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Intelligent transport systems — Vocabulary

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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 (see 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 (see 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.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The definitions found in this document have been formulated in accordance with major ISO International Standards such as ISO 704 and are based on a consistent concept model. It is recognized that the contents of this document are not exhaustive and that terminology evolves over time.

In most cases, the definitions provided within this document are suitable for general application throughout intelligent transport systems (ITS). In those circumstances where a term is intended for a specific domain of discourse or where the term can be used in multiple domains, the intended context is indicated at the beginning of the definition as bracketed text (e.g. "<ITS-S>").

In addition to a Bibliography, this document provides an index that provides an alphabetical listing of all preferred, admitted, and deprecated terms contained in this document.

Other standardization groups and organizations are encouraged to adopt the terminology in this document to promote better understanding of terms among ITS professionals worldwide. The terms and definitions contained within this document can be searched online at ISO's Online Browsing Platform available at https://www.iso.org/obp.

Intelligent transport systems — Vocabulary

1 Scope

This document defines terms relating to intelligent transport systems (ITS).

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Core terms

3.1.1 Entity terms

NOTE Figure A.1 depicts the concept model for the terms defined in this subclause.

3.1.1.1
entity
concrete or abstract thing that exists, did exist, or can possibly exist, including associations among these things

EXAMPLE *Person* (3.1.1.6), object, event, idea, process, etc.

3.1.1.2
immaterial entity
entity (3.1.1.1) that does not occupy three-dimensional space

EXAMPLE Idea, process, organization, etc.

3.1.1.3
material entity
entity (3.1.1.1) that occupies three-dimensional space

Note 1 to entry: All material entities have certain characteristics that can be described and therefore this concept is important for ontology purposes.

3.1.1.4
non-biological entity
material entity (3.1.1.3) that is not and has never been a living organism

3.1.1.5
biological entity
material entity (3.1.1.3) that was or is a living organism

3.1.1.6
person
biological entity (3.1.1.5) that is a human being

3.1.2 General system terms

NOTE Figure A.2 depicts the concept model for the terms defined in this subclause.

3.1.2.1
system
combination of interacting *elements* (3.1.3.10) organized to achieve one or more stated purposes

[SOURCE: ISO/IEC/IEEE 15288:2015, 4.1.46, modified — Notes to entry removed.]

3.1.2.2
transport system
system (3.1.2.1) of infrastructure *elements* (3.1.3.10) and optionally *vehicles* (3.7.1.1) that are jointly designed to move *material entities* (3.1.1.3) from an origin to a destination

Note 1 to entry: Transport systems can also include any supporting system, such as information and control systems.

3.1.2.3
surface transport system
transport system
transport system (3.1.2.2) designed to move *material entities* (3.1.1.3) across the surface or near-surface of the Earth

Note 1 to entry: A surface transport system can include tunnels, bridges and similar *elements* (3.1.3.10).

Note 2 to entry: There is not complete agreement on the precise limitations of a "surface transport system" within the ITS community. Currently, the term is almost exclusively applied to ground-based travel of goods and people over significant distances. The term is viewed as including ferry systems, which often form an integral part of a local surface transport system; it is less clear if it includes long-distance sea-fairing ships. The term "surface transport systems" is also generally limited to transport systems that cover a considerable distance (e.g. factory conveyance technologies are not often referred to as "surface transport systems"). It has been suggested that air travel, which is arguably a transport system designed to move physical entities between points on the surface of the earth, ought to be included in the scope of the term, but this perspective is not universally accepted. It is expected that the exact limitations of the term will be further refined as ITS matures.

Note 3 to entry: Due to the defined scope of ITS, the term "transport system" is intended to be interpreted as being synonymous with the term "surface transport system" unless explicitly specified otherwise.

3.1.2.4
intelligent transport system
ITS
intelligent transportation system
system (3.1.2.1) comprised of information, communication, sensor and control technologies and that is designed to benefit a *surface transport system* (3.1.2.3)

Note 1 to entry: "Intelligent transportation system" is the American English equivalent.

Note 2 to entry: Benefits potentially include, but are not limited to, increased safety, sustainability, efficiency and comfort.

Note 3 to entry: The full term (i.e. "intelligent transport system") is often used when the noun is used as a subject, whereas the abbreviation (i.e. "ITS") is often used to modify another noun (e.g. "Intelligent transport systems provide ITS services.").

3.1.2.5
cooperative ITS
C-ITS
subset of *ITS* (3.1.2.4) where information is shared among *ITS stations* (3.2.7.3) in a manner that enables its use by multiple *ITS services* (3.5.3.1)

3.1.3 General architecture terms

NOTE Figure A.3 depicts the concept model for the terms defined in this subclause.

3.1.3.1
architecture
system architecture
<system> fundamental concepts or properties of a *system* (3.1.2.1) in its *environment* (3.1.3.11) embodied in its *elements* (3.1.3.10), *relationships* (3.1.6.8) and in the principles of its design and evolution

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.2]

3.1.3.2
architecture description
work product used to express an *architecture* (3.1.3.1)

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.3]

3.1.3.3
architecture framework
conventions, principles and practices for the description of *architectures* (3.1.3.1) established within a specific domain of application and/or community of *stakeholders* (3.1.3.4)

EXAMPLE 1 Generalised Enterprise Reference Architecture and Methodologies (GERAM) [ISO 15704] is an architecture framework.

EXAMPLE 2 Reference Model of Open Distributed Processing (RM-ODP) [ISO/IEC 10746] is an architecture framework.

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.4]

3.1.3.4
stakeholder
system stakeholder
<system> individual, team, organization, or *classes* (3.1.12.2) thereof, having an interest in a *system* (3.1.2.1)

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.10]

3.1.3.5
concern
system concern
<system> interest in a *system* (3.1.2.1) relevant to one or more of its *stakeholders* (3.1.3.4)

Note 1 to entry: A concern pertains to any influence on a system in its *environment* (3.1.3.11), including developmental, technological, business, operational, organizational, political, economic, legal, regulatory, ecological and social influences.

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.7]

3.1.3.6
architecture viewpoint
work product establishing the conventions for the construction, interpretation and use of *architecture views* (3.1.3.7) to frame specific system *concerns* (3.1.3.5)

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.6]

3.1.3.7
architecture view
work product expressing the *architecture* (3.1.3.1) of a *system* (3.1.2.1) from the perspective of specific system *concerns* (3.1.3.5)

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.5]

3.1.3.8
model kind
conventions for a type of modelling

Note 1 to entry: Examples of model kinds include *data flow* (3.1.7.1) diagrams, *class* (3.1.11.2) diagrams, Petri nets, balance sheets, organization charts and state transition models.

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.9]

3.1.3.9
architecture model
work product representing one or more *architecture views* (3.1.3.7) and expressed in a format governed by a *model kind* (3.1.3.8)

3.1.3.10
element
architecture element
<architecture> component member of an *architecture model* (3.1.3.9) included in an *architecture view* (3.1.3.7)

3.1.3.11
environment
system environment
<system> context determining the setting and circumstances of all influences upon a *system* (3.1.2.1)

Note 1 to entry: The environment of a system includes developmental, technological, business, operational, organizational, political, economic, legal, regulatory, ecological and social influences.

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.8]

3.1.4 Architecture view terms

NOTE Figure A.4 depicts the concept model for the terms defined in this subclause.

3.1.4.1
communications view
architecture view (3.1.3.7) from the *communications viewpoint* (3.1.4.2)

Note 1 to entry: Within ITS, the preferred model for describing the communications view is based on the *ITS-S reference architecture* (3.1.9.4).

3.1.4.2
communications viewpoint
architecture viewpoint (3.1.3.6) used to frame *concerns* (3.1.3.5) related to all layers of the Open Systems Interconnection (OSI) stack and related management and security issues

3.1.4.3
enterprise view
architecture view (3.1.3.7) from the *enterprise viewpoint* (3.1.4.4)

3.1.4.4
enterprise viewpoint
architecture viewpoint (3.1.3.6) used to frame the policies, funding incentives, working arrangements and jurisdictional structure that support the technical layers of the *architecture* (3.1.3.1)

3.1.4.5
functional view
architecture view (3.1.3.7) from the *functional viewpoint* (3.1.4.6)

3.1.4.6
functional viewpoint
architecture viewpoint (3.1.3.6) used to frame *concerns* (3.1.3.5) related to the definition of *processes* (3.1.7.2) that perform surface transport functions and *data flows* (3.1.7.1) shared between these processes

3.1.4.7
physical view
architecture view (3.1.3.7) from the *physical viewpoint* (3.1.4.8)

Note 1 to entry: The term "deployment view" is sometimes used within the broader ICT community, but the term "physical view" is preferred to prevent confusion between the physical view of a reference architecture and any part of a *deployment architecture* (3.1.9.3).

3.1.4.8
physical viewpoint
architecture viewpoint (3.1.3.6) used to frame *concerns* (3.1.3.5) related to the assignment of functionality to *physical objects* (3.1.8.1) and the interfaces among these physical objects

3.1.5 Architecture — Communication view terms

NOTE Figure A.5 depicts the concept model for the terms defined in this subclause.

3.1.5.1
application entity
ITS-S application entity
DEPRECATED: information layer
<ITS-S> part of the *ITS station reference architecture* (3.1.9.4) that is responsible for providing ITS-related functionality

Note 1 to entry: Within the US, the National Transportation Communications for ITS Protocol (NTCIP) standards identify an "information layer" on top of the traditional OSI stack. However, the purpose of this layer includes both information configuration and functionality. The ITS-S reference architecture separates these two roles between the *management entity* (3.1.5.6) and the application entity.

3.1.5.2
access layer
protocol layer that contains the OSI physical and data link layer protocols

3.1.5.3
ITS-S access layer
link layer
subnet layer
<ITS-S> protocol layer in the *ITS station reference architecture* (3.1.9.4) containing the OSI physical and data link layer protocols for ITS communications

Note 1 to entry: Within the Internet Engineering Task Force (IETF), the term "link layer" is used to describe the same functionality as the ITS-S access layer.

Note 2 to entry: Within the US, the NTCIP standards use the term "subnet layer" to describe the same functionality as the ITS-S access layer.

3.1.5.4
transnet layer
ITS-S networking and transport layer
networking and transport layer
<ITS-S> protocol layer in the *ITS station reference architecture* (3.1.9.4) containing the OSI network and transport layer protocols

Note 1 to entry: The full name of this layer is the networking and transport layer, but the term transnet layer provides a more concise name.

3.1.5.5
facilities layer
ITS-S facilities layer
DEPRECATED: application layer
<ITS-S> protocol layer in the *ITS station reference architecture* (3.1.9.4) containing the OSI session, presentation and application layer protocols

Note 1 to entry: Within the US, the NTCIP standards call the facilities layer the "application layer". However, as this term is easily confused with both the OSI application layer and the *application entity* (3.1.5.1), the term should be avoided and qualified when used (e.g. OSI application layer).

3.1.5.6
management entity
ITS-S management entity
<ITS-S> part of the *ITS station reference architecture* (3.1.9.4) that is responsible for management of communications and configuration information for the local *physical object* (3.1.8.1) and possibly remote physical objects

3.1.5.7
security entity
ITS-S security entity
<ITS-S> part of the *ITS station reference architecture* (3.1.9.4) that is responsible for providing privacy, communication security and *system* (3.1.2.1) security

3.1.6 Architecture — Enterprise view terms

NOTE Figure A.6 depicts the concept model for the terms defined in this subclause.

3.1.6.1
enterprise object
element (3.1.3.10) within an *enterprise view* (3.1.4.3) that represents an organization or individual

3.1.6.2
resource
enterprise view resource
<enterprise view> *element* (3.1.3.10) that represents an *entity* (3.1.1.1) that is managed, operated, referenced and/or used to develop and provide *ITS* (3.1.2.4)

3.1.6.3
document
uniquely identified unit of information for human use

EXAMPLE A report, specification, manual or book, in printed or electronic form.

Note 1 to entry: A document can be a single information item, or part of a larger information item.

[SOURCE: ISO/IEC/IEEE 15289:2019, 3.1.10]

3.1.6.4
interaction
enterprise view interaction
<enterprise view> *element* (3.1.3.10) that represents coordination between two *enterprise objects* (3.1.6.1)

3.1.6.5
formal coordination
enterprise view formal coordination
<enterprise view> *interaction* (3.1.6.4) between two *enterprise objects* (3.1.6.1) governed by a documented agreement

EXAMPLE A road operator can enter into formal agreement(s) with the owner of a *road* (3.3.5.1) and the owner(s) of the associated *roadside* (3.3.1.10) equipment.

3.1.6.6
informal coordination
enterprise view informal coordination
<enterprise view> *interaction* (3.1.6.4) between two *enterprise objects* (3.1.6.1) governed by an understanding that is not documented in a formal agreement between the two parties

3.1.6.7
role
enterprise view role
<enterprise view> *element* (3.1.3.10) that represents the specified responsibilities between an *enterprise object* (3.1.6.1) and another *enterprise view* (3.1.4.3) element

3.1.6.8
relationship
enterprise view relationship
<enterprise view> *element* (3.1.3.10) that represents an association between two *resources* (3.1.6.2)

3.1.6.9
include
enterprise view include
<enterprise view> *relationship* (3.1.6.8) where one *resource* (3.1.6.2) contains another resource

EXAMPLE Every ITS component includes one or more *modules* (3.1.8.7).

3.1.6.10
extend
enterprise view extend
<enterprise view> *relationship* (3.1.6.8) where one *resource* (3.1.6.2) supplements another resource

EXAMPLE A *module* (3.1.8.7) can extend the functionality of another module.

3.1.7 Architecture — Functional view terms

NOTE Figure A.7 depicts the concept model for the terms defined in this subclause.

3.1.7.1
data flow
representation of data flowing between two *processes* (3.1.7.2) or between a process and a *terminator* (3.1.8.3)

3.1.7.2
process
functional view process
<functional view> series of one or more *functions* (3.1.7.3) in support of an *ITS service* (3.5.3.1)

3.1.7.3
function
functional view function
<functional view> series of actions or activities performed by a given object to achieve a goal

Note 1 to entry: A function transforms inputs into outputs that may include the creation, modification, monitoring or destruction of *elements* (3.1.3.10).

3.1.7.4
process specification
document (3.1.6.3) that defines a lowest-level *process* (3.1.7.2)

3.1.8 Architecture — Physical view terms

NOTE Figure A.8 depicts the concept model for the terms defined in this subclause.

3.1.8.1
physical object
ITS physical object
<physical view> abstraction of a *material entity* (3.1.1.3) that interacts with other abstract material entities in the provision of *ITS services* (3.5.3.1)

Note 1 to entry: Physical objects are represented as *elements* (3.1.3.10) within the *physical view* (3.1.4.7) and perform a role. Physical objects can be implemented as cloud-based *systems* (3.1.2.1).

Note 2 to entry: Within many *ITS reference architectures* (3.1.9.5), physical objects are placed into one of five categories: centre, support, field, vehicle or *traveller* (3.6.1.1).

3.1.8.2
ITS component
physical object (3.1.8.1) that has been assigned one or more *functional objects* (3.1.8.6) in the provision of one or more *ITS services* (3.5.3.1)

Note 1 to entry: Physical objects are ITS components if they are an integral part of the *system* (3.1.2.1); otherwise they are *terminators* (3.1.8.3).

3.1.8.3
terminator
ITS terminator
entity (3.1.1.1) that is external to the *ITS service* (3.5.3.1) implementation but with which the implementation communicates either to obtain inputs or to which it can send outputs

Note 1 to entry: A terminator can exist within *functional* (3.1.4.5) and *physical views* (3.1.4.7).

3.1.8.4
information flow
information that is exchanged between *physical objects* (3.1.8.1)

3.1.8.5
information transfer
information flow triple
information flow (3.1.8.4) from a *physical object* (3.1.8.1) acting as an information provider and sent to another physical object acting as an information consumer

Note 1 to entry: The term "information flow triple" is used extensively in the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT; see Reference [25]).

3.1.8.6
functional object
ITS functional object
set of related *processes* (3.1.7.2) that are performed by a *physical object* (3.1.8.1) to fulfil aspects of an *ITS service* (3.5.3.1)

EXAMPLE A vehicle OBE can include a "vehicle basic safety" functional object.

Note 1 to entry: The term "module" is used by the European FRAME architecture while the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) uses the term "functional object".

3.1.8.7
module
ITS module
functional object (3.1.8.6) that can be replaced and has defined interfaces

3.1.9 Architecture type terms

NOTE Figure A.9 depicts the concept model for the terms defined in this subclause.

3.1.9.1
reference architecture
architecture (3.1.3.1) that provides a template solution for *planning* (3.1.9.2) and *deployment architectures* (3.1.9.3)

Note 1 to entry: Interface standards are based on a reference architecture, which should be explicitly described.

3.1.9.2
planning architecture
regional architecture
architecture (3.1.3.1) that provides a long-term vision of *system elements* (3.1.3.10) that may be deployed and managed by different projects and/or *entities* (3.1.1.1) within a geographic area

Note 1 to entry: Some countries use the term "regional architecture", but in International Standards, the term "regional" is avoided due to its multiple meanings.

3.1.9.3
deployment architecture
architecture (3.1.3.1) that provides a vision of a specific deployment of a *system* (3.1.2.1) within a geographic area

3.1.9.4
ITS-S reference architecture
reference architecture (3.1.9.1) for handling communications within a *physical object* (3.1.8.1) as defined in ISO 21217

Note 1 to entry: The ITS-S reference architecture provides a model for describing communication.

3.1.9.5
ITS reference architecture
reference architecture (3.1.9.1) for one or more *ITS services* (3.5.3.1)

Note 1 to entry: An ITS architecture can be a reference, planning or *deployment architecture* (3.1.9.3).

Note 2 to entry: The Harmonised Architecture Reference for Technical Standards (HARTS; see Reference [26]) is an example of an ITS reference architecture.

3.1.9.6
ITS planning architecture
planning architecture (3.1.9.2) for one or more *ITS services* (3.5.3.1)