
**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)



Documents

Document Sharing Hub

© ISO 2013



COPYRIGHT PROTECTED DOCUMENT

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	3
4 Symbols and abbreviated terms	8
5 Context	10
5.1 General context	10
5.2 Road transport information exchanges for supply chain freight time-sensitive delivery	10
5.3 Dangerous goods	12
5.4 Domestic land transport scenarios	16
5.5 Complementariness of standards	16
6 Architecture	18
6.1 Overview	18
6.2 Standardization aspects for intermodal transport	22
6.3 Make and break bulk content identification	24
6.4 Variety of forms of freight land conveyance	25
6.5 Multiple trailers	26
6.6 Principal standards for the intermodal transport scenario	27
6.7 Subsequent standards	27
6.8 Operational aspects for data collection	27
6.9 On-board cargo stress measurement information during road transport	28
7 Freight land conveyance content identification architecture overview	28
7.1 Generalized framework	28
7.2 Cargo/vehicle information data layer	28
7.3 Sensor data	29
7.4 Item data	30
7.5 Agglomeration of data	32
7.6 Aggregation of data	32
7.7 Data transfer	33
8 Freight land conveyance and communication - Application interface profiles	33
8.1 General	33
Annex A (normative) List of referenced International Standards	34
Annex B (informative) Examples of the system implementation	73
Annex C (informative) ISO 6346 in respect of land conveyance identification	76
Bibliography	81

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

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 a basis for the

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 v2.1¹⁾

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.

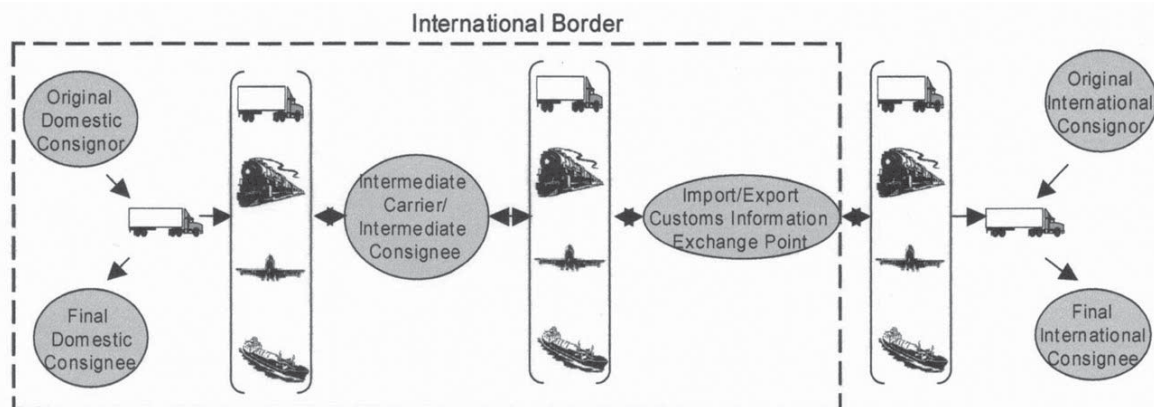


Figure 1 — ISO/TS information exchanges at intermodal interfaces (source ISO/TS 24533)

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.

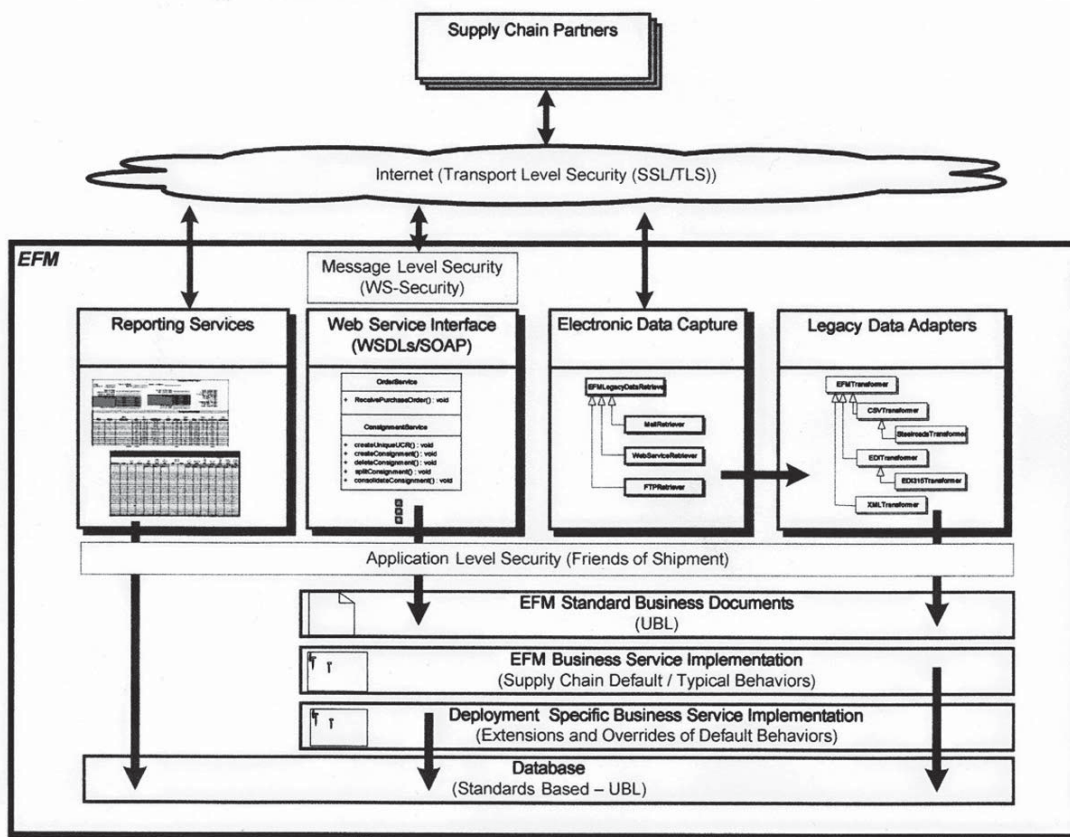


Figure 2 — EFM high level Architecture (source: EFM Design USDoT)

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.

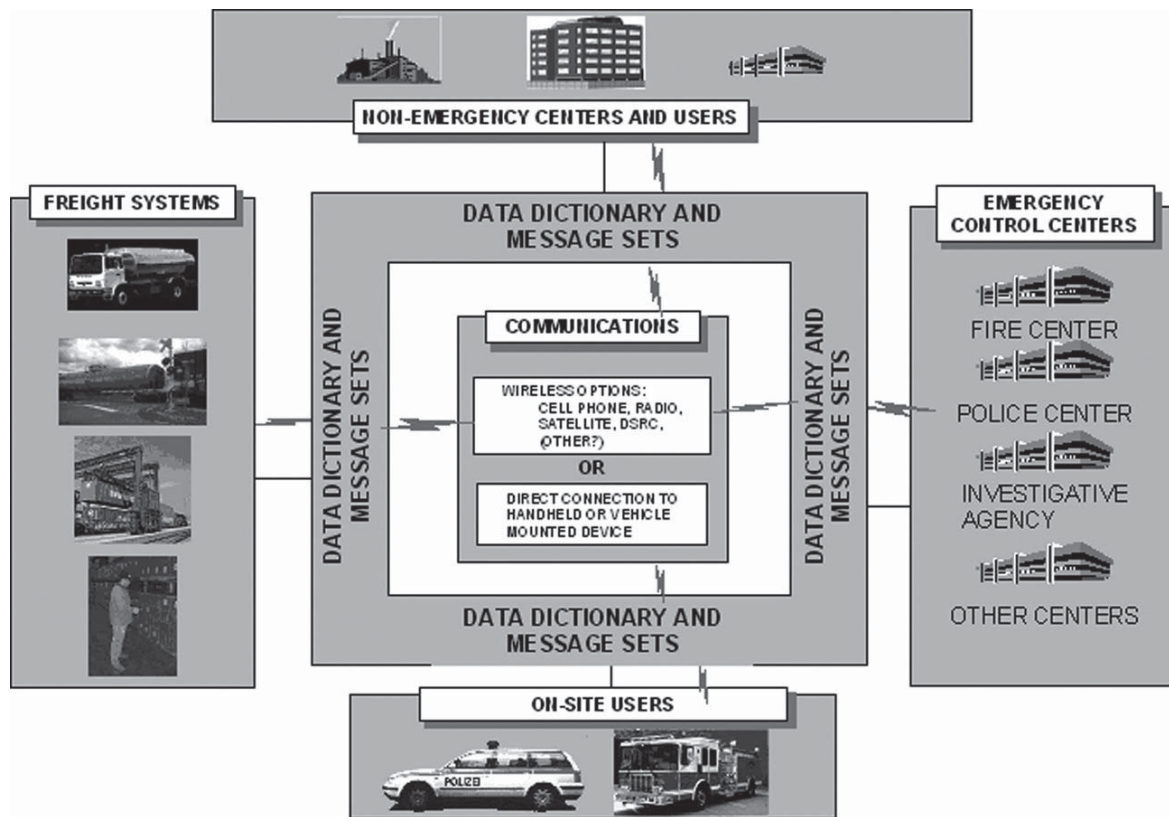


Figure 3 — ISO 17687 electronic identification and monitoring concept (source: ISO 17687)

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.

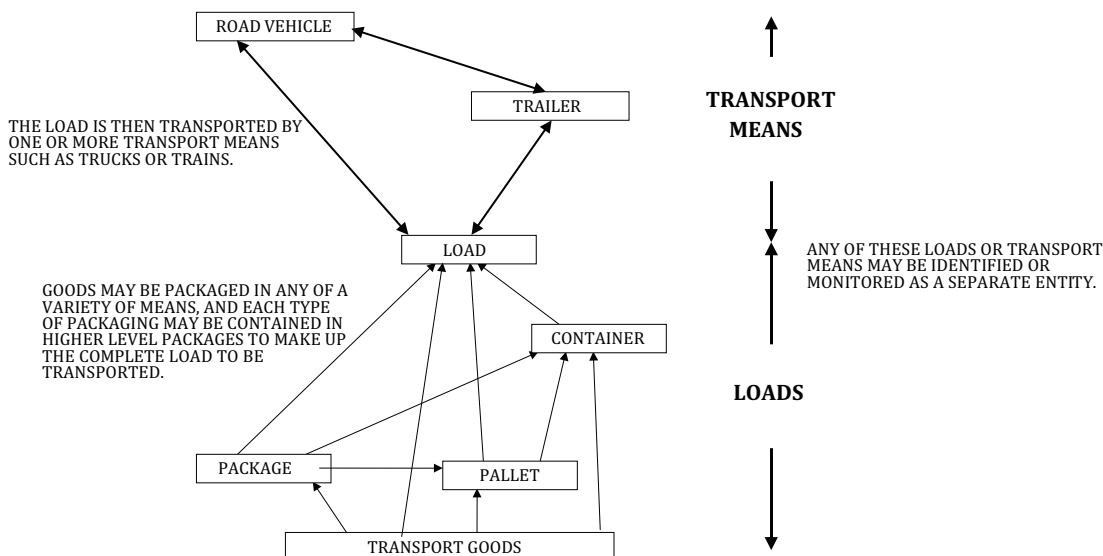


Figure 4 — ISO 17687 representative types of transport units (source: ISO 17687)

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:

- 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);
- 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.

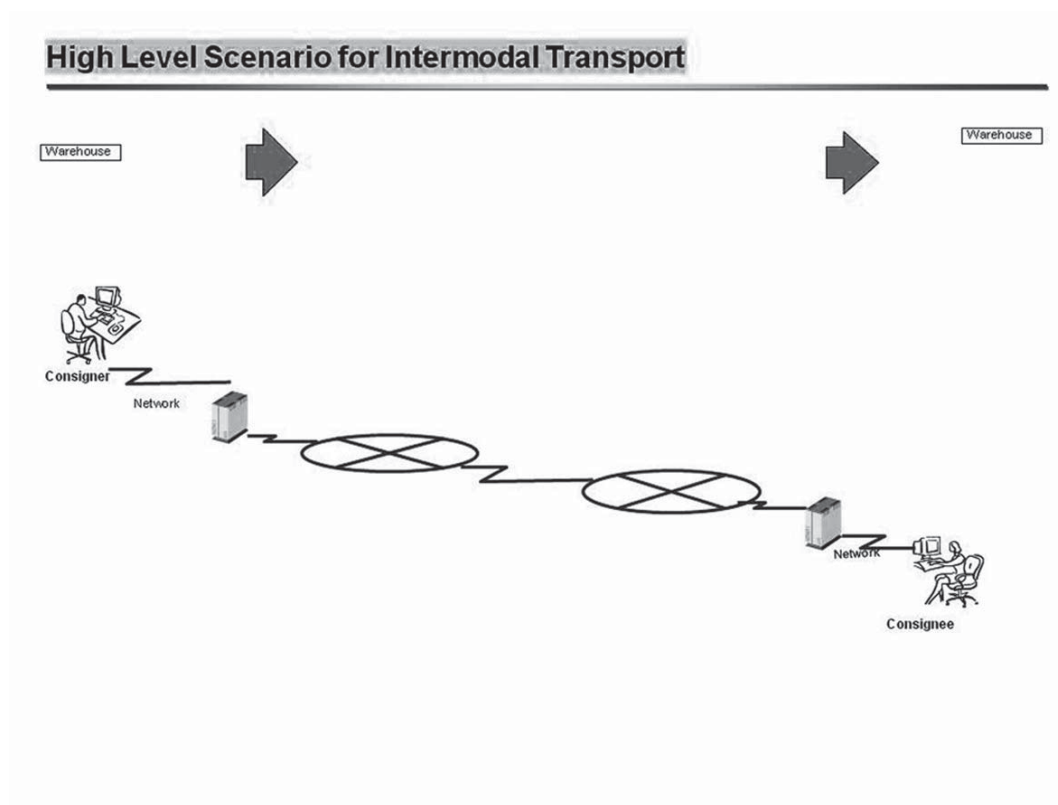


Figure 5 — High Level view of the administration of the movement of an item from consignor to consignee

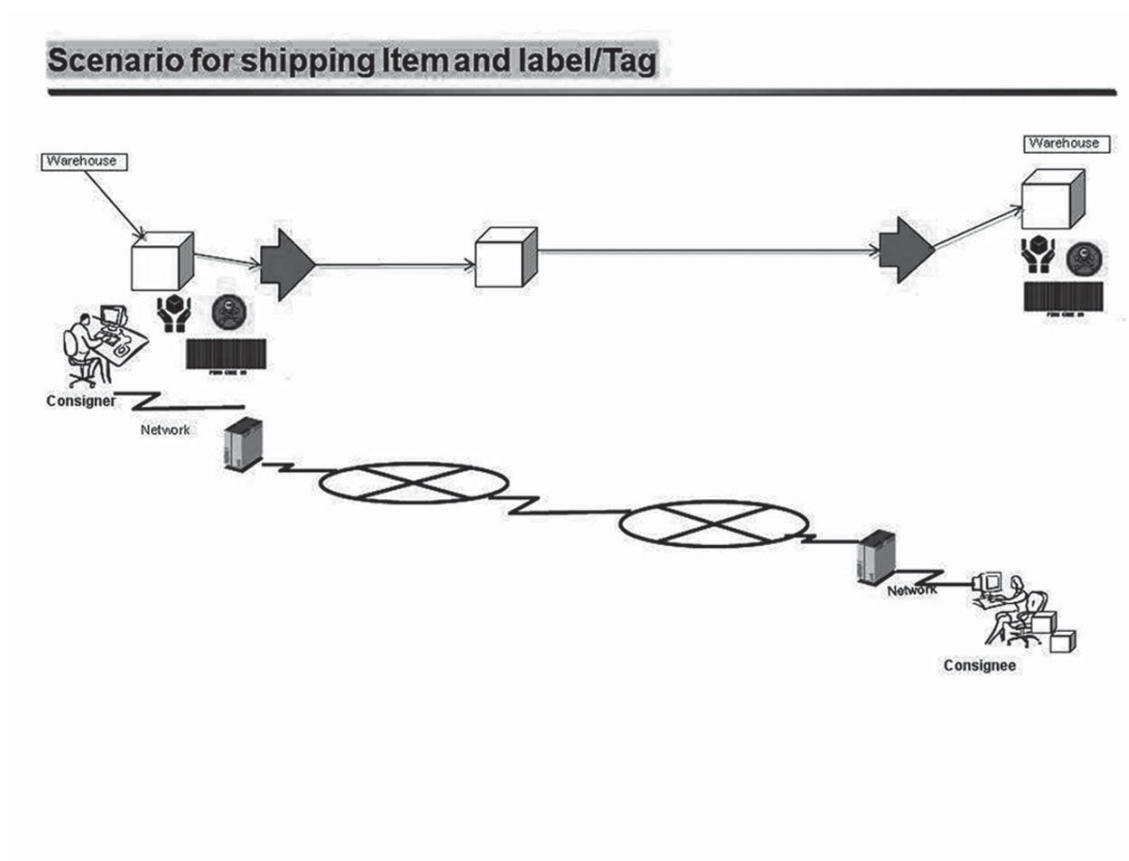
A land transport may be a part of end to end transport within an international transport context, or it may be a simple domestic movement by one mode of transport, or some combination in between.

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.



1

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.

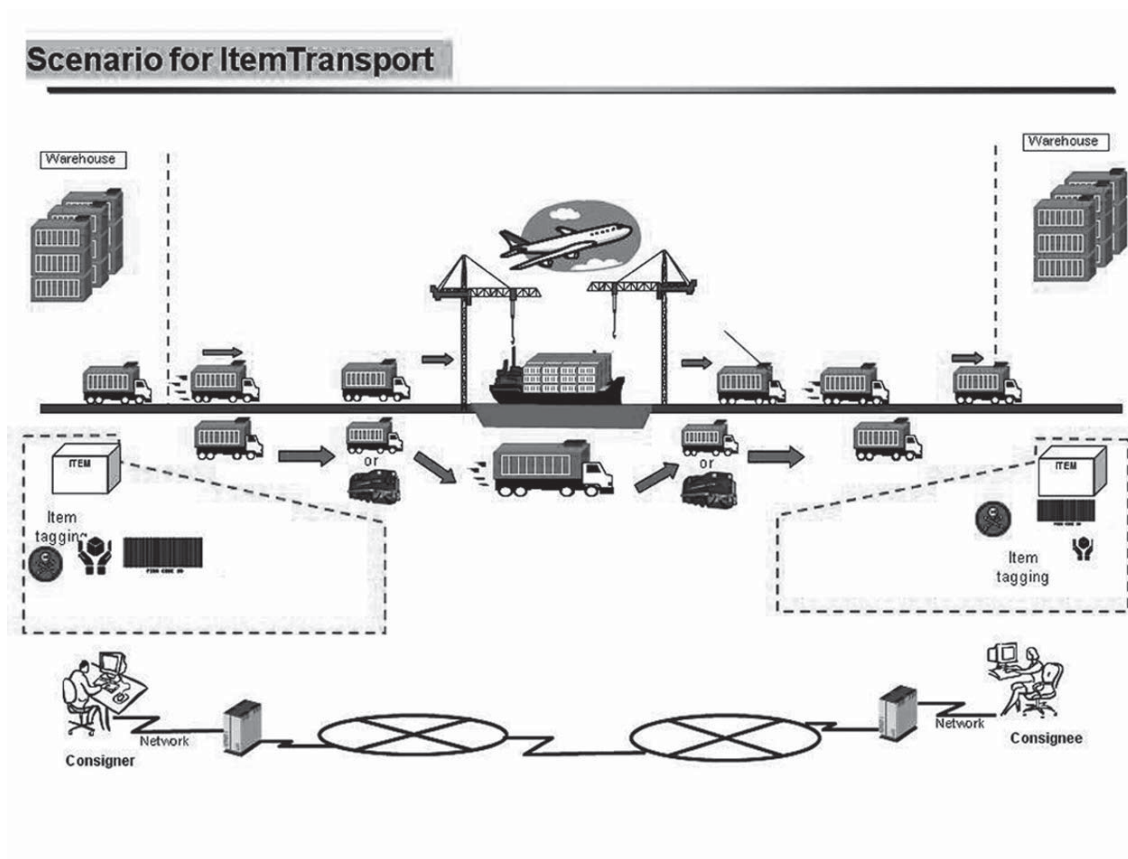


Figure 7 — Scenario for item transport using several transport modes

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.