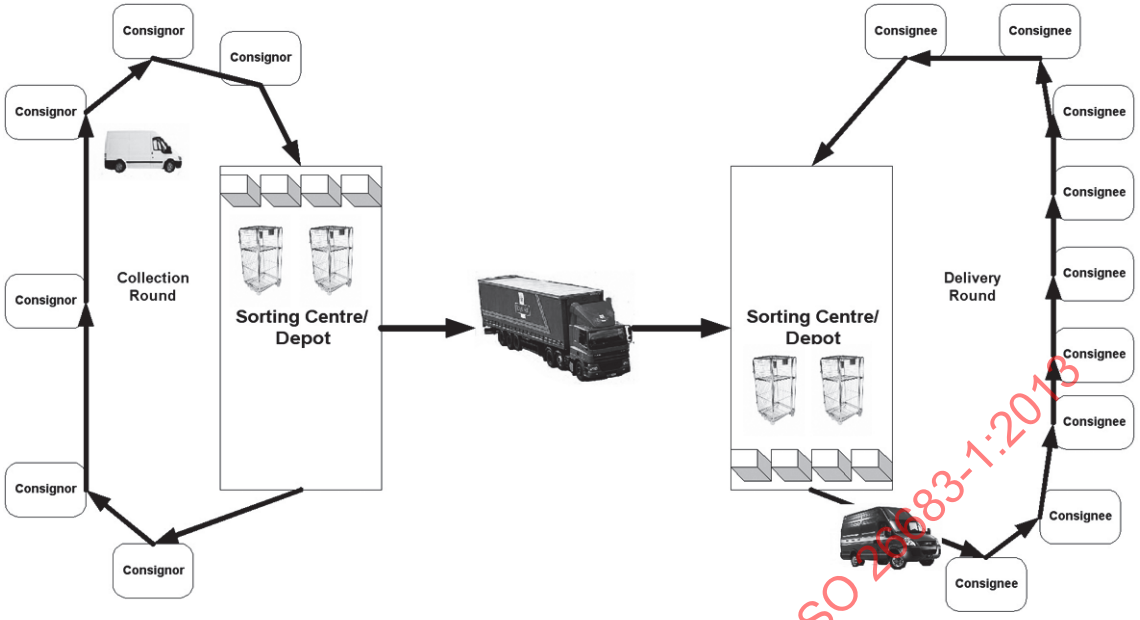

Figure 11 — Example of make and break bulk — Express packet service

In systems such as these, the items are consolidated into rollercages (or similar) in the sorting centre/depot. While a DSRC or 5 GHz communications link may be used, it is more common to tag the rollercages using an ISO/IEC 18000-6 C RFID tag, or use bar-code, and provide an additional tag/bar-code on the land conveyance door, which is read as part of the loading process. Similarly on de-stuffing, the tag on the land conveyance is read and associated with the individual rollercages to confirm their arrival at the receiving sorting centre/depot. At the item level, the item is also logged into the system at both collection and delivery, sometimes using RFID, sometimes using bar-codes, and with the uploading of the system either by GSM/UMTS/LTE/PDC/PHS or by physical docking of the reading equipment on return to the sorting centre/depot. This process is also carried out using only bar-codes. In this way, although the item cannot be audited when actually in transit, it can be logged into the system at collection, at arrival at the sorting centre/depot, on stuffing/destuffing into/from a rollercage, the rollercage is logged into the land conveyance, and at the other end the process is reversed.

6.4 Variety of forms of freight land conveyance

In the examples shown in the figures above, the ubiquitous 'ISO Intermodal Container' is generally shown as an example. If all land conveyance was made using a single truck/ISO container relationship it would be more easy to determine the architecture in ISO 26683. The first complication is that there are both 20 foot and 40 foot 'boxes' (containers), and a truck may be carrying 1 x 40 foot or 2 x 20 foot containers. Further a tractor unit may be hauling more than one trailer (which would give the possibility of two trailers carrying anything from one to four ISO containers). In some parts of the world 'road trains' pulling several trailers, are used. Communication between the vehicle on-board equipment control unit and the containers is therefore not 1:1 but 1:potentially several. (See 6.5 below).

A further, and somewhat obvious further complication, is that not all freight land conveyance movements use ISO Intermodal containers. While these now form the bulk of international multi-modal cargos, for cargo whose journey is land based, or land and inland waterway based from end to end, ISO containers form only a minority of transport land conveyance methods. Figure 11 above, for example, shows collection and delivery rounds in vans and depot/depot movement using rollercages in soft sided curtain trucks.

Within this deliverable, land conveyance shall be used as in the context of ISO 6346, in its several parts shows many forms of land conveyance, These are described in Annex C (informative).

This extensive list can be condensed into about 10 major types, plus 'other'.

ISO 17262, CS10 identifies these types as:

- 0 = nofreightConveyanceIdentifier
- 1 = freightContainerIdentification
- 2 = multipleFreightContainerIdentification
- 2 = swapBodyIdentification
- 3 = boxBodyIdentification
- 4 = curtainSidedBodyIdentification
- 5 = flatbedBodyIdentification
- 6 = tipperBodyIdentification
- 7 = lowloaderBodyIdentification
- 8 = carTransporterBodyIdentification
- 9 = thermalContainer
- 10 = tankContainer
- 11-15-unused
- 16 unspecifiedBody

6.5 Multiple trailers

As well as being multiple types of trailer, there is also a growing instance of the use of multiple trailers. As stated in 6.4 above, most typically, this comprises a tractor unit pulling two trailers, each often carrying 1 x 40 foot, or 2 x 20 foot trailers. The examples in Informative Annex B provide some examples. However, in some parts of the world, 'road trains' are used and these may typically be four or five trailers long . Figures 12 and 13 below show examples.

Obtaining/agglomerating data from multiple trailers has also to be accommodated.

Figure 12 — Road train example

Figure 13 — Road train example

6.6 Principal standards for the intermodal transport scenario

The ISO 26683 series are built upon and rely on the standards listed in Normative Annex A. ISO 26683 does not contend with any of the Standards summarized in Normative Annex A and uses them, wherever practicable, as a source/format of data and data transfer: Data presented shall normally comply to a form defined in one of these Standards, as appropriate, and as specified in one of the OPTIONAL application interface profiles specified in ISO 26683-2.

6.7 Subsequent standards

Subclause 6.6 provides reference to relevant standards available at the time of publication of this deliverable. As the scenario for transport evolves, it is probable that new relevant standards will be developed and be published. Additional standards may be added to the referenced standards list by the publication of a simple amendment to this deliverable.

6.8 Operational aspects for data collection

If the system is closed, and/or operational control is tight enough, as envisaged for example, by the USDoT sponsored EFM system, then data can be collected at the point of consignment, data can be aggregated electronically, the final consolidated item of movement (ISO Intermodal Container, ULD etc.) and the progress tracked through the progress of the associated bill of lading or whatever travel documents accompany the aggregated consignment as it is processed by the authorities through its passage.

The problem with this is that it assumes that everything is happening smoothly and correctly, and in the real world that is not always the case. So ISO/TS 24533 and EFM provide opportunities to use manual or electronic means to physically audit the consolidated item of movement, for example by using an RFID tag, or bar-code, on the ISO intermodal container/ULD etc.

However, in much of the commercial world, for example domestic road movements, or movements through free trading area, the operational controlling systems may not provide the level of detail required. At some point of the journey, it may rely on physically printed paperwork, and the electronic record may not accompany the load, or not get transferred through some incompatibility or regulation or privacy requirement.

Additionally, in electronic systems there is the assumption that what is loaded is what was supposed to have been loaded, and what arrived is what was despatched. Due to operational error, threat, or adverse conditions, this may not always be the case.

6.9 On-board cargo stress measurement information during road transport

A further aspect of operational interest, both in real time and at the end of the journey, is the condition of the cargo. This is particularly important for refrigerated goods, but in some cargo movements, other environmental aspects, such as pressure, or shock, upright cargo, etc. are also important.

If the cargo is equipped with sensors that can communicate with a local (usually RFID) tag or reader, that information can be transmitted whenever requested at an interrogation point. ISO 26683-3 will address these issues.

7 Freight land conveyance content identification architecture overview

7.1 Generalized framework

Figure 14 below shows an overview of the architecture for freight land conveyance content identification and communication

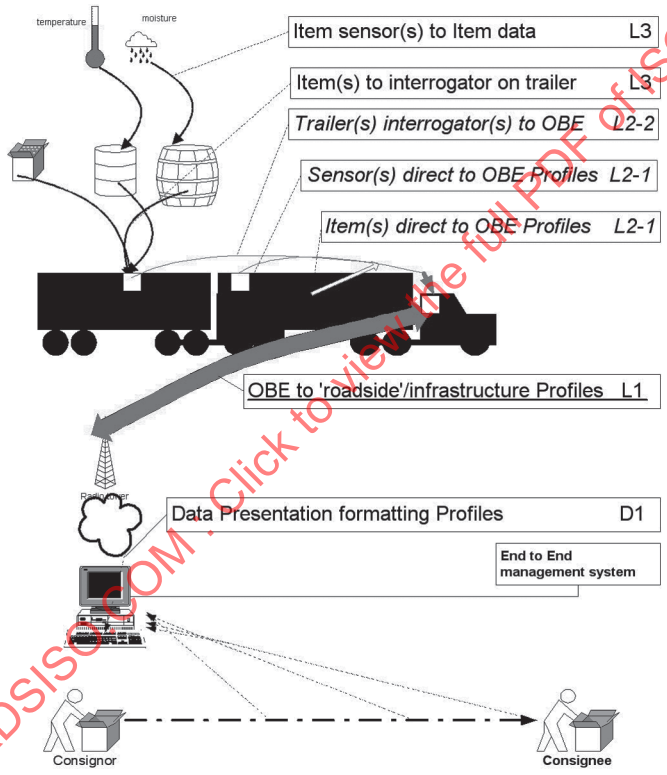

Figure 14 — Scheme of architecture and structure overview for freight land conveyance content identification and communication

Although various cargo information data models exist it is important that standardised data structures are used, as defined in the appropriate Standard referenced in the previous Clause and summarized in Normative Annex A.

7.2 Cargo/vehicle information data layer

Figure 15 below shows the cargo/vehicle information data layers at each cargo/vehicle type. Ideally, there will be a single library of transport information objects that are inter-related; each transport information object with a collection of information attributes that encompass all the data items that are specified for any and all configurations of truck and trailer configurations. Data elements representing a particular single truck/trailer configuration being a subset of the full set of data elements, from a single library of transport information objects that are inter-related. Each transport information object

with a collection of information attributes that encompass all the data items that are specified for any and all configurations of truck and trailer configurations, data elements representing a particular single truck/trailer configuration being a subset of the full set of data elements. That is the aspiration of UN/CEFACT and UBL. But in reality, most frequently, a range of long standing and widely used standards which use different technologies, data structures and data reading/writing /access methods are encountered. Therefore, the data communication content, and the appropriate standard(s) to conform to, between on-board cargo/ truck/trailer and OBE varies case by case. For example, consumer electronics goods are directly loaded onto trucks and these goods information may directly be written to OBE in vehicle manually by a portable interrogator. Another example is where smaller goods are consolidated into a box, palletized and loaded onto truck, and some goods are containerized and associated with the trailer. The Standards references below are examples of the most common cases. These aspects are addressed in ISO 26683-2, Intelligent transport systems — Freight land conveyance content identification and communication —Application interface profiles.

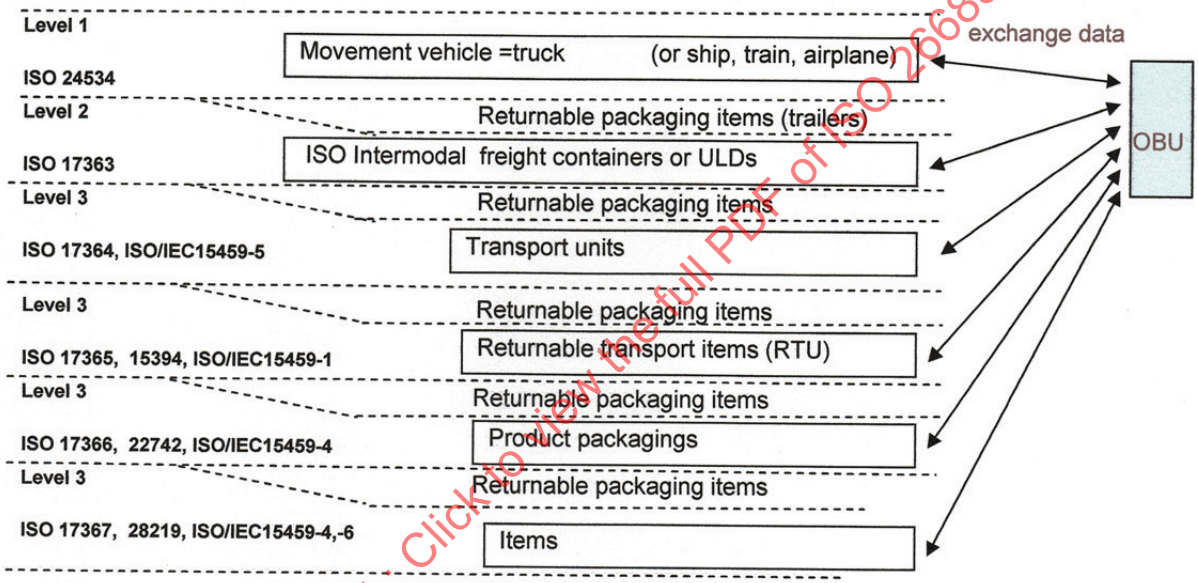

Figure 15 — Cargo/vehicle information data levels

7.3 Sensor data

There are many types of sensors that may be placed in association with a tag. The physical form factor may be a wired connection, the sensor may be inbuilt as part of the tag, it may be a contact device (such as in ISO 14443), it may be a proximity device (such as in ISO 15693/ISO/IEC 18000-3 Mode 1), or it may be connected wirelessly to the tag (although this seems less likely). The referenced standards shall be ISO/IEC/IEEE 21450, ISO/IEC/IEEE 21451-1, ISO/IEC/IEEE 21451-2, ISO/IEC/IEEE 21451-4, ISO/IEC/IEEE 21451-7, and ISO/IEC 18000-6 amongst others. ISO 26683-2 addresses these issues in greater detail.

The architecture models are simple and examples are shown in Figure 16.

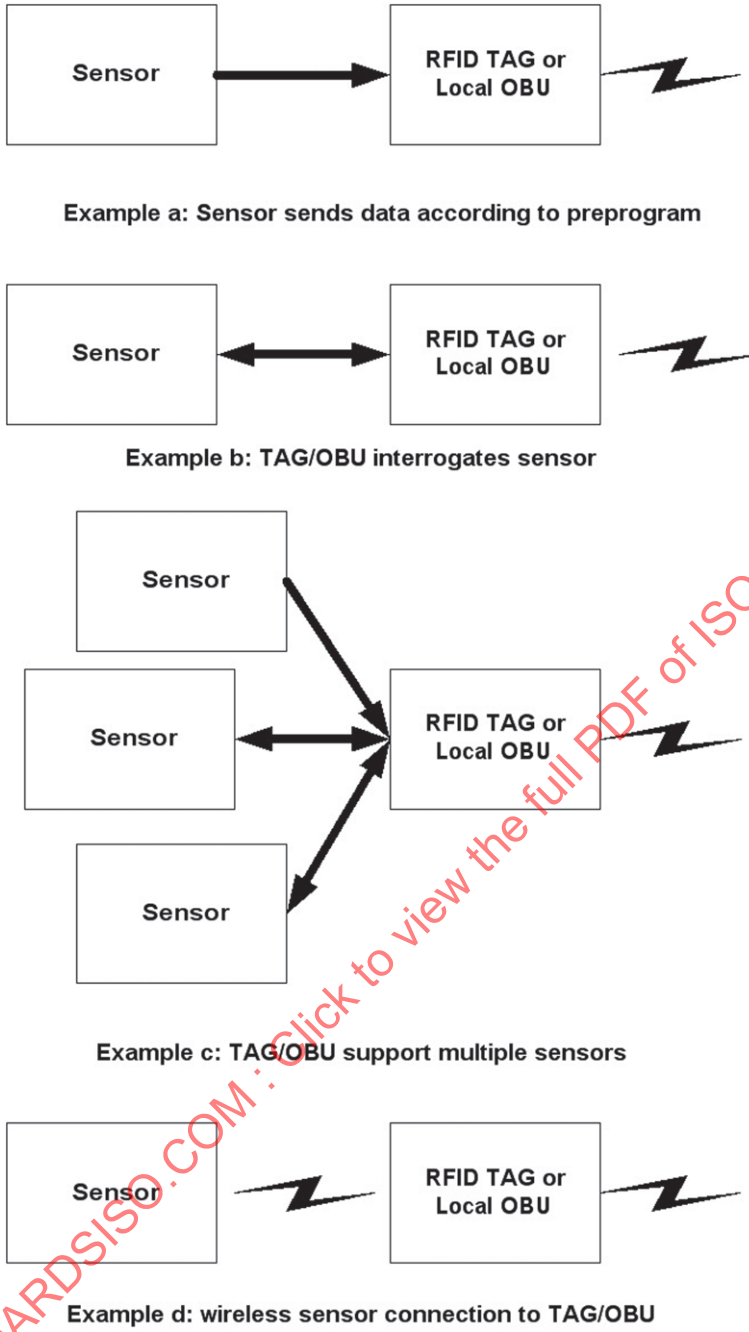

Figure 16 — Sensor-tag communications

7.4 Item data

Item data needs to be unique, at least to the cargo shipment and or tractor and trailer combination. A number of truck-trailer combinations are possible. ISO 26683 envisages the situation where an RFID interrogator (connected to the OBE), interrogates tags within the truck /trailer as appropriate. However, it would be possible to read bar-codes or use OCR to create an audit of the contents of the truck/trailer as they are loaded. What is important to the ISO 26683 concept of operations is that this is a real audit of what is actually in the cargo, and not central system data of what is supposed to be in the cargo.

For discrete in-house operations there is no need to use a common International Standard RFID system, nor bar-code, so long as the data are presented in a consistent format and manner when it leaves the

domestic system. However where data are to be captured at points outside of the in-house system, it is necessary to use a standardised technology in addition to standardised data.

The information provided by the item concerning its identity will vary according to the nature of the item and its owner, but in order to be useable outside of the closed environment will need to comply with the appropriate identification/numbering standard (see 6.6 and Annex A). The application profiles part of this series (ISO 26683-2) provides specific references for some typical application types.

The architecture of the data associated with an item may be considered in two parts:

a) the data content and presentation;

b) the data carrier.

For use in an open environment, the data content and its form of presentation will be determined by the appropriate data standard. (for example it could be a simple EAN number, a company specific number, or something more complicated such as the VIN number of a vehicle (if that is the cargo). This will vary from cargo to cargo It is neither possible nor desirable for ISO 26683 to specify what schema are used, so the architectural concept must be that the item data are a 'black box' container and that the data will identify itself according to the standard being used and that the data complies to a published International Standard.

The carrier of the data will need to comply with an appropriate standard.

The prime focus of ISO 26683 is that the data carrier will normally be an RFID tag, however, the ISO 26683 design specification must be robust enough so that it can cope with situations where the item identification is a bar code, or is read by OCR or some other technology. The requirement for compliance will be that the appropriate means to capture the item identification data are part of/ available to, the truck or trailer OBE. Items that are travelling through normal commercial 'open' transport systems (i.e. not closed systems entirely within one organization) will need to utilize common technologies as well as use common data presentation and formatting. However, there may be multiple technologies, rather than a single technology.

It is also important to understand that item identification is something attached to the item, it is not the item itself. The advantage of the on-board data are that it is electronically audited as being present. This will have much more accuracy than a remotely generated manifest of what should be in the cargo. However, the possibility of substitution, or separation of the data carrier from the item always remain a possibility and system design and operation need to take measures to combat these possibilities, be they of fraud or accident.

The physical architecture that forms the basis of the premise for ISO 26683 is that an item carries its identification, normally in the form of an RFID tag, or some other carrier (bar code, touch memory, smart card, etc.) that can be read by the trailer/truck OBE. Figure 17 shows a carton with a logistics shipping label with multiple bar-codes, human/OCR readable text and an RFID tag.

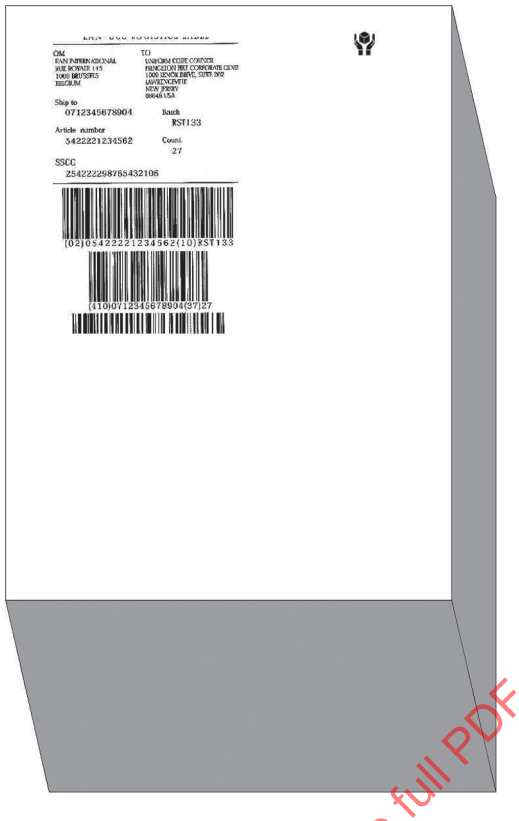

Figure 17 — Carton with shipping label, multiple bar-codes, human/OCR readable text and an RFID tag

7.5 Agglomeration of data

The on-board equipment will receive and collate data.

In the case of trailer OBE, data shall be harvested from the contents either as they are registered into the trailer, or by interrogation of RFID tags present, or by some other wireless means, etc. In the case of a truck/tractor mounted OBE, the data will be forwarded by the trailer(s) OBE to the tractor (host) OBE either on demand or to a cycle as determined by the host OBE, or in the case of a single body truck, obtained in the same way as a trailer OBE. This cargo data shall be agglomerated with data about the truck/tractor as required by the standard to which they comply. The data will be agglomerated usually in such a fashion so that it can for example, in the case of multiple trailers, identify which trailer contains which items.

For closed fleets, the technical means (wireless or wired) that trailer content data are transferred to the OBE is a matter for commercial decision. For open mixed fleets profiles of how this data can be transferred interoperably, shall be in accordance with standards provided in Clause 6 and Annex A provided as profiles in ISO 26683-2.

In respect of the actual data to be agglomerated and transferred, this is not standardised by ISO 26683 and will vary from cargo to cargo. ISO 26683 manages this variable situation by treating 'data' as a 'black box bundle', simply specified as ' FREIGHT CONVEYANCE DATA'. The content of the data are transparent to ISO 26683, and it is only required that data shall be compliant to one or more of the standards referenced in Clause 6/Normative Annex A, and shall be presented in a way that each data concept contained in the bundle can be successfully deciphered when required by reference to such standards.

7.6 Aggregation of data

Aggregation of data occurs where several data concepts are merged to form a single data concept of the combined data. For example location data are usually only useful linked to a time. An example of an aggregated data concept would be a single data concept 'Location_Timestamp'

Another example might be an item identification combined with temperature and a timestamp into a data concept 'ItemID_Temperature_Timestamp'.

ISO 26683 does not aggregate data, but leaves that to data concepts defined in the referenced Standards. ISO 26683 does not provide data concept definitions, these definitions are to be found in the Standards referenced in 6.6 /Normative Annex A.

7.7 Data transfer

7.7.1 Transfer of data from tags to readers

Shall be in accordance with the referenced Standard(s) (See 6.6/Normative Annex A) specified in the application interface profile (see ISO 26683-2) used.

7.7.2 Transfer of data from trailers to OBE

For closed fleets shall be at the determination of the fleet operator. For open fleets where interrogation is to occur outside of the closed system, shall be in accordance with the referenced Standard(s) (See 6.6/Normative Annex A) specified in the application interface profile (see ISO 26683-2) used.

7.7.3 Transfer of data from OBE to infrastructure

The transfer of data from OBE to infrastructure shall be in accordance with ISO 17261, ISO 17262, ISO 17263, ISO 17264 and/or the standards referenced in the appropriate application interface profile as specified in ISO 26683-2.

8 Freight land conveyance and communication - Application interface profiles

8.1 General

There is no single communication application interface profile defined in ISO 26683. Rather, ISO 26683 provides interoperability where the communication medium has been selected and is in compliance to one or more of the communications standards referenced in 6.6 and Annex A of this deliverable. Where appropriate, the nature of the application interface exchanges are provided in the profiles defined in ISO 26683-2 (Application interface profiles).

Annex A
(normative)

List of referenced International Standards

This annex provides a normative list and summary of the International Standards referenced throughout the ISO 26683 series.

Where appropriate ISO 26683 is built upon and relies on (but not exclusively) the following standards. It does not contend with any of the Standards summarized below and uses them, wherever practicable as a source/format of data and data transfer:

A.1 ISO 668, Series 1 freight containers – Classification, dimensions and ratings

Designs the ISO Intermodal Container Series 1, 20' and 40'.

A.2 ISO 1496, Series 1 freight containers – Specification and testing

A.2.1 Series 1 freight containers – Specification and testing – Part 1: General cargo containers for general purposes

Lays down the basic specifications and testing requirements for ISO series 1 freight containers of the totally enclosed general purpose types and certain specific purpose types (closed, vented, ventilated or open top) which are suitable for international exchange and for conveyance by road, rail and sea, including interchange between these forms of transport.

A.2.2 Series 1 freight containers – Specification and testing – Part 2: Thermal containers

ISO 1496-2 gives the basic specifications and testing requirements for ISO series 1 thermal containers for international exchange and for conveyance of goods by road, rail and sea, including interchange between these forms of transport.

A.2.3 Series 1 freight containers – Specification and testing – Part 3: Tank containers for liquids, gases and pressurized dry bulk

Specifies the basic specifications and testing requirements for ISO series 1 tank containers suitable for the carriage of gases, liquids and solid substances (dry bulk) which may be loaded or unloaded as liquids by gravity or pressure discharge, for international exchange and for conveyance by road, rail and sea, including interchange between these forms of transport. The requirements are minimum requirements.

A.2.4 Series 1 freight containers – Specification and testing – Part 4: Non-pressurized containers for dry bulk

Specifies the basic specifications and testing requirements for containers of the dry bulk non-pressurized type which are suitable for international exchange and for conveyance by road, rail and sea. Annexes F and G are for information only.

A.2.5 Series 1 freight containers – Specification and testing – Part 5: Platform and platform-based containers

Specifies the basic specifications and testing requirements for containers designated 1AA, 1A, 1AX, 1BB, 1B, 1BX, 1CC, 1C and 1CX which are suitable for international exchange and for conveyance by road, rail and sea

A.3 ISO 6346, Freight containers – Coding, identification and marking

Provides a system for general application for the identification and presentation of information about freight containers. Specifies a identification system with mandatory marks for visual interpretation and optional features for automatic identification and electronic data interchange and a coding system for data on container size and type. Replaces the second edition, which has been technically revised.

A.4 ISO 7372, Trade data interchange – Trade data elements directory

ISO 7372 lists standard data elements intended to facilitate open interchange of data in international trade.

The standard data elements listed can be used with any method for data interchange on paper documents as well as with other means of data processing and communication.

A.5 ISO 9735, Electronic data interchange for administration, commerce and transport (EDIFACT)– Application level syntax rules

A.5.1 ISO 9735-1, Electronic data interchange for administration, commerce and transport (EDIFACT)– Application level syntax rules (Syntax version number: 4, Syntax release number: 1)– Part 1: Syntax rules common to all parts

This part of ISO 9735 specifies common syntax rules for the formatting of batch and interactive messages to be interchanged between computer application systems. It includes the terms and definitions for all parts of ISO 9735.

A.5.2 ISO 9735-2, Electronic data interchange for administration, commerce and transport (EDIFACT) – Application level syntax rules (Syntax version number: 4, Syntax release number: 1) – Part 2: Syntax rules specific to batch EDI

This part of ISO 9735 specifies syntax rules specifically for the formatting of batch messages to be interchanged between computer application systems. For the transfer of packages in a batch environment, see ISO 9735-8.

A.5.3 ISO 9735-3, Electronic data interchange for administration, commerce and transport (EDIFACT)– Application level syntax rules (Syntax version number: 4, Syntax release number: 1)– Part 3: Syntax rules specific to interactive EDI

This part of ISO 9735 specifies syntax rules specifically for the transfer of interactive messages to be interchanged between computer application systems. For the transfer of packages in an interactive environment, see ISO 9735-8.

A.5.4 ISO 9735-4, Electronic data interchange for administration, commerce and transport (EDIFACT)– Application level syntax rules (Syntax version number: 4, Syntax release number: 1)– Part 4: Syntax and service report message for batch EDI (message type – CONTRL)

This part of ISO 9735 defines the syntax and service report message for batch EDI, CONTRL.

A.5.5 ISO 9735-5, Electronic data interchange for administration, commerce and transport (EDIFACT)– Application level syntax rules (Syntax version number: 4, Syntax release number: 1)– Part 5: Security rules for batch EDI (authenticity, integrity and non-repudiation of origin)

Method to address message/package level, group level and interchange level security for authenticity, integrity and non-repudiation of origin, in accordance with established security mechanisms.

A.5.6 ISO 9735-6, Electronic data interchange for administration, commerce and transport (EDIFACT)– Application level syntax rules (Syntax version number: 4, Syntax release number: 1)– Part 6: Secure authentication and acknowledgement message (message type - AUTACK)

This part of ISO 9735 for EDIFACT security defines the secure authentication and acknowledgement message AUTACK.

A.5.7 ISO 9735-7, Electronic data interchange for administration, commerce and transport (EDIFACT)– Application level syntax rules (Syntax version number: 4, Syntax release number: 1)– Part 7: Security rules for batch EDI (confidentiality)

This part of ISO 9735 for batch EDIFACT security addresses message/package level, group level and interchange level security for confidentiality in accordance with established security mechanisms.

A.5.8 ISO 9735-8, Electronic data interchange for administration, commerce and transport (EDIFACT),– Application level syntax rules (Syntax version number: 4, Syntax release number: 1),– Part 8: Associated data in EDI

This part of ISO 9735 specifies syntax rules for associated data in EDI to be interchanged between computer application systems. This provides a method to transfer data which cannot be carried by means of either a batch or interactive EDIFACT message. The data may be created by other applications (such as STEP, CAD, etc.), and is referred to in this part as associated data.

A.5.9 ISO 9735-9, Electronic data interchange for administration, commerce and transport (EDIFACT),– Application level syntax rules (Syntax version number: 4, Syntax release number: 1),– Part 9: Security key and certificate management message (message type- KEYMAN)

This part of ISO 9735 specifies syntax rules specifically for the formatting of batch messages to be interchanged between computer application systems. For the transfer of packages in a batch environment, see ISO 9735-8.

A.5.10 ISO 9735-10 Electronic data interchange for administration, commerce and transport (EDIFACT),– Application level syntax rules (Syntax version number: 4, Syntax release number: 1),– Part 10: Syntax service directories

This part of ISO 9735 specifies common syntax rules for the formatting of batch and interactive messages to be interchanged between computer application systems. It includes the terms and definitions for all parts of ISO 9735.

A.6 ISO 9897, Freight containers – Container equipment data exchange (CEDEX) – General communication codes

ISO 9897 is an international standard for electronic interchange relating to freight containers. It is also known as CEDEX as an acronym of Container Equipment Data Exchange.

A.7 ISO 10368, Freight thermal containers – Remote condition monitoring

ISO 10368 establishes the information and interfaces required to permit complying central monitoring and control systems employed by one carrier or terminal to interface and communicate with complying remote communication devices of differing manufacture and configuration used by other carriers and terminals.

The data-logging formats and message protocols outlined in ISO 10368 apply to all currently available data rate transmission techniques. These formats and protocols also apply to all future techniques designed to be an ISO International Standard compatible system.

A.8 ISO 10374, Freight containers – Automatic identification

Specifies all necessary user requirements. Includes: a container identification system, data coding systems, description of data, performance criteria and security features using RFID.

ISO 10374 establishes:

a) a container identification system which allows the transfer of information from a freight container to an automatic processing system by electronic means,

b) a data coding system for container identification and permanent related information which resides within an electronic device called a tag installed on a freight container,

c) a data coding system for the electronic transfer of both container identification and permanent related information from an electronic device installed on a freight container to automatic data processing systems,

d) the description of the data to be included in the tag for transmission to the sensing equipment,

e) performance criteria necessary to ensure consistent and reliable operation of the automatic equipment identification (AEI) system within the international transportation community, requirements for the physical location of the electronic device on freight containers, and. security features to inhibit malicious or unintentional alteration of the information content of the electronic device when installed on a freight container.

It specifies all necessary user requirements in order to permit international use of the tag without modification or adjustment.

ISO 10374 applies to freight containers as defined in ISO 668.

A.9 ISO/TS 10891, Freight containers – Radio frequency identification (RFID) – Licence plate tag

ISO/TS 10891 establishes:

a) a set of requirements for container tags, which allow the transfer of information from a container to automatic processing systems by electronic means;

b) a data coding system for container identification and permanent related information which resides within a container tag;

c) a data coding system for the electronic transfer of both container identification and permanent related information from container tags to automatic data processing systems;

d) the description of data to be included in container tags for transmission to automatic data processing systems;

e) performance criteria necessary to ensure consistent and reliable operation of container tags within the international transportation community;

f) the physical location of container tags on containers;

g) features to inhibit malicious or unintentional alteration and/or deletion of the information content of container tags when installed on a freight container.

It is intended to be applicable to freight containers as defined in ISO 668 as well as to other containers not defined in ISO 668 and container ancillary equipment such as road and terminal chassis, generator sets and power packs.

The use of container tags and the equipping of containers for automatic identification are optional. The purpose of ISO/TS 10891 is to optimize the efficiency of equipment control systems and to assist

in container security initiatives and programs, including the optional usage of electronic seals in accordance with ISO 18185, and any subsequent International Standard. For this reason, any container tag system used for identifying containers shall be non-proprietary and conform to and be compatible with ISO/TS 10891.

A.10 ISO 13183, Intelligent transport systems — Communications access for land mobiles (CALM) — Broadcast communications

This International Standard specifies the architectural communications framework of "Intelligent Transport Systems" (ITS) for the family of CALM-related International Standards. The architecture is described in an abstract way with several graphical views and examples. The graphical representations follow partly the ISO OSI principles. In addition to the requirements specified within this International Standard a number of notes and examples are provided to illustrate the CALM concept.

Wherever practicable, this International Standard has been developed by reference to suitable extant International Standards, adopted by selection. The architecture provides for regional variations where regulations differ in different countries and regions.

A.11 ISO/IEC 14443, Identification cards – Contactless integrated circuit cards – Proximity cards

A.11.1 ISO/IEC 14443-1, Identification cards – Contactless integrated circuit cards – Proximity cards – Part 1: Physical characteristics

Defines the physical characteristics of PICCs, commonly known as proximity cards. It is to be used in conjunction with other parts of ISO/IEC 14443.

A.11.2 ISO/IEC 14443-2, Identification cards – Contactless integrated circuit cards – Proximity cards – Part 2: Radio frequency power and signal interface

Specifies the characteristics of the fields to be provided for power and bi-directional communication between proximity coupling devices (PCDs) and proximity cards or objects (PICCs).

It does not specify the means of generating coupling fields, nor the means of compliance with electromagnetic radiation and human exposure regulations, which can vary according to country.

A.11.3 ISO/IEC 14443-3, Identification cards – Contactless integrated circuit(s) cards – Proximity cards – Part 3: Initialization and anticollision

Provides initialisation and anticollision protocols for ISO/IEC 14443 contactless integrated circuit cards.

A.11.4 ISO/IEC 14443-4, Identification cards – Contactless integrated circuit cards – Proximity cards – Part 4: Transmission protocol

ISO/IEC 14443 is one of a series of International Standards describing the parameters for identification cards as defined in ISO/IEC 7810, and the use of such cards for international interchange.

ISO/IEC 14443-4:2008 specifies a half-duplex block transmission protocol featuring the special needs of a contactless environment and defines the activation and deactivation sequence of the protocol.

ISO/IEC 14443-4:2008 is intended to be used in conjunction with other parts of ISO/IEC 14443 and is applicable to proximity cards or objects of Type A and Type B.

A.12 ISO/TR 14813-2, Transport information and control systems – Reference model architecture(s) for the TICS sector – Part 2: Core TICS reference architecture

Provides description of how to elaborate an ITS architecture with examples.

A.13 ISO 14814, Road transport and traffic telematics – Automatic vehicle and equipment identification – Reference architecture and terminology

ISO 14814 establishes a common framework to achieve unambiguous identification in ITS/RTTT (Intelligent Transport Systems/Road Transport and Traffic Telematics) AVI/AEI (Automatic Vehicle Identification/Automatic Equipment Identification) applications.

This scheme and Reference Architecture Model is designed to be an "enabling" structure to allow interoperability between different commercial systems, and not prescriptive in determining any one system. It is not frequency- nor air interface protocol-specific, provides maximum interoperability, has a high population capability, and provides the possibility of upwards migration to more capable systems.

ISO 14814 provides a reference structure which enables an unambiguous identification and also identifies the data construct as an ITS/RTTT message. The construct also identifies which ITS/RTTT data structure is contained in the message.

A.14 ISO 14816, Road transport and traffic telematics – Automatic vehicle and equipment identification – Numbering and data structures

ISO 14816 establishes a common framework data structure for unambiguous identification in RTTT/ITS systems. It excludes any physical aspects such as interfaces. It is neither frequency- nor air interface protocol-specific.

Data elements that form part of transmission or storage protocols such as headers, frame markers and checksums are thus excluded.

The specifications for protecting against changes, classifying and qualifying security aspects of the data structure elements are not included within ISO 14816.

The principles of data element structure and description determined in ISO/IEC 8824, ISO/IEC 8825-1 and ISO/IEC 8825-2 have been adopted to provide an interoperable architecture within a standard framework according to guidelines from ISO/TC 204 and CEN/TC 278.

ISO 14816 defines data structures based on the ISO/IEC 8824-1 ASN.1 UNIVERSAL CLASS types that may be directly IMPORTED to other application standards that would need only subsets of the full APPLICATION CLASS types. These UNIVERSAL CLASS and APPLICATION CLASS types are uniquely defined as an ASN.1 module in Annex B. This module may be directly linked into an application data definition.

ISO 14816 defines default encoding for simple AVI/AEI applications where no other relevant application standard exists. This definition forms Clause 4.

A.15 ISO/TS 15000, Electronic business eXtensible Markup Language (ebXML)

A.15.1 ISO/TS 15000-1, Electronic business eXtensible Markup Language (ebXML),– Part 1: Collaboration-protocol profile and agreement specification (ebCPP)

ISO/TS 15000-1 specifies the requirements for a collaboration-protocol profile (CPP), and a collaboration-protocol agreement (CPA). The CPP describes a trading partner's technical capabilities for performing electronic business. The CPA describes the agreement between two trading partners on the technical capabilities they will use for a specific electronic-business collaboration. Included in the CPP and CPA are details of transport, messaging (using ISO/TS 15000-2), security constraints, and binding to a business-process-specification document that contains the definition of the interactions between the

two parties while engaging in a specified electronic business collaboration. ISO/TS 15000-1 defines the mark-up language vocabulary for creating the electronic CPPs and CPAs and includes examples of a pair of CPPs and a CPA derived from them, the process specification document referenced by the CPPs and CPA, and the XML schema governing the structures of CPPs and CPAs. A prospective trading partner may publish one or more CPPs. A CPA for a business collaboration between two trading partners is derived by combining one CPP from each trading partner. The "legal" terms and conditions of a Business agreement are outside the scope of ISO/TS 15000-1.

A.15.2 ISO/TS 15000-2, Electronic business eXtensible Markup Language (ebXML),– Part 2: Message service specification (ebMS)

ISO/TS 15000-2 addresses the requirements for an ebXML message service handler for the eBusiness community. ISO/TS 15000-2 defines a communications-protocol neutral method for exchanging electronic business messages and defines specific enveloping constructs supporting reliable, secure delivery of business information. ISO/TS 15000-2 includes a flexible enveloping technique permitting messages that is independent of the payload, the communications protocol used, and also of any format type. The versatility ensures legacy electronic business systems employing traditional syntaxes (i.e. UN/EDIFACT, ASCX12, or HL7) can leverage the ebXML infrastructure along with users of emerging technologies. Examples using these specifications with HTTP (RFC2616) and SMTP (RFC2821) are included.

A.15.3 ISO/TS 15000-3, Electronic business eXtensible Markup Language (ebXML),– Part 3: Registry information model specification (ebRIM)

ISO/TS 15000-3 defines the requirements for the information model for the ebXML registry. The ebXML registry describes objects that reside in a repository for storage and safekeeping. The information model does not deal with the actual content of the repository. All elements of the information model represent metadata about the content stored in the repository. Such information is used to facilitate ebXML-based Business-to-Business partnerships and transactions. The registry information model provides a high-level schema for the ebXML registry. It provides information on the type of metadata that are stored in the registry as well as the relationships among metadata classes. The registry information model defines what types of objects are stored and defines how stored objects are organized. The abstract registry is implemented using one or both of the following concrete bindings: a SOAP binding using the HTTP protocol, or an ebXML messaging service binding. These specifications are compatible with other ebXML specifications.

A.15.4 ISO/TS 15000-4, Electronic business eXtensible Markup Language (ebXML),– Part 4: Registry services specification (ebRS)

ISO/TS 15000-4 defines the interface between the registry and the registry clients, as well as the interaction protocols, message definitions and XML schema. The interface is intended to function as the basis for a more complete definition of the ebXML registry requirements in the future. The ebXML Registry provides a set of services that enable sharing of information between interested parties for the purpose of enabling business process integration between such parties based on the ebXML specifications. The shared information is maintained as objects in a repository and managed by the ebXML Registry Services defined in this document.

A.15.5 ISO/TS 15000-5, Electronic Business Extensible Markup Language (ebXML),– Part 5: ebXML Core Components Technical Specification, Version 2.01(ebCCTS)

ISO/TS 15000-5 can be employed wherever business information is being shared or exchanged amongst and between enterprises, governmental agencies, and/or other organisations in an open and worldwide environment.

ISO/TS 15000-5 will form the basis for standards development work of business analysts, business users and information technology specialists supplying the content of and implementing applications that will employ the UN/CEFACT Core Component Library (CCL). The Core Component Library will be stored in a UN/CEFACT repository and identified in an ebXML compliant registry.

Due to the evolving nature of the UN/CEFACT Core Component Library, ISO/TS 15000-5 includes material that focuses on the business community doing further discovery and analysis work. Some of the contents of ISO/TS 15000-5 are not typical of this type of technical document. However, they are critical for successful adoption and standardization in this area to move forward.

A.16 ISO/IEC 15417, Information technology – Automatic identification and data capture techniques – Code 128 bar code symbology specification

The technology of bar coding is based on the recognition of patterns encoded in bars and spaces of defined dimensions. There are numerous methods of encoding information in bar code form, known as symbologies. Code 128 is one such symbology. The rules defining the translation of characters into bar and space patterns, and other essential features of each symbology, are known as the symbology specification.

In the past, symbology specifications were developed and published by a number of organizations, resulting in certain instances in conflicting requirements for certain symbologies.

Manufacturers of bar code equipment and users of bar code technology require publicly available standard symbology specifications to which they can refer when developing equipment and software.

ISO/IEC 15417 specifies the requirements for the bar code symbology known as Code 128. It specifies Code 128 symbology characteristics, data character encodation, dimensions, decoding algorithms and the parameters to be defined by applications. It specifies the symbology identifier prefix strings for Code 128 symbols.

A.17 ISO/IEC 15418, Information technology – Automatic identification and data capture techniques – GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance

ISO/IEC 15418 specifies sets of Data Identifiers and Application Identifiers for the purpose of identifying encoded data, and identifies the organizations responsible for their maintenance.

A.18 ISO 15394, Packaging – Bar code and two-dimensional symbols for shipping, transport and receiving labels

a) ISO 15394 specifies the minimum requirements for the design of labels containing linear bar code and two-dimensional symbols on transport units to convey data between trading partners;

b) provides for traceability of transported units via a unique transport unit identifier (licence plate);

c) provides guidance on the formatting on the label of data presented in linear bar code, two-dimensional symbol or human readable form;

d) provides specific recommendations regarding the choice of bar code symbologies, and specifies quality requirements and classes of bar code density;

e) makes recommendations as to label placement, size and the inclusion of free text and any appropriate graphics;

f) provides guidance on the selection of label material.

ISO 15394 is not applicable to the direct printing on to kraft coloured corrugated surfaces. Those wishing to find more information on the direct printing of bar code symbols on to kraft coloured corrugated surfaces may find suitable guidance from texts specific to this subject.

A.19 ISO/IEC 15420, Information technology – Automatic identification and data capture techniques – EAN/UPC bar code symbology specification.

Manufacturers of bar code equipment and users of bar code technology require publicly available standard symbology specifications to which they can refer when developing equipment and software.

ISO/IEC 15420 specifies the requirements for the bar code symbology known as EAN/UPC. It specifies EAN/UPC symbology characteristics, data character encodation, dimensions, tolerances, decoding algorithms and parameters to be defined by applications. It specifies the Symbology Identifier prefix strings for EAN/UPC symbols.

Data content and the rules governing the use of this symbology are outside the scope of ISO/IEC 15420; they are defined in the GS1 General Specifications.

A.20 ISO 15394, Packaging – Bar code and two-dimensional symbols for shipping, transport and receiving labels

a) ISO 15394 specifies the minimum requirements for the design of labels containing linear bar code and two-dimensional symbols on transport units to convey data between trading partners;

b) provides for traceability of transported units via a unique transport unit identifier (licence plate);

c) provides guidance on the formatting on the label of data presented in linear bar code, two-dimensional symbol or human readable form;

d) provides specific recommendations regarding the choice of bar code symbologies, and specifies quality requirements and classes of bar code density;

e) makes recommendations as to label placement, size and the inclusion of free text and any appropriate graphics;

f) provides guidance on the selection of label material.

ISO 15394 is not applicable to the direct printing on to kraft coloured corrugated surfaces. Those wishing to find more information on the direct printing of bar code symbols on to kraft coloured corrugated surfaces may find suitable guidance from texts specific to this subject.

A.21 ISO/IEC 15418, Information technology – Automatic identification and data capture techniques – GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance

ISO/IEC 15418 specifies sets of Data Identifiers and Application Identifiers for the purpose of identifying encoded data, and identifies the organizations responsible for their maintenance.

A.22 ISO/IEC 15424, Information technology – Automatic identification and data capture techniques – Data Carrier Identifiers (including Symbology Identifiers)

The need exists to identify the data carrier a reader detects in autodiscrimination environments. The Symbology Identifier concept provides a standardized way for a device receiving data from a reader to differentiate between the data carriers. ISO/IEC 15424 deals mostly with bar code symbologies; the terms Symbology Identifier, symbology, and bar code are therefore used throughout ISO/IEC 15424 although they are intended to apply to other data carriers as well.

This identification is achieved by the addition of an optional feature to readers enabling the reader to prefix a standard string of characters to data messages. This preamble contains information about the decoded symbol (or other data carrier) and any processing the reader has done. The information is not encoded or otherwise explicitly or implicitly represented in the symbol, except that the presence of

some optional features may be detected by the reading equipment, whereas others require the reader to be expressly configured to implement them.

ISO/IEC 15424 should be read in conjunction with the relevant symbology specifications.

ISO/IEC 15424 applies to automatic identification device communication conventions and standardizes the reporting of data carriers from bar code readers and other automatic identification equipment. It specifies a preamble message generated by the reader and interpretable by the receiving system, which indicates the bar code symbology or other origin of transmitted data, together with details of certain specified optional processing features associated with the data message.

A.23 ISO/IEC 15434, Information technology – Automatic identification and data capture techniques – Syntax for high-capacity ADC media

ISO/IEC 15434 defines the manner in which data are transferred to high-capacity automatic data capture (ADC) media from a supplier's information system and the manner in which data are transferred to the recipient's information system. It does not define the internal data storage format for specific high-capacity ADC media, nor does it specify the application of data structures provided by a specific data syntax format. The application of the data structure is specified by industry conventions.

Users of ADC technologies benefit by being able to receive data in a standard form and by being able to provide data in a standard form. Static ADC technologies such as bar code symbologies, magnetic stripe, optical character recognition, surface acoustical wave (SAW) and Weigand effect typically encode a single field of data. Most applications of these technologies involve the encoding of a single field of data by the supplier of the medium and the subsequent decoding of the data field by the recipient. Encoding single fields of data permits the supplier to perform the encodation from a single field within the supplier's information system. Decoding single fields of data permits the recipient to input this data into a single field in the recipient's information system, in lieu of key entry.

High-capacity ADC technologies, such as two-dimensional symbols, RFID transponders, contact memories and smart cards, encode multiple fields of data. These multiple fields are usually parsed by the recipient's information system and then mapped to specific fields of data in the recipient's information system. ISO/IEC 15434 defines the syntax for high-capacity ADC media, so as to enable ADC users to utilize a single mapping utility, regardless of which high-capacity ADC medium is employed.

ISO/IEC 15434 specifies a transfer structure, syntax, and coding of messages and data formats when using high-capacity ADC media between trading partners (specifically between suppliers and recipients) and, where applicable, in support of carrier applications, such as bills of lading and carrier sortation and tracking.

The data encoded according to ISO/IEC 15434 include:

a) data which may be used in the shipping, receiving, and inventory of transport units;

b) data which may be contained within supporting documentation, in paper or electronic form, related to unit loads or transport packages;

c) data which may be used in the sortation and tracking of transport units.

ISO/IEC 15434 describes the ISO/IEC 646 syntax for automatic data capture.

ISO/IEC 15434 is not the controlling specification for data structures (e.g. CII) referenced in ISO/IEC 15434.

ISO/IEC 15434 does not supersede or replace any applicable safety or regulatory marking or labelling requirements. It is to be applied in addition to any other mandated labelling requirements.

A.24 ISO/IEC 15438, Information technology – Automatic identification and data capture techniques – PDF417 bar code symbology specification

ISO/IEC 15438 specifies the requirements for the bar code symbology known as PDF417. It specifies PDF417 symbology characteristics, data character encodation, symbol formats, dimensions, error correction rules, reference decoding algorithm, and a number of application parameters.

A.25 ISO/IEC 15459, Information technology – Unique identifiers

Unique identification can occur at many different levels in the supply chain, at the transport unit, at the item level, and elsewhere. Such distinct entities are often handled by several parties: the sender, the receiver, one or more carriers, customs authorities, etc. Each of these parties must be able to identify and trace the item so that reference can be made to associated information such as address, order number, contents of the item, weight, sender, batch or lot number, etc.

The information is often held on computer systems, and may be exchanged between parties involved via EDI (Electronic Data Interchange) and XML (eXtensible Markup Language) messages.

There are considerable benefits if the identity of the item is represented in bar code format, or other AIDC (Automatic Identification and Data Capture) media and attached to or made a constituent part of that which is being uniquely identified so that

it can be read electronically, thus minimising errors;

a) one identifier can be used by all parties;

b) each party can use the identifier to look up its computer files to find the data associated with the item;

c) the identifier is unique within the class and cannot appear on any other item of the class during the lifetime of the item.

The unique identifier for transport units defined in ISO/IEC 15459-1 and represented in a bar code label, two-dimensional symbol, radio-frequency identification tag, or other AIDC media attached to the item meets these needs.

All AIDC technologies have the potential to encode a unique identifier. It is expected that application standards for items, using various automatic identification technologies, will be developed based upon the unique identifier as a prime key. These application standards may be made available from the Issuing Agency.

A.25.1 ISO/IEC 15459-1, Information technology – Unique identifiers – Part 1: Unique identifiers for transport units

ISO/IEC 15459-1 specifies a unique, non-significant, string of characters for the identification of transport units. The character string is intended to be represented in a bar code label or other AIDC media attached to the item to meet item management needs. To address management needs different classes of items are recognized in the various parts of ISO/IEC 15459, which allows different requirements to be met by the unique identifiers associated with each class. The rules for the unique identifier for transport units, to identify physical logistical transfers, with the identity relevant for the duration of one or more items in the load being held or transported as part of that load, are defined and supported by an example.

A.25.2 ISO/IEC 15459-2, Information technology – Unique identifiers – Part 2: Registration procedures

ISO/IEC 15459-2 specifies the procedural requirements to maintain a non-significant, unique identifier for item management applications, and outlines the obligations of the Registration Authority and Issuing Agencies.

ISO/IEC 15459-2 excludes those items where ISO has designated Maintenance Agencies or Registration Authorities to provide identification schemes. It does not apply to freight containers, because their

unique coding is specified in ISO 6346, Freight containers – Coding, identification and marking; vehicles, because their unique identification is specified in ISO 3779, Road vehicles – Vehicle identification number (VIN) – Content and structure; car radios, because their unique identification is specified in ISO 10486, Passenger cars – Car radio identification number (CRIN). The exclusion also applies to ISO 2108, Information and documentation – International standard book number (ISBN) and ISO 3297, Information and documentation – International standard serial number (ISSN).

NOTE The scope of each of ISO 2108 and ISO 3297 identifies the title rather than the individual copy of a book or periodical. As such, the level of identification achieved is at a level higher than the unique identity required to be compliant with ISO/IEC 15459-2.

A.25.3 ISO/IEC 15459-3, Information technology – Unique identifiers – Part 3: Common rules for unique identifiers

ISO/IEC 15459-3 specifies the common rules that apply for unique identifiers for item management that are required to ensure full compatibility across classes of unique identifiers.

A.25.4 ISO/IEC 15459-4, Information technology – Unique identifiers – Part 4: Individual items

The unique identifier for individual items defined in ISO/IEC 15459-4 and represented in a bar code label, two-dimensional symbol, radio-frequency identification tag, or other AIDC media attached to the item meets these needs.

All AIDC technologies have the potential to encode a unique identifier. It is expected that application standards for items, using various automatic identification technologies, will be developed based upon the unique identifier as a prime key. These application standards may be made available from the Issuing Agency.

ISO/IEC 15459-4 specifies a unique, non-significant string of characters for the unique identifier for individual items. The character string is intended to be represented in a bar code label or other AIDC media attached to the item to meet supply chain needs. To address management needs, different classes of items are recognized in the various parts of ISO/IEC 15459, which allows different requirements to be met by the unique identifiers associated with each class. The rules are defined for the individual items to identify the unique occurrence of an item, understood to mean the layers zero and one as will be defined in two future International Standards (ISO 17367 and ISO 17366, respectively).

A.25.5 ISO/IEC 15459-5, Information technology – Unique identifiers – Part 5: Unique identifier for returnable transport items (RTIs)

ISO/IEC 15459-5 specifies a unique, non-significant string of characters for the unique identification of returnable transport items (RTIs). The character string is intended to be represented in a radio frequency identification (RFID) transponder, bar code label or other automatic identification and data capture (AIDC) media attached to the item to meet supply chain management needs. To address management needs different classes of RTI are recognized in the various parts of ISO/IEC 15459, which allows different requirements to be met by the unique identifiers associated with each class. The rules for the unique identifier for RTIs, to identify the unique occurrence of an item, with the identity being relevant for the complete life cycle of the item, are defined and supported by an example.

A.25.6 ISO/IEC 15459-6, Information technology – Unique identifiers – Part 6: Unique identifier for product groupings

ISO/IEC 15459-6 specifies a unique, non-significant string of characters for the unique identifier of product groupings. The character string is intended to be represented in linear bar code and two-dimensional symbols, radio frequency identification (RFID) transponder or other automatic identification and data capture (AIDC) media attached to the product and/or material to meet the management needs in a batch or lot unit. To address management needs, different classes of item are recognized in the various parts of ISO/IEC 15459. This allows different requirements to be met by the unique identifiers of each class.

The unique identifier for product grouping enables a product grouping defined by a batch or lot number to be uniquely identified from all other lots and batches compliant with ISO/IEC 15459-6. Encoding this unique identifier in a data carrier enables information about the quality of product and end-of-life processing to be clearly identified.

The rules for the unique identifier for product grouping, to identify the unique occurrence of that quality, are defined and supported by an example.

A.25.7 ISO/IEC 15459-8, Information technology – Unique identifiers – Part 8: Grouping of transport units

ISO/IEC 15459-8 specifies a unique, non-significant, string of characters for the unique identifier for grouping of transport units. The character string might be represented in a bar code label or other AIDC media associated with the items that make up the grouping to meet supply chain needs and regulatory needs (e.g. customs clearance). An individual instance of an entity is aptly identified by a unique identifier defined in other parts of ISO/IEC 15459. This relationship has to be communicated to the business partners according to the business need and the unique identifier for the grouping might be used as a reference number only or marked in addition to the existing identifier. To address management needs, different classes of items are recognized in the various parts of ISO/IEC 15459, which allows different requirements to be met by the unique identifiers associated with each class. ISO/IEC 15459-8 defines the rules for the grouping of transport units to identify the multiple physical units that make up a single shipment from a consignor and are treated as a single logical grouping for customs and other shipping requirements.

A.26 ISO 15628, Road transport and traffic telematics – Dedicated short range communication (DSRC) – DSRC application layer

ISO 15628 specifies the application layer core which provides communication tools for applications based on DSRC. These tools consist of kernels that can be used by application processes via service primitives. The application processes, including application data and application-specific functions, are outside the scope of ISO 15628.

ISO 15628 is named “application layer”, although it does not cover all functionality of OSI Layer 7 and it includes functionality from lower layers.

A.27 ISO 15394, Packaging - Bar code and two-dimensional symbols for shipping, transport and receiving labels

ISO 15394 specifies:

a) the minimum requirements for the design of labels containing linear bar code and two-dimensional symbols on transport units to convey data between trading partners;

b) provides for traceability of transported units via a unique transport unit identifier (licence plate);

c) provides guidance on the formatting on the label of data presented in linear bar code, two-dimensional symbol or human readable form;

d) provides specific recommendations regarding the choice of bar code symbologies, and specifies quality requirements and classes of bar code density;

e) makes recommendations as to label placement, size and the inclusion of free text and any appropriate graphics;

f) provides guidance on the selection of label material.

ISO 15394 is not applicable to the direct printing on to kraft coloured corrugated surfaces. Those wishing to find more information on the direct printing of bar code symbols on to kraft coloured corrugated surfaces may find suitable guidance from texts specific to this subject.

A.28 ISO/IEC 15961, Information technology – Radio frequency identification (RFID) for item management – Data protocol: application interface

The data protocol used to exchange information in a radio-frequency identification (RFID) system for item management is specified in ISO/IEC 15961 and in ISO/IEC 15962. Both are required for a complete understanding of the data protocol in its entirety; but each focuses on one particular interface:

ISO/IEC 15961 addresses the information interface with the application system.

ISO/IEC 15961 focuses on the interface between the application and the data protocol processor, and includes the specification of the transfer syntax and definition of application commands and responses. It allows data and commands to be specified in a standardized way, independent of the particular air interface of ISO/IEC 18000.

ISO/IEC 15961 provides:

a) guidelines on how data shall be presented as objects;

b) defines the structure of object identifiers, based on ISO/IEC 9834-1;

c) specifies the commands that are supported for transferring data between the application and the RF tag;

d) specifies the responses that are supported for transferring data between the RF tag and the application;

e) provides a formal description of all the processes using ASN.1, as specified in ISO/IEC 8824-1;

f) specifies the transfer syntax, based on the Basic Encoding Rules of ISO/IEC 8825-1, for data to be transferred from and to the application.

It is expected that ISO/IEC 15961 will be used as a reference to develop software appropriate for particular applications, or for particular RF equipment.

A.29 ISO/IEC 15962, Information technology – Radio frequency identification (RFID) for item management – Data protocol: data encoding rules and logical memory functions

The data protocol used to exchange information in a radio-frequency identification (RFID) system for item management is specified in ISO/IEC 15961 and in ISO/IEC 15962. Both are required for a complete understanding of the data protocol in its entirety; but each focuses on one particular interface:

ISO/IEC 15962 deals with the processing of data and its presentation to the RF tag, and the initial processing of data captured from the RF tag.

ISO/IEC 15962 defines:

a) the encoded structure of object identifiers;

b) specifies the data compaction rules that apply to the encoded data;

c) specifies a Precursor for encoding syntax features efficiently;

d) specifies formatting rules for the data, e.g. depending on whether a directory is used or not;

e) defines how application commands, e.g. to lock data, are transferred to the Tag Driver;

f) defines other communication to the application.

A.30 ISO/IEC 15963, Information technology – Radio frequency identification for item management – Unique identification for RF tags

ISO/IEC 15963 describes numbering systems that are available for the identification of RF tags.

The unique ID can be used:

a) for the traceability of the integrated circuit itself for quality control in its manufacturing process,

b) for the traceability of the RF tag during its manufacturing process and along its lifetime,

c) for the completion of the reading in a multi-antenna configuration,

d) by the anti-collision mechanism to inventory multiple tags in the reader's field of view, and

e) for the traceability of the Item to which the RF tag is attached.

A.31 ISO/IEC 16022, Information technology – Automatic identification and data capture techniques – Data Matrix bar code symbology specification

ISO/IEC 16022 defines the requirements for the symbology known as Data Matrix. It specifies the Data Matrix symbology characteristics, data character encodation, symbol formats, dimensions and print quality requirements, error correction rules, decoding algorithm, and user-selectable application parameters.

It applies to all Data Matrix symbols produced by any printing or marking technology.

Data Matrix is a two-dimensional matrix symbology which is made up of nominally square modules arranged within a perimeter finder pattern. Though primarily shown and described in ISO/IEC 16022 as a dark symbol on light background, Data Matrix symbols can also be printed to appear as light on dark.

Manufacturers of bar code equipment and users of the technology require publicly available standard symbology specifications to which they can refer when developing equipment and application standards. The publication of standardized symbology specifications is designed to achieve this.

A.32 ISO/IEC 16023, Information technology – International symbology specification – MaxiCode

This specification defines the requirements for the symbology known as MaxiCode. MaxiCode is a fixed-size matrix symbology which is made up of offset rows of hexagonal modules arranged around a unique finder pattern. This specification specifies the MaxiCode symbology characteristics, data character encodation, symbol formats, dimensions and print quality requirements, error correction rules, decoding algorithm, and user-selectable application parameters. MaxiCode includes special encodation modes for use in destination sortation symbols by carriers in the transport industry.

A.33 ISO/IEC 16388, Information technology – Automatic identification and data capture techniques – Code 39 bar code symbology specification

ISO/IEC 16388 specifies the requirements for the bar code symbology known as Code 39; it specifies Code 39 symbology characteristics, data character encodation, dimensions, tolerances, decoding algorithms and parameters to be defined by applications. It specifies the Symbology Identifier prefix strings for Code 39 symbols.

A.34 ISO 17261, Road Transport and Traffic Telematics — Automatic Vehicle and Equipment Identification – Intermodal- Architecture

The mission statement for this Standard is to "'To provide an 'enabling' Reference Architecture Model for Intermodal/Multimodal AEI. The Reference Architecture Model Standard is designed to accommodate,

within the framework, a wide and diverse variety of ITS/RTTT applications from simple AVI/AEI to more complex transactions with a wide variety of uses, including the transfer of data relating to the manifest of loads and part loads and means of identification of loads and part loads, in an ITS/RTTT environment.'

ISO 17261 is a follow on to ISO 14814 and describes the conceptual and logical architecture for automatic vehicle and Equipment identification (AVI/AEI) and supporting services in an intermodal/multimodal environment. It presents a high level view of AEI intermodal and multimodal system Architecture. ISO 17261 describes the key sub systems, their associated interfaces and interactions and how they fit into system-wide functions such as management, security and information flow. This is represented by a series of architecture diagrams.

A.35 ISO 17262, Road Transport and Traffic Telematics — Automatic Vehicle and Equipment identification –Intermodal Goods Transport Numbering and Data Structures

ISO 17262 is a follow on to ISO 14816, which extends to cover Intermodal identifications and extends the use of ASN.1 within AVI/AEI numbering and data structures.

ISO 17262 defines generic numbering and data structures for unambiguous identification of equipment used for Intermodal goods transport. These data are known as Intermodal Goods Transport Numbering and Data Structures.

ISO 17262 defines data independently of the data carrier. The modelling of data are based on Abstract Syntax Notation One (ASN.1) as defined in ISO/IEC 8824. ISO 17262 excludes any physical aspects such as interfaces, dimensions etc. Data that form part of transmission or storage protocols (headers, frame markers and checksums) are excluded.

Data defined in ISO 17262 require a system for control and distribution of number series independent of the different AVI/AEI systems. This is required in order to avoid ambiguity and to provide the necessary level of security where appropriate. For this reason the registration authority defined in ENV ISO 14816 applies for ISO 17262.

ISO 17262 enables the use of optimised encoding schemes such as ASN.1 Basic Packed Encoding Rules (PER).

ISO 17262 provides interoperability, not only between simple AVI/AEI and more complex RTTT/TICS functions, but also with pre-existing Standards such as container (ISO 10374). Specifications for protecting against changes, classifying and qualifying security aspects of the data are out of scope of ISO 17262.

ISO 17262 relates to AVI/AEI units, but not to smaller containers and units being transported. For smaller units (pallet loads, trays, parcels etc.) please refer to ISO/IEC SC 31 standards, ISO 18000 series. The Numbering Structure defined in ISO 17262 is designed to enable combinations with the data definitions from ISO 18000 series. This combination will be covered in CISO 17264.

ISO 17262 provides the capability to carry application data, associated with the identification, to be carried as part of the AVI/AEI message. Within ISO 17262 this is provided as a "black box" facility. The definition of the structure and contents of such messages are outside the scope of ISO 17262.

A.36 ISO 17263, Road transport and traffic telematics — Automatic Vehicle and Equipment Identification – Intermodal Goods Transport-System Parameters

ISO 17263 establishes an AEI-System based on radio frequency technologies. This system is intended for general application in RTTT/TICS. It allows for the transfer of the identification codes and further information about equipment and vehicles used in intermodal transport into such RTTT/TICS and information systems related to Intermodal Transport processes. Within the intermodal context of the RTTT/TICS Sector, AEI systems have the specific objective of achieving an unambiguous identification of an ITU or related equipment or vehicle or item used in intermodal transport, and to make that identification automatically. Vehicles will be considered and handled under Intermodal aspects as

"Intermodal Equipment". Therefore a differentiation between AEI and AVI systems under the purpose of ISO 17263 is not required.

ISO 17263 is specifically aimed at DSRC-type air interfaces. The requirement and test methods may not apply for Intermodal AEI systems using long range communications such as Cellular Networks or Satellite, or vicinity communication such as inductively coupled antennas. The interoperability across the air interface (reference point Delta) is outside the scope of ISO 17263.

The aim of ISO 17263 is to define, describe and specify the System Parameters related to an intermodal AEI system to provide an enabling standard, which, while allowing the system specifier to determine the performance levels and operating conditions, provides a framework for interoperability.

Therefore ISO 17263 specifies:

a) parameters and requirements of the identification system itself;

b) performance criteria necessary to ensure consistent and reliable operation of AEI systems within international transport processing;

c) requirements of the performance and the position of the electronic devices (tag) when installed on intermodal equipment;

d) requirements for the installation of readers, and performance data related to these components.

The standard firstly defines the basic rules - purpose - application categories.

It then defines user requirements and technical and electronically features.

The standard then defines operational parameters and requirements to the system itself - Basic requirements and performance criteria -System reliability and security.

It next provides definition for specific parameters and performance criteria for the reader – General Application related performance criteria -Protection and safety - Specific operational parameters and performance criteria for TAG. Further definition is provided in respect of data contents and storage capacity, mounting conditions, lifetime and environmental requirements. The final section provides a summary view of test requirements.

A.37 ISO 17264, Road Transport and Traffic Telematics (RTTT) – Automatic Vehicle and Equipment Identification – AVI/AEI Interfaces

ISO 17264 specifies an application interface for Automatic Vehicle Identification (AVI) systems, which are based on the Dedicated Short-Range Communication (DSRC), enabling interoperability between open AVI systems (i.e. between different AVI system operators) on an AVI-DSRC application interface level.

By using the Layer 7 DSRC Application Layer Standard, the deliverable makes clear specification requirements. However ISO 15628 (DSRC Application Layer), while originally designed for European DSRC, is now supported by CALM and Japanese DSRC, so is actually medium independent, preserving the nature of ISO AVI/AEI Standards.

The deliverable provides specifications for the AVI transaction model, AVI data elements (referred to as attributes) and functions, from which an AVI transaction can be built. The AVI transaction model provides a mechanism that allows handling of different versions of AVI transactions and associated contracts. A certain AVI transaction supports a certain set of AVI attributes and AVI functions as defined in the deliverable. It is not envisaged that the complete set of AVI attributes and functions is present in each piece of AVI equipment, be OBE or RSE.

In order to achieve interoperability, operators have to agree on issues like:

a) which optional features are actually being implemented and used;

b) security policy (including encryption algorithms and key management, if applicable);

c) the agreements needed between operators in order to regulate the handling of different AVI transactions.

This deliverable has the following structure: In the first four clauses the scope, normative references, definitions of terms and abbreviations are accounted for. Next, in Clause 5, AVI Transaction Requirements are defined, which are independent of any communication media.

In a normative Annex A the AVI Application interface architecture is described in terms of its relation to the DSRC communication architecture, based on EN 12834/ISO 15628. An informative Annex D provides, informative examples of AVI transactions using the specified AVI attributes and functions.

A.38 ISO 17363, Supply chain applications of RFID – Freight containers

ISO 17363 defines the usage of read/write radio-frequency identification technology (RFID) cargo shipment-specific tags on freight containers for supply chain management purposes (shipment tags). It defines the air-interface communications, a common set of required data structures, and a commonly organized set of optional data requirements (through common syntax and semantics).

It contains recommendations about a containerized cargo supply chain RFID system, based on shipment tags; specific recommendations about mandatory non-reprogrammable information on the shipment tag; and specific recommendations about optional, re-programmable information on the shipment tag.

Identified within ISO 17363 are the air-interface and communication parameters for active radio-frequency identification communications using ISO/IEC 18000-7.

ISO 17363 is applicable to freight containers as defined in ISO 668 and to freight containers that are not defined by other ISO standards. It complements ISO 10374 for permanent container license-plate tags.

It fully describes cargo shipment-specific tags.

It does not address smart container technologies affixed to, or inside, freight containers (e.g. sensors) for supply chain management purposes.

A.39 ISO 17364, Supply chain applications of RFID – Returnable transport items (RTIs)

ISO 17364 defines the basic features of RFID for the use in the supply chain when applied to returnable transport items. In particular it:

a) provides specifications for the identification of the RTI,

b) makes recommendations about additional information on the RF tag,

c) specifies the semantics and data syntax to be used,

d) specifies the data protocol to be used to interface with business applications and the RFID system,

e) specifies the minimum performance requirements,

f) specifies the air interface standards between the RF interrogator and RF tag, and

g) specifies the reuse and recyclability of the RF tag.

A.40 ISO 17365, Supply chain applications of RFID – Transport units

ISO 17365 defines the basic features of RFID for the use in the supply chain when applied to transport units. In particular it:

a) provides specifications for the identification of the transport unit,

b) makes recommendations about additional information on the RF tag,

c) specifies the semantics and data syntax to be used,

d) specifies the data protocol to be used to interface with business applications and the RFID system,

e) specifies the minimum performance requirements,

f) specifies the air interface standards between the RF interrogator and RF tag, and

g) specifies the reuse and recyclability of the RF tag.

A.41 ISO 17366, Supply chain applications of RFID – Product packaging

ISO 17366 defines the basic features of RFID for the use in the supply chain in respect of product packaging.

A.42 ISO 17367, Supply chain applications of RFID – Product tagging

ISO 17367 defines the basic features of RFID for the use in the supply chain when applied to product tagging. In particular it

a) provides specific recommendations about the encoded identification of the product,

b) makes recommendations about additional information about the product on the RF tag,

c) makes recommendations about the semantics and data syntax to be used,

d) makes recommendations about the data protocol to be used to interface with business applications and the RFID system, and

e) makes recommendations about the air interface standards between the RF interrogator and RF tag,

f) It only addresses product tagging and does not address product packaging.

A.43 ISO 17687, Transport Information and Control Systems (TICS) – General fleet management and commercial freight operations – Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation

See also Introduction and 5.1 above.

ISO 17687 supports the application of automated identification, monitoring and exchange of emergency response information regarding dangerous goods carried on board road transport vehicles. Such information may include the identification, quantity and current condition (such as pressure and temperature) of such goods, as well as any relevant emergency response information. When equipped with appropriate electronics and communications capabilities, vehicles carrying dangerous goods may respond to queries regarding their status or self-initiate a message.

The information defined here, electronically carried on-board the road transport vehicle, may be transferred to interested roadside systems by whatever communications means are appropriate to that roadside system.

The primary intent of ISO 17687 is not trade, economic, or commercial, but to help save lives by facilitating emergency response. ISO 17687 supports local on-site needs in the same manner as conventional visual placards do but with an optional, complementary, enhanced and more versatile electronic version.

A.44 ISO/IEC 18000, Information technology – Radio frequency identification for item management

ISO/IEC 18000 has been developed to provide a framework to define common communications protocols for Internationally useable frequencies for Radio Frequency Identification (RFID), and, where possible, to determine the use of the same protocols for all frequencies such that the problems of migrating from one to another are diminished; to minimize software and implementation costs; and to enable system management and control and information exchange to be common as far as is possible. It is in six main parts each covering a different frequency range.

A.44.1 ISO/IEC 18000-1, Information technology – Radio frequency identification for item management – Part 1: Reference architecture and definition of parameters to be standardized

ISO/IEC 18000-1 defines the generic architecture concepts in which item identification may commonly be required within the logistics and supply chain and defines the parameters that need to be determined in any standardized air interface definition in the subsequent parts of ISO/IEC 18000. The subsequent parts of ISO/IEC 18000 provide the specific values for definition of the air interface parameters for a particular frequency/type of air interface from which compliance (or non-compliance) with ISO/IEC 18000-1 can be established. ISO/IEC 18000-1 also provides a description of example conceptual architectures in which these air interfaces are often to be utilized.

ISO/IEC 18000-1 limits its scope to transactions and data exchanges across the air interface at reference point delta. The means of generating and managing such transactions, other than a requirement to achieve the transactional performance determined within ISO/IEC 18000-1, are outside the scope of ISO/IEC 18000-1, as is the definition or specification of any supporting hardware, firmware, software or associated equipment.

Standardization of other reference points is outside the scope of ISO/IEC 18000-1.

ISO/IEC 18000-1 is an enabling standard which supports and promotes several RFID implementations without making conclusions about the relative technical merits of any available option for any possible application.

ISO/IEC 18000-1 also provides reference information in respect of patents that have been declared to the developers of ISO/IEC 18000 as pertinent and provides reference addresses in respect of regulations under which ISO/IEC 18000 must operate.

A.44.2 ISO/IEC 18000-2, Information technology – Radio frequency identification for item management – Part 2: Parameters for air interface communications below 135 kHz

ISO/IEC 18000-2 defines the air interface for radio frequency identification (RFID) devices operating below 135 kHz. The purpose of ISO/IEC 18000-2 is to provide a common technical specification for RFID devices that can be used by ISO committees developing RFID application standards. ISO/IEC 18000-2 is intended to allow for compatibility and to encourage inter-operability of products in the international marketplace. ISO/IEC 18000-2 defines the physical layer used for communication between the interrogator and the tag and further defines the communications protocol used in the air interface.

Two types of tag are defined by ISO/IEC 18000-2: Type A and Type B, which differ only by their physical layer. Both support the same inventory (anti-collision) and protocol.

Type A tags are permanently powered by the interrogator, including during the tag-to-interrogator transmission, and operate at 125 kHz.

Type B tags are powered by the interrogator, except during the tag-to-interrogator transmission, and operate at 125 kHz or 134,2 kHz.

A.44.3 ISO/IEC 18000-3, Information technology – Radio frequency identification for item management – Part 3: Parameters for air interface communications at 13,56 MHz

ISO/IEC 18000-3 was prepared in accordance with the requirements determined in ISO/IEC 18000-1. ISO/IEC 18000-1 provides explanation of the concepts behind ISO/IEC 18000-3.

ISO/IEC 18000-3 has 2 MODES of operation, intended to address different applications. It summarizes the differences between MODE characteristics. The detailed technical differences between the modes are shown in the parameter tables.

ISO/IEC 18000-3 relates solely to systems operating at 13,56 MHz.

ISO/IEC 18000-3 provides physical layer, collision management system and protocol values for RFID systems for Item Identification operating at 13,56 MHz in accordance with the requirements of ISO/IEC 18000-1.

ISO/IEC 18000-3 provides definitions for systems for each MODE determined in ISO/IEC 18000-3.

ISO/IEC 18000-3 defines two non-interfering MODES.

The MODES are not interoperable.

The MODES, while not interoperable, are non-interfering.

A.44.4 ISO/IEC 18000-4, Information technology – Radio frequency identification for item management – Part 4: Parameters for air interface communications at 2,45 GHz

ISO/IEC 18000-4 is one of a series of International Standards and Technical Reports developed for the identification of items (Item Management) using radio frequency identification (RFID) technology.

ISO/IEC 18000-4 defines the 2,45 GHz protocols that support ISO/IEC 18000-1. Each of the specific physical/data link configurations is defined in a separate sub-clause. The configuration descriptions include a Physical Layer and a Data Link Layer.

ISO/IEC 18000-4 defines the air interface for radio frequency identification (RFID) devices operating in the 2,45 GHz Industrial, Scientific, and Medical (ISM) band used in item management applications. ISO/IEC 18000-4 provides a common technical specification for RFID devices that can be used by ISO committees developing RFID application standards. ISO/IEC 18000-4 is intended to allow for compatibility and to encourage inter-operability of products for the growing RFID market in the international marketplace. ISO/IEC 18000-4 defines the forward and return link parameters for technical attributes including, but not limited to, operating frequency, operating channel accuracy, occupied channel bandwidth, maximum equivalent isotropically radiated power (EIRP), spurious emissions, modulation, duty cycle, data coding, bit rate, bit rate accuracy, bit transmission order, and where appropriate operating channels, frequency hop rate, hop sequence, spreading sequence, and chip rate. ISO/IEC 18000-4 further defines the communications protocol used in the air interface.

ISO/IEC 18000-4 contains two modes. The first is a passive tag operating as an interrogator talks first while the second is a battery assisted tag operating as a tag talks first. The detailed technical differences between the modes are shown in the parameter tables.

A.44.5 ISO/IEC 18000-6, Information technology – Radio frequency identification for item management – Part 6: Parameters for air interface communications at 860 MHz to 960 MHz

ISO/IEC 18000-6 defines the air interface for radio-frequency identification (RFID) devices operating in the 860 MHz to 960 MHz Industrial, Scientific, and Medical (ISM) band used in item management applications. Its purpose is to provide a common technical specification for RFID devices that may be used by ISO committees developing RFID application standards. ISO/IEC 18000-6 is intended to allow for compatibility and to encourage inter-operability of products for the growing RFID market in the international marketplace. ISO/IEC 18000-6 defines the forward and return link parameters for technical attributes including, but not limited to, operating frequency, operating channel accuracy,

occupied channel bandwidth, maximum EIRP, spurious emissions, modulation, duty cycle, data coding, bit rate, bit rate accuracy, bit transmission order, and where appropriate operating channels, frequency hop rate, hop sequence, spreading sequence, and chip rate. It further defines the communications protocol used in the air interface.

ISO/IEC 18000-6 contains one mode with two types. Both types use a common return link and are reader talks first. Type A uses Pulse Interval Encoding (PIE) in the forward link, and an adaptive ALOHA collision arbitration algorithm. Type B uses Manchester in the forward link and an adaptive binary tree collision arbitration algorithm. The detailed technical differences between the two types are shown in the parameter tables.

ISO 18000-6: Amd1 2006: provides an extension with Type C and update of Types A and B.

A.44.6 ISO/IEC 18000-7, Information technology – Radio frequency identification for item management – Part 7: Parameters for active air interface communications at 433 MHz

ISO/IEC 18000-7 defines the air interface for radio frequency identification (RFID) devices operating as an active RF tag in the 433 MHz band used in item management applications. It provides a common technical specification for RFID devices that can be used by ISO technical committees developing RFID application standards. ISO/IEC 18000-7 is intended to allow for compatibility and to encourage inter-operability of products for the growing RFID market in the international marketplace. ISO/IEC 18000-7 defines the forward and return link parameters for technical attributes including, but not limited to, operating frequency, operating channel accuracy, occupied channel bandwidth, maximum power, spurious emissions, modulation, duty cycle, data coding, bit rate, bit rate accuracy, bit transmission order, and, where appropriate, operating channels, frequency hop rate, hop sequence, spreading sequence, and chip rate. ISO/IEC 18000-7 further defines the communications protocol used in the air interface.

A.45 ISO/IEC 18004, Information technology – Automatic identification and data capture techniques – QR Code 2005 bar code symbology specification

ISO/IEC 18004 defines the requirements for the symbology known as QR Code 2005. It specifies the QR Code 2005 symbology characteristics, data character encoding methods, symbol formats, dimensional characteristics, error correction rules, reference decoding algorithm, production quality requirements, and user-selectable application parameters, and lists in an informative annex the features of QR Code Model 1 symbols which differ from QR Code 2005.

A.46 ISO 18185-1, Freight containers – Electronic seals

A.46.1 ISO 18185-1, Freight containers – Electronic seals – Part 1: Communication protocol

ISO 18185-1 provides a system for the identification and presentation of information about freight container electronic seals. The identification system provides an unambiguous and unique identification of the container seal, its status and related information.

The presentation of this information is provided through a radio-communications interface providing seal identification and a method for determining whether a freight container's seal has been opened.

ISO 18185-1 specifies a read-only, non-reusable freight container seal identification system, with an associated system for verifying the accuracy of use, having

a) a seal status identification system,

b) a battery status indicator,

c) a unique seal identifier including the identification of the manufacturer,

d) seal (tag) type.

ISO 18185-1 is used in conjunction with the other parts of ISO 18185.

It applies to all electronic seals used on freight containers covered by ISO 668, ISO 1496-1 to ISO 1496-5, and ISO 8323. Wherever appropriate and practicable, it also applies to freight containers other than those covered by these International Standards.

A.46.2 ISO 18185-2, Freight containers – Electronic seals – Part 2: Application requirements

ISO 18185-2 specifies a freight container seal identification system, with an associated system for verifying the accuracy of use, having:

a) a seal status identification system;

b) a battery status indicator;

c) a unique seal identifier including the identification of the manufacturer;

d) a seal (tag) type.

ISO 18185-2 is used in conjunction with the other parts of ISO 18185.

A.46.3 ISO 18185-3, Freight containers – Electronic seals – Part 3: Environmental characteristics

ISO 18185-3 specifies the minimum environmental characteristics for electronic seals.

ISO 18185-3 describes the environmental requirements for the ISO 18185 series, for ISO 10374 (Freight containers – RF automatic identification) and for ISO 17363 (Supply chain applications of RFID – Freight containers), since it is expected that the implementation of these International Standards will face the same environmental conditions. However, each of these International Standards has its own unique requirements other than environmental conditions.

A.46.4 ISO 18185-4, Freight containers – Electronic seals – Part 4: Data protection

ISO 18185-4 specifies requirements for the data protection, device authentication and conformance capabilities of electronic seals for communication to and from a seal and its associated reader. These capabilities include the accessibility, confidentiality, data integrity, authentication and non-repudiation of stored data.

A.46.5 ISO 18185-5, Freight containers – Electronic seals – Part 5: Physical layer

ISO 18185-5 specifies the air interface between electronic container seals and Reader/Interrogators of those seals.

It is to be used in conjunction with the other parts of ISO 18185.

ISO 18185-5 describes the physical layer for supply chain applications of RFID for freight containers in accordance with the ISO 18185 series and ISO 17363, since it is expected that the implementation of these standards will face the same international conditions. However, each of these standards has its own unique requirements other than the physical layer. It is expected that RFID Freight Container Identification (as specified in ISO 10374 and ISO 17363), and electronic seals (as specified in the ISO 18185 series) will be able to use the same infrastructure, while recognizing that that there may be requirements for different frequencies for passive devices as opposed to the active devices identified in ISO 18185-5.

A.47 ISO 20858, Ships and marine technology – Maritime port facility security assessments and security plan development

ISO 20858 establishes a framework to assist marine port facilities in specifying the competence of personnel to conduct a marine port facility security assessment and to develop a security plan as required by the ISPS Code International Standard, conducting the marine port facility security assessment, and drafting/implementing a Port Facility Security Plan (PFSP).

In addition, ISO 20858 establishes certain documentation requirements designed to ensure that the process used in performing the duties described above was recorded in a manner that would permit independent verification by a qualified and authorized agency (if the port facility has agreed to the review). It is not an objective of ISO 20858 to set requirements for a contracting government or designated authority in designating a Recognized Security Organization (RSO), or to impose the use of an outside service provider or other third parties to perform the marine port facility security assessment or security plan if the port facility personnel possess the expertise outlined in this specification. Ship operators may be informed that marine port facilities that use this document meet an industry-determined level of compliance with the ISPS Code.

Port infrastructure that falls outside the security perimeter of a marine port facility might affect the security of the facility/ship interface. ISO 20858 does not address the requirements of the ISPS Code relative to such infrastructures. State governments have a duty to protect their populations and infrastructures from marine incidents occurring outside their marine port facilities. These duties are outside the scope of ISO 20858.

A.48 ISO 21210, Intelligent transport systems — Communications access for land mobiles — IPv6 Networking

This International Standard specifies networking protocol functionalities related to IPv6 networking between two or more ITS stations communicating over the global internet communication network.

A.49 ISO 21212, Intelligent transport systems – Communications access for land mobiles (CALM) – 2G Cellular systems

ISO 21212 determines the air interface for second generation (2G) cellular networks and 2G systems (e.g. using WAP and I-Mode type protocols) to be compliant to CALM, i.e. requirements that must be met before a 2G system can be incorporated into a CALM system. In particular, it specifies protocols and parameters that 2G systems shall include to support prolonged, long-range, high data rate wireless communication links in ITS environments where heterogeneous handovers or media independent handovers (MIH) are either necessary to maintain the link, or desirable as determined by media selection policies.

ISO 21212 provides protocols and parameters for long range, medium speed wireless communications in the ITS sector using second generation cellular communications.

Wherever practicable, ISO 21212 has been developed by reference to suitable extant standards, adopted by selection. Required regional variations are provided.

Specifically, for ISO 21212, extant 2G systems, as defined by various international and national standards, are adopted by reference.

Application-specific upper layers are not included in ISO 21212, but will be driven by application standards (which may not be technology specific).

A.50 ISO 21213, (CALM) – 3G Cellular systems

ISO 21213 determines the air interface options applicable to CALM using third generation (3G) cellular networks. In particular, it specifies protocols and parameters that 3G systems shall include to support prolonged, long-range, high data rate wireless communication links in ITS environments where heterogeneous handovers or media independent handovers (MIH) are either necessary to maintain the link, or desirable, as determined by media selection policies.

ISO 21213 provides protocols and parameters for long range, medium speed wireless communications in the ITS sector using third generation cellular communications.

Wherever practicable, ISO 21213 has been developed by reference to suitable extant Standards, adopted by selection. Required regional variations are provided.

Specifically, for ISO 21213, extant 3G systems, as defined by various international and national standards, are adopted by reference.

Application specific upper layers are not included in ISO 21213, but will be driven by application standards (which may not be technology specific).

A.51 ISO 21214, Intelligent transport systems – Communications access for land mobiles (CALM) – Infrared systems

ISO 21214:2006 determines the air interface using infrared systems at 820 nm to 1 010 nm.

It provides protocols and parameters for medium-range, medium- to high-speed wireless communications in the ITS sector using infrared systems.

Such links are required for quasi-continuous, prolonged or short communications

a) between vehicles and the roadside,

b) between vehicles, and

c) between mobile equipment and fixed infrastructure points,

d) over medium and long ranges.

Vehicles may be moving or stationary.

Wherever practicable, ISO 21214 has been developed by reference to suitable extant International Standards, adopted by selection. Required regional variations are provided.

Due account is given to, and use made of, any relevant parts of appropriate communications systems, such as global positioning systems (GPS), digital audio broadcasting (DAB), digital video broadcasting (DVB), radio local area networks (RLANs), digital data broadcasting (DDB), TETRA, FM subcarrier, mobile broadband systems (MBS, W-ATM), internet protocols, and dedicated short range communication (DSRC).

ISO 21214:

a) supports data rates of 1 Mbit/s up to 128 Mbit/s (it may support higher data rates);

b) supports vehicle speeds up to a minimum of 200 km/h (closing speeds could be double this value);

c) defines or references environmental parameters relevant to link operation;

d) supports communication distances up to 100 m (it may support longer communication distances of 300 m to 1 000 m);

e) supports latencies and communication delays in the order of milliseconds;

f) is compliant to regional/national regulatory parameters;

g) may support other regional/national parameters as applicable.

Application-specific requirements are outside the scope of ISO 21214. These requirements will be defined in the CALM management and upper layer standards and in application standards.

Application-specific upper layers are not included in ISO 21214, but will be driven by application standards (which may not be technology specific).

A.52 ISO 21215, Intelligent transport systems – Communications access for land mobiles (CALM) – M5

ISO 21215 provides specifications of the access layer (OSI layers 1 and 2 and the related management functionality) of a communication interface (CI) named "CALM M5", operating in the 5 GHz microwave frequency range.

A.53 ISO 21216, Intelligent transport systems – Wireless communications – CALM using millimetre communications – Air interface

ISO 21216 covers the open systems interconnection (OSI) Layer 1 physical layer (PHY) air interface for a communications medium operating in the 60 GHz millimetric frequency range by providing the parameters for medium range, medium to high speed wireless communications in the ITS sector. It specifies the parameters required to interface the Layer 1 of such a system to the communications access for land mobiles (CALM) architecture.

A.54 ISO 21217, Intelligent transport systems – Communications access for land mobiles (CALM) – Architecture

ISO 21217 specifies the architectural communications framework of "Intelligent Transport Systems" (ITS) for the family of CALM-related International Standards. The architecture is described in an abstract way with several graphical views and examples. The graphical representations partly follow the ISO Open Systems Interconnection (OSI) principles. In addition to the requirements specified within ISO 21217 a number of notes and examples are provided to illustrate the CALM concept.

Wherever practicable, ISO 21217 has been developed by reference to suitable extant International Standards, adopted by selection. The architecture provides for regional variations where regulations differ in different countries and regions.

A.55 ISO 21218, Intelligent transport systems – Communications access for land mobiles (CALM)– Medium service access points

ISO 21218 determines the service access points of a communication interface (CI) as provided by the communication adaptation layer (CAL) for communication, and as provided by the CI management adaptation entity (CIMAE) for management of the CI.

A.56 ISO/IEC/IEEE 21450, Information technology – Smart transducer interface for sensors and actuators – Common functions, communication protocols, and Transducer Electronic Data Sheet (TEDS) formats

ISO/IEC/IEEE 21450 provides a common basis for members of the ISO/IEC/IEEE 21451 series of International Standards to be interoperable. It defines the functions that are to be performed by a transducer interface module (TIM) and the common characteristics for all devices that implement the TIM. It specifies the formats for Transducer Electronic Data Sheets (TEDS). It defines a set of commands to facilitate the setup and control of the TIM as well as reading and writing the data used by the system. Application programming interfaces (APIs) are defined to facilitate communications with the TIM and with applications.

A.57 ISO/IEC/IEEE 21451, Information technology – Smart transducer interface for sensors and actuators

A.57.1 ISO/IEC/IEEE 21451-1, Information technology – Smart transducer interface for sensors and actuators – Part 1: Network Capable Application Processor (NCAP) information model

ISO/IEC/IEEE 21451-1 defines an object model with a network-neutral interface for connecting processors to communication networks, sensors, and actuators. The object model contains blocks, services, and components; it specifies interactions with sensors and actuators and forms the basis for implementing application code executing in the processor.

A.57.2 ISO/IEC/IEEE 21451-2, Information technology – Smart transducer interface for sensors and actuators – Part 2: Transducer to microprocessor communication protocols and Transducer Electronic Data Sheet (TEDS) formats

ISO/IEC/IEEE 21451-2 defines a digital interface for connecting transducers to microprocessors. It describes a Transducer Electronic Data Sheet (TEDS) and its data formats. It defines an electrical interface, read and write logic functions to access the TEDS, and a wide variety of transducers. ISO/IEC/IEEE 21451-2 does not specify signal conditioning, signal conversion, or how the TEDS data are used in applications.

A.57.3 ISO/IEC/IEEE 21451-4, Information technology – Smart transducer interface for sensors and actuators – Part 4: Mixed-mode communication protocols and Transducer Electronic Data Sheet (TEDS) formats

ISO/IEC/IEEE 21451-4 defines the protocol and interface that allows analog transducers to communicate digital information with an ISO/IEC/IEEE 21451 object. It also defines the format of the Transducer Electronic Data Sheet (TEDS), which is based on the ISO/IEC/IEEE 21451-2 TEDS. It does not specify the transducer design, signal conditioning, or the specific use of the TEDS.

A.57.4 ISO/IEC/IEEE 21451-7, Information technology – Smart transducer interface for sensors and actuators – Transducer to radio frequency identification (RFID) systems communication protocols and Transducer Electronic Data Sheet (TEDS) formats

ISO/IEC/IEEE 21451-7 defines communication methods and data formats for transducers (sensors and actuators) communicating with RFID tags. This part of ISO/IEC/IEEE 21451 also defines Transducer Electronic Data Sheet (TEDS) formats based on the ISO/IEC/IEEE 21451 family of standards and protocols for accessing TEDS and transducer data. It adopts necessary interfaces and protocols to facilitate the use of technically different fated, existing technology solutions. It doesn't specify transducer design or signal conditioning.

The purpose of this part of ISO/IEC/IEEE 21451 is to provide interfaces and methods for interfacing transducers to RFID tags and reporting transducer data within the RFID infrastructure. It also provides means for device and equipment interoperability.

A.58 ISO 22742, Packaging – Linear bar code and two-dimensional symbols for product packaging

ISO 22742 specifies the minimum requirements for the design of labels containing a linear bar code and two-dimensional symbols on product packages to convey data between trading partners; provides guidance for the formatting on the label of data presented in a linear bar code, two-dimensional symbols or human-readable form; provides specific recommendations regarding the choice of linear bar code and 2D symbologies; specifies quality requirements and classes of bar code density, provides specific recommendations regarding 2D symbologies, which allow a broad choice for general use of scanning hardware (e.g. area imagers, linear imagers, single-line laser scanners, and rastering laser scanners); and makes recommendations as to label placement, size and the inclusion of free text and any appropriate graphics.

It supports item identification and supply chain processes, at the product package level, such as inventory control, picking, and point of use.

The purpose of ISO 22742 is to establish the machine-readable (e.g. bar code) and human-readable data content of labels applied to product packages.

A.59 ISO 24101, Intelligent transport systems – Communications access for land mobiles (CALM) – Application management

A.59.1 ISO 24101-1, Intelligent transport systems – Communications access for land mobiles (CALM) – Application management – Part 1: General requirements

ISO 24101-1 specifies structures and methods for application management, including means for installing, uninstalling and updating applications on on-board equipment (OBE) and wireless access equipment (WAE) deployed in a communications access for land mobiles (CALM) network in a reliable and secure manner.

ISO 24101-1 specifies structures and methods for application management, including means for installing, uninstalling and updating applications on on-board equipment (OBE) and wireless access equipment (WAE) deployed in a communications access for land mobiles (CALM) network in a reliable and secure manner.

A.59.2 ISO 24101-2, Intelligent transport systems – Communications access for land mobiles (CALM) – Application management – Part 2: Conformance test

ISO 24101-2 specifies the test system, test cases, test conditions, test procedures and test results for examining the function of the communications access for land mobiles (CALM) application management (AM).

A.60 ISO 24102, Intelligent transport systems – Communications access for land mobiles (CALM) – Management

ISO 24102 provides specifications for intelligent transport systems (ITS) station management to be compliant with the ITS station reference architecture and the set of communications access for land mobiles (CALM) related standards.

Management actions are specified via service access points; messages and data that flow between the ITS station management entity and the security entity, the application entity and the various communication protocol layers of the ITS station reference architecture; and protocol data units for management communications between addressable instances of functionality of an ITS station.

A.61 ISO 24103, Intelligent transport systems – Communications access for land mobiles (CALM) – Media adapted interface layer (MAIL)

ISO 24103 determines the logical structure of using dedicated short-range communication (DSRC) with an OSI (open systems interconnection) application layer as a CALM medium for IP communications. DSRC to which MAIL is applicable are those with an application layer compliant with ISO 15628, and the standards of such DSRC include the following: ARIB STD-T75 DSRC (Japan); TTAS.KO-06.0025 DSRC in the 5,8 GHz band (Korea); EN 12253 DSRC physical layer using microwave in the 5,8 GHz band, EN 12795 DSRC data link layer and EN 12834 DSRC application layer (Europe).

A.62 ISO/TS 24533, Intelligent Transport Systems — Data dictionary and message set to facilitate the movement of freight and its intermodal transfer — Road transport information exchanges

See also Introduction and 5.1

This International Standard specifies the data concepts applicable to the movement of freight and its intermodal transfer. It also addresses the business processes depicting the roles and responsibilities of the various participants in the international supply chain. This first version of the International Standard focuses on a single "thread" of the overall end to end supply chain consisting of a road-air-road combination. These data concepts include data elements, data frames (groups of data elements) and messages that comprise information exchanges at road transport interfaces along the chain of participants responsible for the delivery of goods from the point of origin through to the final recipient.

The scope includes motor transport data needs within the international supply chain to satisfy the requirements of both businesses and governmental organizations. This international standard is applicable to highway shipments that originate in one country and terminate in another. It may also be applied to highway shipments that originate and terminate in a single country. This international standard is applicable to highway freight movements that interface with other modes and incorporates requirements set for those other modes.

If goods change to or from another mode between origin and destination, this international standard does not establish requirements for those other modes. However, it addresses the requirements of information exchange between the truck mode and the air freight mode. Further, this international standard does not constrain the requirements of Customs, regulatory, and safety bodies at border crossings. However, this International Standard does include the data elements most likely to be required by Customs.

NOTE It is intended that this thread may be generalized to address the various combination of segments that occur in the global supply chain.

Specifically, the Standard includes aspects such as:

— Intermodal freight context

— Intermodal freight – Road and air transport components concept of operations

— Overview of freight physical flow

— Information Exchange Transactions

— Operational Scenario

— Intermodal freight – Road transport component use cases

— Business domain

— Business requirements

— Global context use case: "Ship (Transport Interpretation)" (Level)

— Use case elaboration: "Initiate Consignment Transport" (Level)

— Use case elaboration: "Export" (Level)

— Use case elaboration: "Import" (Level)

— Use case elaboration: "Transport Consignment – Inbound" (Level)

— Use case elaboration: "Conclude Consignment Transaction" (Level)

— Supply chain exchange data dictionary – road transport partition

— CarrierdepartureDate:time

— CarrierdepartureDateFormat:code

— CarrierjourneyIdentifier:text

— Carrierliability:text

— CarriernameAndAddress:text

— Chargeamount:amount

— ChargetypeCode:integer

— ConsigneeaccountNumber:number

— ConsigneenameAndAddress:text

— ConsignmentchargesAtDestination:amount

— ConsignmentconvertedCharges:amount

— ConsignmentdeclaredValueForCarriage:amount

— ConsignmentdeclaredValueForCustoms:amount

— ConsignmentdgIndicator:code

— ConsignmenthandlingInstructions:text

— ConsignmentinsuranceAmount:amount

— Identifying location using latitude and longitude

— Applicable messages, data frames and data elements

— ASN.1 data type and structure summary

— ASN.1 module for electronic freight manifest

A.63 ISO 24534, Road Transport and Traffic telematics – Automatic Vehicle and Equipment Identification - Electronic Registration Identification (ERI) for Vehicles

A.63.1 ISO 24534-1, Road Transport and Traffic telematics – Automatic Vehicle and Equipment Identification - Electronic Registration Identification (ERI) for Vehicles - Part 1: Architecture

ISO 24534-1 provides the generic requirements for electronic registration that is based on an identifier assigned to a vehicle (e.g. for recognition by national authorities), suitable to be used for:

— electronic identification of local and foreign vehicles by national authorities,

— vehicle manufacturing, in-life maintenance and end-of-life identification (vehicle life cycle management),

— adaptation of vehicle data (e.g. for international resale),

— safety-related purposes,

— rime reduction, and

— commercial services.

It adheres to privacy and data protection regulations.

The International Standard defines the general context of the ERI Standards 24534 and 24535.

ISO 24534-1 provides an overview of the ERI system concept, in terms of the on-board vehicle components and the external off-vehicle components required for an operational system. The detailed requirements are defined in ISO 24534-2, ISO 24534-3,ISO 24534-4 and ISO 24534-5 and for the more limited, relevant provisions of ISO 24535.

A.63.2 ISO 24534-2, Road Transport and Traffic telematics – Automatic Vehicle and Equipment Identification - Electronic Registration Identification (ERI) for Vehicles - Part 2: Operational Requirements

ISO 24534-2 defines the operational requirements for the remaining parts of ISO 24534 and the more limited but relevant provisions of ISO 24535.

While the definition of the organizational framework required to implement, operate and maintain an ERI system is outside the scope of this part of ISO 24534, a list of potential stakeholders in the public and private sector has been included.

The following operational parameters are defined:

— ERT (electronic Registration Tag) memory allocation

— Security of ERI (Electronic Registration Identification) data

— On-board ERI equipment categories

— ERT location on-board

— ERI equipment safety

— Environmental requirements

— ERT security

— ERT Life Provision

— ERI system organizational framework

A.63.3 ISO 24534-3, Road Transport and Traffic telematics – Automatic Vehicle and Equipment Identification - Electronic Registration Identification (ERI) for Vehicles - Part 3: Vehicle Data

ISO 24534-3 defines the vehicle identification data. This data are called the ERI data and includes:

— the vehicle identifier, and possible additional vehicle-related information (as typically included in a vehicle registration certificate).

All additional vehicle data elements are defined as optional. It is left to local legislation and/or the discretion of a registration authority to use or not to use a particular data element. If used, the value is assumed to be the one registered by the registration authority in accordance with local legislation. This part of ISO 24534 only provides the syntax for all these data elements.

The standard identifies a 'VehicleId type' to be used for the vehicle identifier according to local legislation and defined in ASN.1. An 'ERI' is defined to be used for specific ERI data and is specified in aSN.1

The Standard goes on to define a number of optional ERI data fields.

A.63.4 ISO 24534-4, Road Transport and Traffic Telematics – Automatic Vehicle and Equipment Identification - Electronic Registration Identification (ERI) for Vehicles - Part 4: Secure Communications Using Asymmetric Techniques

ISO 24534-4 specifies the interfaces for a secure exchange of data between an ERT and an ERI reader or ERI writer in or outside the vehicle using asymmetric encryption techniques.

The standard includes:

— the application layer interface between an ERT and an on-board ERI reader or writer,