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

*Systèmes intelligents de transport — Identification automatique des  
véhicules et de leur équipement — Architecture et terminologie du  
transport intermodal de marchandises*

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## Foreword

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

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

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

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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

ISO/TS 17261 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, Road transport and traffic telematics, in collaboration with Technical Committee ISO/TC 204, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

## Introduction

This Technical Specification prescribes the overall parameters within which these subsidiary Standards and Technical Specifications are constructed. The Architecture description defined in this document is presented in a form consistent with the recommendations of ISO/TC 204/WG1, and is supported by that working group, and is a consistent extension to EN ISO 14814 (AVI Reference architectures and terminology).

EN ISO 14814 provides an architecture context for AVI/AEI for road transport. CEN ISO/TS 17261 (this Technical Specification) extends this architecture context to include intermodal and multimodal movements.

This document is part of a series of Standards defining AVI/AEI in the Intelligent Transport Systems/Road Transport and Traffic Telematics (ITS/RTTT) environment. The following parts have been/shall also be issued from CEN TC 278/WG12 to form a family of Standards for the Sector.

EN ISO 14814	AVI/AEI Reference architectures and terminology
EN ISO 14816	AVI/AEI Numbering and data structures
EN ISO 14815	AVI/AEI System specification
CEN ISO/TS 17261	AVI/AEI Intermodal goods transport reference architectures and terminology.
CEN ISO/TS 17262	AVI/AEI Intermodal goods transport: Numbering and data structures
CEN ISO/TS 17263	AVI/AEI Intermodal goods transport: System parameters
CEN ISO/TS 17264	AVI/AEI Intermodal goods transport: Interface requirements

An AVI/AEI interaction in an ITS/RTTT environment comprises an identification of On-Board Equipment (OBE) by a reader/interrogator and may transfer additional data.

The data component in an ITS/RTTT environment provides the basis for unambiguous identification of the OBE, and may also share a medium for a bi-directional interactive exchange of data between the host and OBE and to other equipment (such as smart cards etc.).

The principles of data presentation determined in CEN ISO/TS 17262 have been adopted to provide an interoperable architecture within a Standard framework. The use of Abstract Syntax Notation One (ASN.1) PER is therefore an integral part of the data architecture determined in this Technical Specification.

The numbering and data structure shall be capable of operation both by read/write devices, and by read only devices where there is no requirement (and sometimes no possibility) to write to the OBE.

A key feature of the structure is to provide interoperability of data constructs.

Within the ITS/RTTT sector, applications may range from simple vehicle and equipment identification to complex International systems.

The reference architecture model and the data construct schemes described in this family of Standards/Technical Specifications extend the approved AVI conceptual architecture to provide a comprehensive conceptual and logical system architecture to describe the relationships and functionality for a wide range of media so that the currency of the Technical Specification shall remain good for both existing and future technologies. The Technical Specification recognises that there are existing AVI/AEI applications and provides a means of supporting such data constructs within the Technical Specification.

In many cases it is necessary or desirable to use one air carrier frequency and protocol, but this is not always possible nor even desirable in all situations.

In accordance with the resolutions of ISO TC 204 and CEN TC 278 the use of Abstract Syntax Notation One (ASN.1) from ISO 8824 as a data definition structure is adopted. Its usage provides maximum interoperability and conformance to existing ITS/RTTT and related Standards and Technical Specifications

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## 1 Scope

This Technical Specification describes the conceptual and logical architecture for automatic vehicle and Equipment identification (AVI/AEI) and supporting services in an intermodal/multimodal environment.

This Technical Specification presents a high level view of AEI intermodal and multimodal system Architecture. The Technical Specification 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.

The Architecture is product independent, e.g. individual modules within sub systems e.g. the data tag module within the data capture sub system will be described in terms of system parameters not in terms of a defined or named product specification.

The Technical Specification identifies the context of intermodal/multimodal AEI within the overall AVI/AEI context and key external inter-dependencies and interfaces to the intermodal/multimodal Sector IT infrastructure. These include interfaces to the external and internal users of the Intermodal/multimodal System services and their associated IT systems, interfaces to Intermodal/multimodal management systems, existing Intermodal/multimodal networks and System Operations, and specifically interfaces to item identification and the domain of ISO/IEC SC 31, item logistics Standards. As an architecture it is designed to be complementary and interlocking to that domain.

**NOTE** In addition to the work of this Technical Specification, the reader should be aware that there are a number of ongoing architecture and terminology activities in a number of organizations such as the UNCEFACT and ISO/TC 154 that relate to the movement of intermodal/multimodal goods. In respect of the architecture concepts described in this Technical Specification it is important that there be ongoing collaboration between the ITS community and such bodies such that semantic interoperability and syntactic coherence may be attained at information exchanges intermodally.

This Technical Specification relates to AVI/AEI units, but not to smaller containers and items being transported. Whilst the architecture described within this Technical Specification shows the inter-relationship to the item identification domain (see Annex A), for smaller items (pallet loads, trays, parcels etc.), Standardization will be undertaken by ISO/IEC JTC 1 SC 31. Supporting Standards developed by ISO/TC 204 will be limited to vehicle, trailer and AVI/AEI unit identification, whereas ISO/SC 31 Standards will work from units of pallet (and equivalent) size down to item level.

This Technical Specification is intended to be complementary and consistent with the work of ISO/TC 104 (ISO Containers).

This Specification extends the conceptual and communication AVI architecture determined in EN ISO 14814 and is neither frequency nor air interface protocol specific. It provides maximum interoperability, has a high population capability, and provides the possibility of upwards migration to more capable systems.

This Technical Specification does not include the air interface nor any implementation aspect, solely the reference architectures. Subsequent Standards shall define data structures for general AVI/AEI and for specific sectors of application.

**NOTE** This Technical Specification presents a number of views to describe the intermodal/multimodal environment. Other organizations, such as UN/CEFACT, and other ITS Standards, may use views that are based on different methodologies.

## 2 Normative references

This Technical Specification incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Technical Specification only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

ISO/IEC 8824-1:1995, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 1: Specification of basic notation*, 1995-10-15

## ISO/TS 17261:2005(E)

ISO/IEC 8824-1:1995, Amd 1:1996, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 1: Specification of Basic Notation, Amendment 1 Rules of extensibility*, 1996-05-01

ISO/IEC 8824-2:1995, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 2: Information object specification*, 1995-10-15

ISO/IEC 8824-2:1995, Amd 1:1996, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 2: Information object specification, Amendment 1 Rules of Extensibility*, 1996-05-01

ISO/IEC 8824-3:1995, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 3: Constraint specification*, 1995-10-15

ISO/IEC 8824-4:1995, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 4: Parameterization of ASN.1 specifications*, 1995-10-15

ISO/IEC 8825-1:1995, *Information technology — ASN.1 encoding rules — Part 1: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*, 1995-10-15

ISO/IEC 8825-2:1996, *Information technology — ASN.1 encoding rules — Part 2: Specification of Packed Encoding Rules (PER)*, 1996-08-01

ISO 9897, *Electronic Data Interchange*

ISO 10374, *Freight Containers — Coding, identification and marking*

ISO 11179, *TICS Data Registration Procedures*

ISO 14812, *Transport information and control systems, System architecture, Glossary of terms*

ISO 14813, *Transport Information and Control Systems, System architecture, taxonomy and terminology — Parts 1 - 6: ITS Reference architecture*

EN ISO 14814, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Reference architectures and terminology (review)*

ENV ISO 14816, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structures*

ENV ISO 14815, *Road transport and traffic telematics — Automatic vehicle and equipment identification — System specification*

CEN ISO/TS 17262, *AVI/AEI Intermodal goods transport: Numbering and data structures*

CEN ISO/TS 17262, *AVI/AEI Intermodal goods transport: System parameters*

CEN ISO/TS 17264, *AVI/AEI Intermodal goods transport: Interface requirements*

ISO/IEC 18000-1, *Automatic identification - Radio frequency identification for item management — Communications and interfaces — Part 1: Reference architecture and definition of parameters to be standardized*

ISO 14817, *Data modelling: Data registration and data dictionary, Procedures for the ITS sector*

ISO/IEC DIS 19501-1, *Information technology — Unified Modelling Language (UML) — Part 1*



### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14812 and the following apply.

#### 3.1

##### **Address**

A data element designating the originating source or destination of data being transmitted

#### 3.2

##### **AEI (Automatic Equipment Identification)**

The process of identifying equipment or entities that uses the surface transportation infrastructures by means of *OBE*'s combined with the unambiguous data structure defined in these Standards. Within this series of Standards, 'Equipment' indicates large equipment that is carried in, or forms an integral part of, a trailer or trailer mounted unit.

#### 3.3

##### **Air interface**

The conductor-free medium between an *OBE* and the reader/interrogator through which the linking of the *OBE* to the reader /interrogator is achieved by means of electro-magnetic signals.

#### 3.4

##### **Application identifier**

In the context of this reference architecture model and its numbering and data structures, one item of a data element construct (usually the first octet) that uniquely identifies the domain of an ITS/RTTT information exchange at an explicitly defined reference point (see Figure 5), usually at reference points "Alpha", "Beta" or "Zeta"). This octet shall identify that the message is a specific RTTT message.

#### 3.5

##### **ASN.1**

Abstract Syntax Notation One, as defined in ISO 8824 and ISO 8825.

#### 3.6

##### **AVI (Automatic vehicle identification)**

The process of identifying vehicles using *OBE* combined with the unambiguous data structure defined in these Standards.

#### 3.7

##### **AVI/AEI System Operator**

The commercial operator of an AVI/AEI/RTTT system that uses *OBE*'(s) for the purposes defined in this Technical Specification.

#### 3.8

##### **Bi-directional dialogue**

Two way communications between *Fixed Equipment* and *OBE*'(s).

#### 3.9

##### **Bill of lading**

A document which evidences a contract of the carriage and the taking over or loading of the goods by the carrier, and by which the carrier undertakes to deliver the goods against surrender of the document. A provision in the document that the goods are to be delivered to the order of a named person, or to order, or to bearer, constitutes such an undertaking. The document has the following functions:

- a receipt for goods, signed by a duly authorised person on behalf of the carriers;
- a document of title to the goods described therein;
- evidence of the terms and conditions of carriage agreed upon between the two parties.

**3.10**

**Communication control**

*Fixed equipment* function to control the communication between *Fixed Equipment* and *OBE*

**3.11**

**Compatibility**

Capability of two or more items or components of equipment or material to exist and/or function in the same system or environment without modification, adaptation or mutual interference

**3.12**

**Consignment**

A separately identifiable amount of goods (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 (ISO 14812)

**3.13**

**Consignor**

A party that provides goods to another party. A Consignor may be a manufacturer, trader, agent, or individual. Also known as a “goods provider”.

**3.14**

**Container**

A receptacle for the transport of goods, especially one readily transferable from one form of transport to another. See also non-ISO *Container*.

**3.15**

**DSRC**

See *Dedicated short range communication*.

**3.16**

**Data element structure**

A framework comprising a number of data elements in a prescribed form. Also known as a 'message'.

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**3.17**

**Dedicated Short Range Communication**

A means of effecting local (short range) transactions between *Fixed equipment* and *OBE*(s) using an 'air interface' comprising inductive or propagated signals between the *Fixed equipment* and *OBE*(s).

**3.18**

**EDI (Electronic data interchange)**

The passing of a data message, or series of messages, between computers and/or between different software systems. Within this context an EDI message is normally compatible with the form specified in ISO 9897. EDI is an instance of an *EDT* transaction

**3.19**

**EDT (Electronic data transfer)**

The passing of data sets comprising an entire message from one computer to another or from one software system to another.

**3.20**

**Goods provider**

A party that provides goods to another party. A goods provider may be a manufacturer, trader, agent, or individual. More commonly known as a “consignor”

**3.21**

**Information**

Data, documentation, and other relevant knowledge organized to inform and describe

**3.22****Information manager**

The function of managing information in a system. The role of information manager may be provided by one or many actors. The role of Information Manager may be performed internally by one or more of the system principal actors, or may be formed commercially or altruistically by one or more third parties.

**3.23****Interchangeability**

A condition which exists when two or more items possess such functional and physical characteristics as to be equivalent in performance and durability, and are capable of being exchanged one for the other without alteration of the items themselves, or of adjoining items, and without selection for fit and performance.

**3.24****Intermodal transport**

The movement of goods in one or more loading unit or vehicle which uses successively several modes of transport without handling of the goods themselves when changing modes (CEN ISO/TS 17262, CEN ISO/TS 17263).

**3.25****Interoperability**

The ability of systems to provide services to and accept services from other systems and to use the services so exchanged to enable them to operate effectively together.

**3.26****Interrogator**

A device that performs the functions of a reader, but in addition has the ability to write new data to an *OBE*, or change data held in the *OBE* memory via an air interface.

**3.27****ISO Container**

A large boxlike receptacle of standard design for the transport of goods. Defined in ISO 10374 (under revision). See also *ISO Container*.

**3.28****Item**

An item of goods to be moved. An item may be a single unit, such as a letter, a bundle or box of units or other units that will be bundled into a receptacle which will be carried in equipment (such as an *ISO intermodal container*) as a sub component of an *AEI* item. Items are not defined in this family of Standards and are defined by the Standards of ISO/IEC SC 31. Item identification for Logistics.

**3.29****Journey**

Within the AVI/AEI context, the physical movement of goods from the *goods provider* to the *receiver*.

**3.30****Load**

That which is to be transported from the *consignor* to the *receiver*. A load comprises the *consignment*, packaging, pallets and or containers that are smaller than an *ISO container*

**3.31****Manifest**

Document which lists complete specifications of the goods loaded for transport to various destinations by a vessel or other means of transport. As a rule cargo manifests are drawn up by the agents in the ports of loading and are based upon the bills of lading. For shipping, a manifest represents a cumulating of bills of lading for official and administrative purposes (ISO/TR 14812).

**3.32****Media Adaptation**

Function to adapt the communication media (air interface propagated modulation) to communication and computing equipment.

**3.33**

**Monologue**

One way communication between the *Fixed equipment* and *OBE*(s).

**3.34**

**Multimodal Transport**

The carriage of goods by at least two different modes of transport. In contrast, *intermodal transport* implies changing from mode to another using the same form of loading unit. Multimodal transport implies that either there is more than one modal shift, or that loads may be broken into partial loads as part of a modal change (ISO/TR 14812).

**3.35**

**Non ISO container**

Within the AVI/AEI context, a *container* used in the transport of goods that does **not** comply with any ISO container Standard ( e.g.non compliant with ISO 10374).

**3.36**

**Non returnable unit**

One trip pallets, containers or packaging which is not returned to the *consignor* or *returnables manager*.

**3.37**

**OBE (On board equipment)**

A device on board or attached to the vehicle/equipment to perform the functionality of AVI/AEI.

**3.38**

**Operator**

see *AVI/AEI System operator*

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**3.39**

**Packed encoding rules (PER)**

A standardised determination of data encoding to conform to the requirements of ISO 8824 ASN.1 data notation. The "Packed Encoding Rules" are given in ISO 8825. Note that there are alternate forms of encodation such as "Basic Encoding Rules" (BER). Within FICS Standards, reference to ASN.1 shall imply also the use of PER as specified in ISO 8825 unless otherwise stated (ISO/TR 14812).

**3.40**

**Packet**

A collation of goods to be moved. An a packet may be a single unit, or a collection of smaller packets and items that will be bundled into a receptacle which will be carried in equipment (such as an *ISO intermodal container*) as a sub component of an AEI item. Packets are not defined in this family of Standards and are defined by the Standards of ISO/IEC SC 31. Item identification for logistics.

**3.41**

**Pallet**

A wooden, plastic or metal platform that enables a bundle of goods to be moved around by a fork lift truck or similar platform moving device that will be carried in equipment (such as an *ISO Intermodal Container*) as a sub component of an AEI item. Pallets are not defined in this family of Standards and are defined by the Standards of ISO/IEC SC 31 *Item identification for logistics*. See also '*AEI*', '*items*', '*packets*', and '*receptacles*'.

**3.42**

**Programmable (device/OBE)**

A device where all or part of the identity and memory can be reprogrammed many times by an external device, but not during a normal 'on the fly' *read/write* cycle.

**3.43**

**RCU**

Returnable container unit. See also *returnable unit*.