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ISO TC 204/WG 1

Secretariat: ANSI

# Intelligent transport systems — Vocabulary

# WD stage

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# Contents

# Foreword

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

This is the first edition of this document.

# Introduction

This document establishes the preferred vocabulary within ISO/TC 204. Standards developed by this committee are encouraged to copy the definitions found in this document as they have been formulated in accordance with major ISO standards such as ISO 704 *Terminology Work – Principles and Methods* and are based on a consistent concept model.

Other standards groups and organisations are also 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 is intended to formally document the vocabulary used and developed by the entire intelligent transport systems (ITS) community. The terms and definitions are developed in an open environment according to the principles defined in Annex A with specific versions formally adopted through updates to this ISO document.

It is recognized that the contents of this document are not exhaustive, and that terminology evolves over time. ISO/TC 204 standards are encouraged to adopt the definitions included within this document; however, it is recognized that each document may need to define additional terms to meet its own needs. Annex B provides the best practices for defining terms in other documents. The process to suggest changes to the contents of this document is provided in Annex C.

In most cases, the definitions provided within this document are suitable for general application throughout ITS. In those circumstances where the definition only applies within a restricted context, the context is indicated at the beginning of the definition.

EDITOR'S NOTE 1: Text marked "EDITOR'S NOTE" in this document will be removed in the final TR.

EDITOR'S NOTE 2: To facilitate the review of this Technical Report by others, the attached Microsoft Excel file maps each of the terms defined in this document to similar terms defined in existing ISO/TC 204 documents, along with the definitions for those terms and the WGs responsible for developing and maintaining those documents.

## 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 terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at http://www.iso.org/obp
- IEC Electropedia: available at http://www.electropedia.org/

### 3.1 General

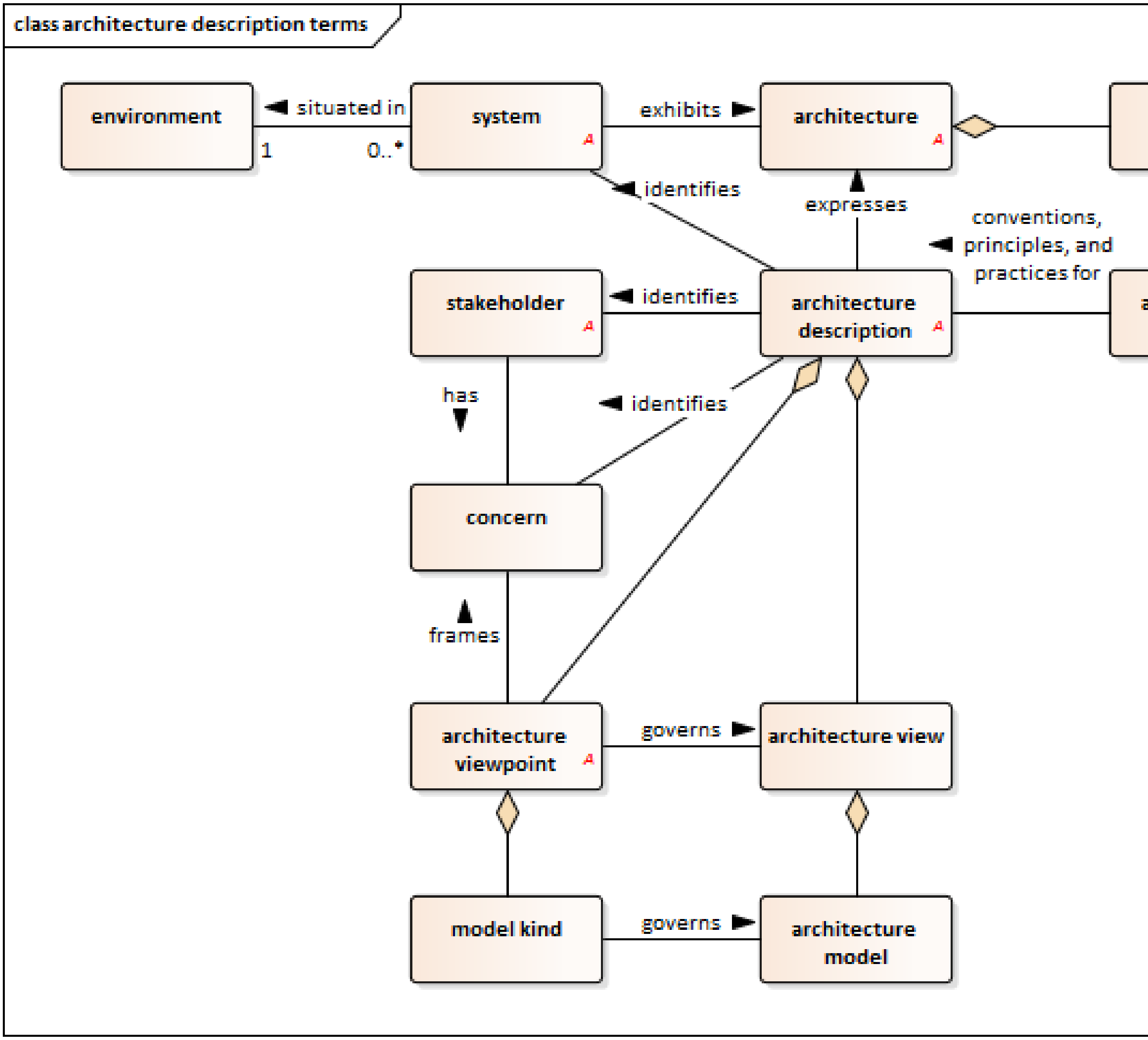


Figure 1: Concept model for architecture description terms

**3.1.1.1**
**architecture**
<system> fundamental concepts or properties of a system in its *environment* ( 3.1.1.9) embodied in its *elements* ( 3.1.1.8), relationships, and in the principles of its design and evolution \r\n

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

**3.1.1.10**
**model kind**
conventions for a type of modelling

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

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

**3.1.1.11**
**stakeholder**
<system> individual, team, organization, or classes thereof, having an interest in a system \r\n

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

**3.1.1.12**
**system**
combination of interacting elements organized to achieve one or more stated purposes

[Source: ISO/IEC/IEEE 15288:2015, 4.1.46]

**3.1.1.2**
**architecture description**
work product used to express an *architecture* ( 3.1.1.1) \r\n

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

**3.1.1.3**
**architecture framework**
conventions, principles and practices for the description of *architectures* ( 3.1.1.1) established within a specific domain of application and/or community of stakeholders \r\n

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

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

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

**3.1.1.4**
**architecture model**
work product representing one or more *architecture views* ( 3.1.1.5) and expressed in a format governed by a *model kind* ( 3.1.1.10)\r\n

**3.1.1.5**
**architecture view**
work product expressing the *architecture* ( 3.1.1.1) of a system from the perspective of specific system *concerns* ( 3.1.1.7) \r\n

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

**3.1.1.6**
**architecture viewpoint**
work product establishing the conventions for the construction, interpretation and use of *architecture views* ( 3.1.1.5) to frame specific system *concerns* ( 3.1.1.7) \r\n

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

**3.1.1.7**
**concern**
<system> interest in a system relevant to one or more of its *stakeholders* ( 3.1.1.11)

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

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

**3.1.1.8**
**element**
<architecture> component member of an *architecture* ( 3.1.1.1)

**3.1.1.9**
**environment**
<system> context determining the setting and circumstances of all influences upon a system

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]

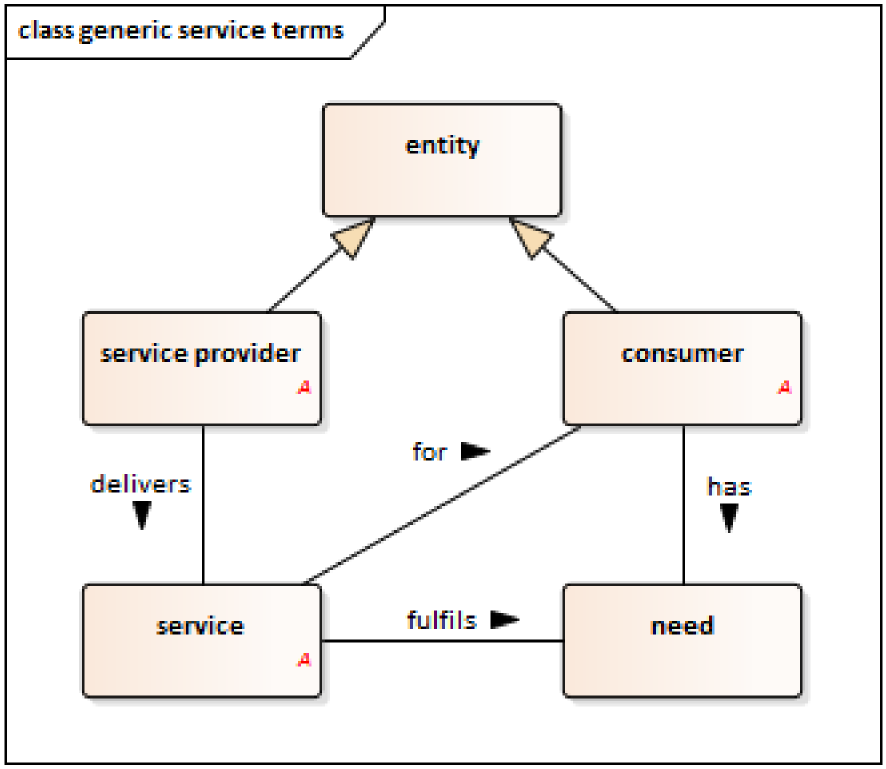


Figure 2: Concept model for generic service terms

**3.1.10.1**
**entity**
concrete or abstract thing that exists, did exist, or might exist, including associations among these things

EXAMPLE A person, object, event, idea, process, etc.

[Source: ISO/TR 17185-1]

**3.1.10.2**
**service provider**
*entity* ( 3.1.10.1) that delivers one or more *services* ( 3.1.10.3)

**3.1.10.3**
**service**
performance of one or more tasks or provision of one or more facilities to enable one or more tasks for a *consumer* ( 3.1.10.4) to fulfil a *need* ( 3.1.10.5)

**3.1.10.4**
**consumer**
*entity* ( 3.1.10.1) that has a *need* ( 3.1.10.5) to be fulfilled

**3.1.10.5**
**need**
factor or condition necessary to achieve desired results within a specified context of use

[Source: Adapted from ISO 25060:2010(en), 2.25]

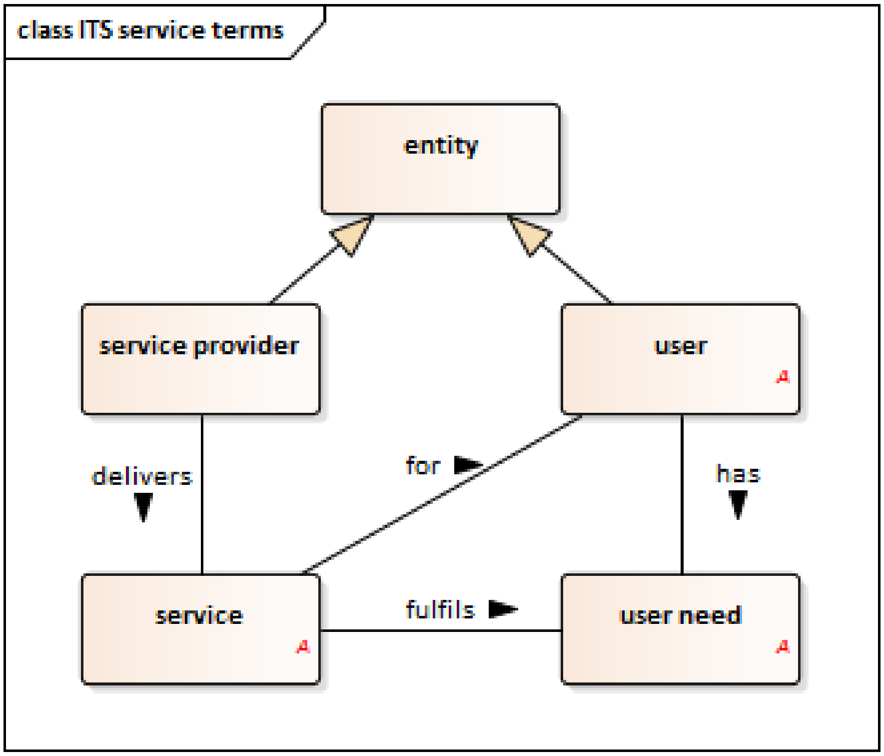


Figure 3: Concept model for ITS service terms

**3.1.11.1**
**service**
<ITS> performance of one or more tasks that fulfils an *ITS user need* ( 3.1.11.4) for an *ITS user* ( 3.1.11.3)

**3.1.11.2**
**service provider**
<ITS> *entity* ( 3.1.10.1) that delivers one or more *ITS services* ( 3.1.11.1)

**3.1.11.3**
**user**
<ITS> *entity* ( 3.1.10.1) that has an *ITS user need* ( 3.1.11.4) to be fulfilled

**3.1.11.4**
**user need**
<ITS> *need* ( 3.1.10.5) of an entity external to the intelligent transport system for a *surface transport system* ( 3.1.14.2) benefit that can be met with the use of a *technology system* ( 3.1.14.3)

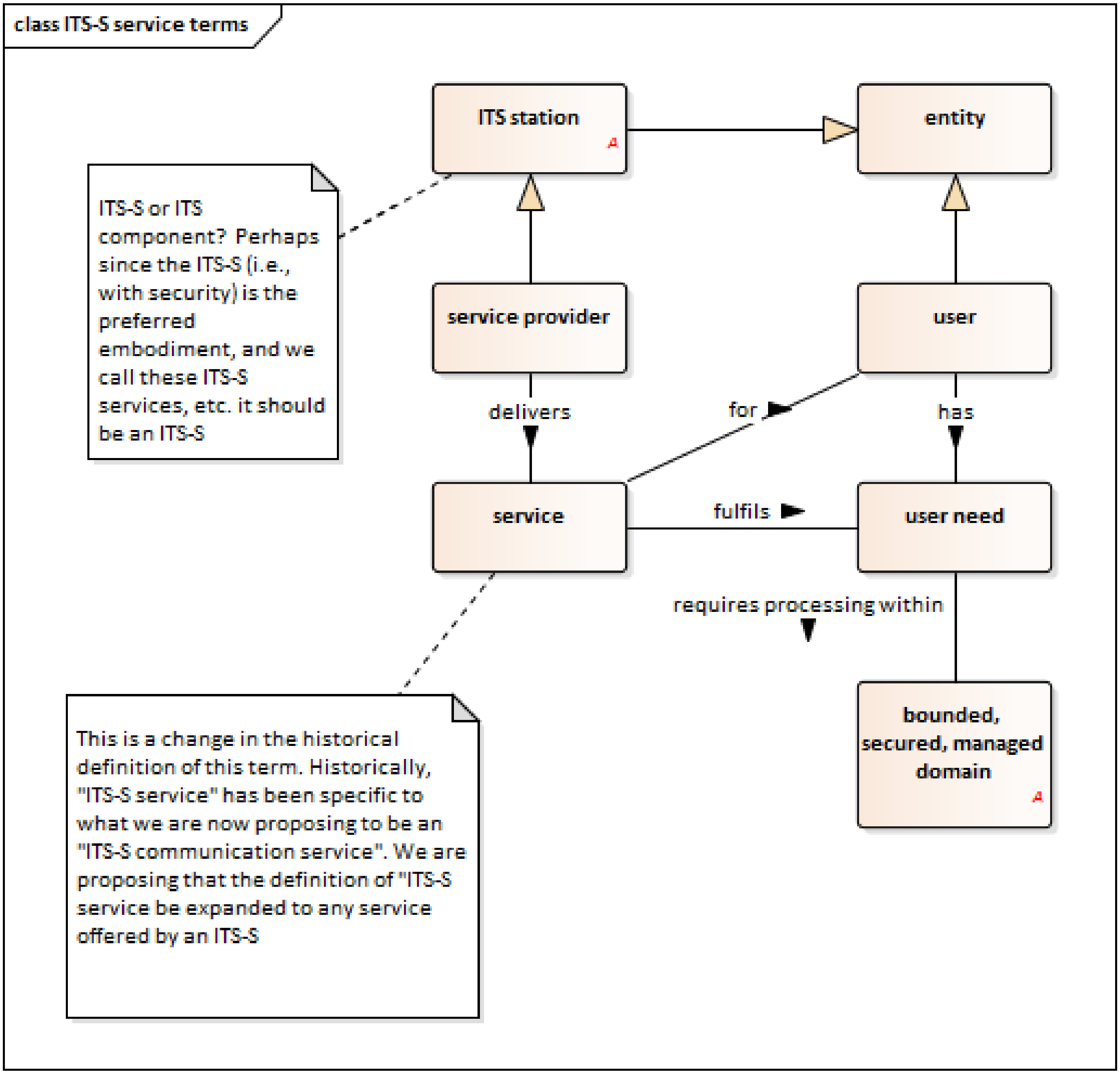


Figure 4: Concept model for ITS-S service terms

**3.1.12.1**
**service provider**
<ITS-S> *ITS-S* ( 3.7.7.2) that delivers one or more *ITS-S services* ( 3.1.12.2)\r\n

**3.1.12.2**
**service**
<ITS-S> performance of one or more tasks that fulfils an *ITS-S user need* ( 3.1.12.4) for an *ITS-S user* ( 3.1.12.3)

**3.1.12.3**
**user**
<ITS-S> *entity* ( 3.1.10.1) that has an *ITS-S user need* ( 3.1.12.4)

**3.1.12.4**
**user need**
<ITS-S> *need* ( 3.1.10.5) for processing within a *bounded, secure, managed domain* ( 3.1.12.5)

**3.1.12.5**
**bounded, secured, managed domain**
controlled processing environment that adheres to a minimum set of management and security principles and procedures so as to establish a level of trust between itself and other similar *ITS stations* ( 3.7.7.2) with which it might communicate

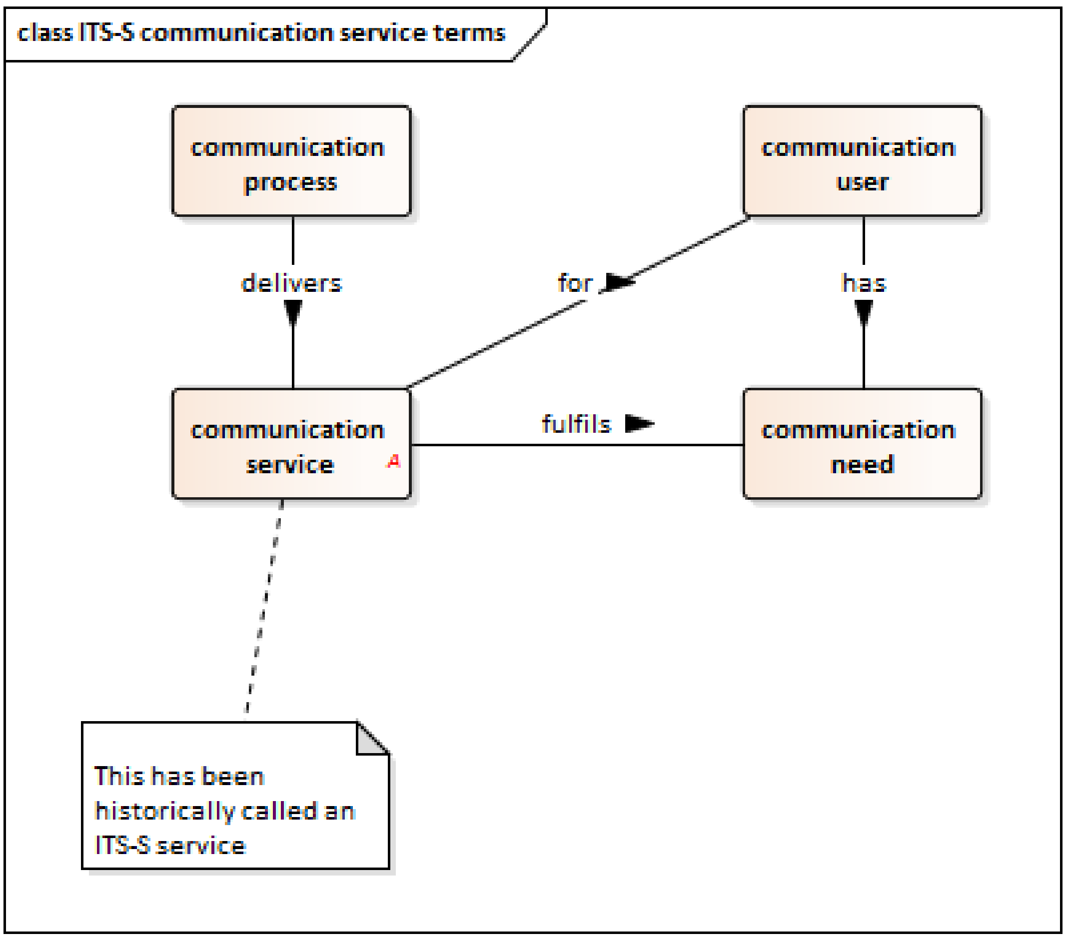


Figure 5: Concept model for ITS-S communication service terms

**3.1.13.1**
**communication process**
<ITS-S> *entity* ( 3.1.10.1) that delivers one or more *ITS-S communication services* ( 3.1.13.2)

**3.1.13.2**
**communication service**
<ITS-S> performance of one or more tasks that fulfils an *ITS-S communication need* ( 3.1.13.4) for an *ITS-S communication user* ( 3.1.13.3)\r\n

**3.1.13.3**
**communication user**
<ITS-S> *entity* ( 3.1.10.1) that has an *ITS-S communication need* ( 3.1.13.4)

**3.1.13.4**
**communication need**
<ITS-S> *need* ( 3.1.10.5) for communication functionality that connects an *ITS-S* ( 3.7.7.2) to other nodes\r\n

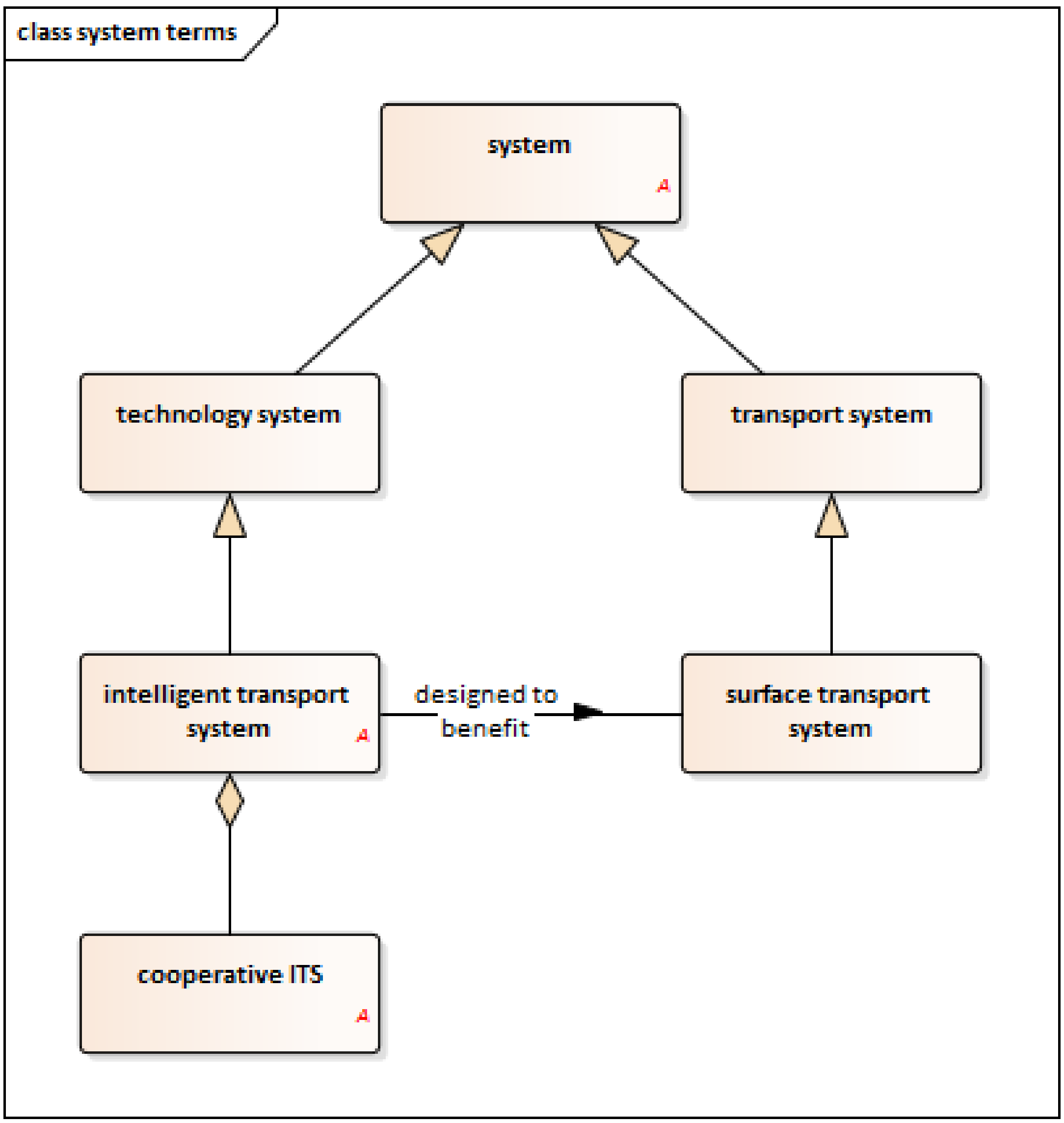


Figure 6: Concept model for system terms

### 3.1.14.1
**transport system**
*system* ( 3.1.1.12) of infrastructure elements and optionally *vehicles* ( 3.8.1.1) that jointly are designed to move *entities* ( 3.1.10.1) from an *origin* to a *destination*

Note 1 to entry: Transport systems are not necessarily limited to the transport of physical entities; the Internet could be considered a transport system of electronic entities.

### 3.1.14.2
**surface transport system**
*transport system* ( 3.1.14.1) designed to move physical entities across the surface of the earth

Note 1 to entry: A surface transport system might include tunnels, bridges, and similar elements.

### 3.1.14.3
**technology system**
*system* ( 3.1.1.12) that is comprised of information, communication, sensor, and control technologies

### 3.1.14.4
**intelligent transport system**
**ITS**
intelligent transportation system
*technology system* ( 3.1.14.3) that is designed to benefit a *surface transport system* ( 3.1.14.2)

Note 1 to entry: There is not complete agreement on the precise limits of ITS. 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. ITS is also generally applied to transport systems that cover a considerable distance (e.g., control systems for factory conveyance technologies are not often referred to as ITS). Some have suggested that air travel, which is arguably a transport system designed to move physical entities between points on the surface of the earth, should be included in the scope of the term, but this perspective is not universally accepted. It is expected that the exact limits of the term will be further refined as the technology matures.

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

Note 3 to entry: The long form (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.).

### 3.1.14.5
**cooperative ITS**
**C-ITS**
subset of *ITS* ( 3.1.14.4) where information is shared among *physical objects* ( 3.1.6.5) based on mutual security agreements with a credentialing system

Note 1 to entry: Most current-day computer systems rely upon an agreement between the owners or users of the two systems involved in an exchange. For example, there is typically bi-lateral agreement between a provider and a user. C-ITS instead relies upon a system of third-party agreements.

In other words, a third party defines the rules for operating within a domain and creates a trust network. Providers and users establish agreements with the third party agreeing to abide by the rules. Providers and users then directly interact based on the rules of the trust network without requiring any direct relationship between the two.

Note 2 to entry: C-ITS does not preclude two parties from having a separate bi-lateral agreement, but any services requiring a bi-lateral agreement would not technically be considered "C-ITS". For example, two emergency vehicles may have a bi-lateral agreement to share incident information containing sensitive data; such a service would not be considered C-ITS, since it is under a bi-lateral agreement. However, the same two vehicles may share vehicle location and motion information for collision avoidance purposes; this would be considered C-ITS since the agreement to share that information is under the broader use case that uses a third-party agreement.

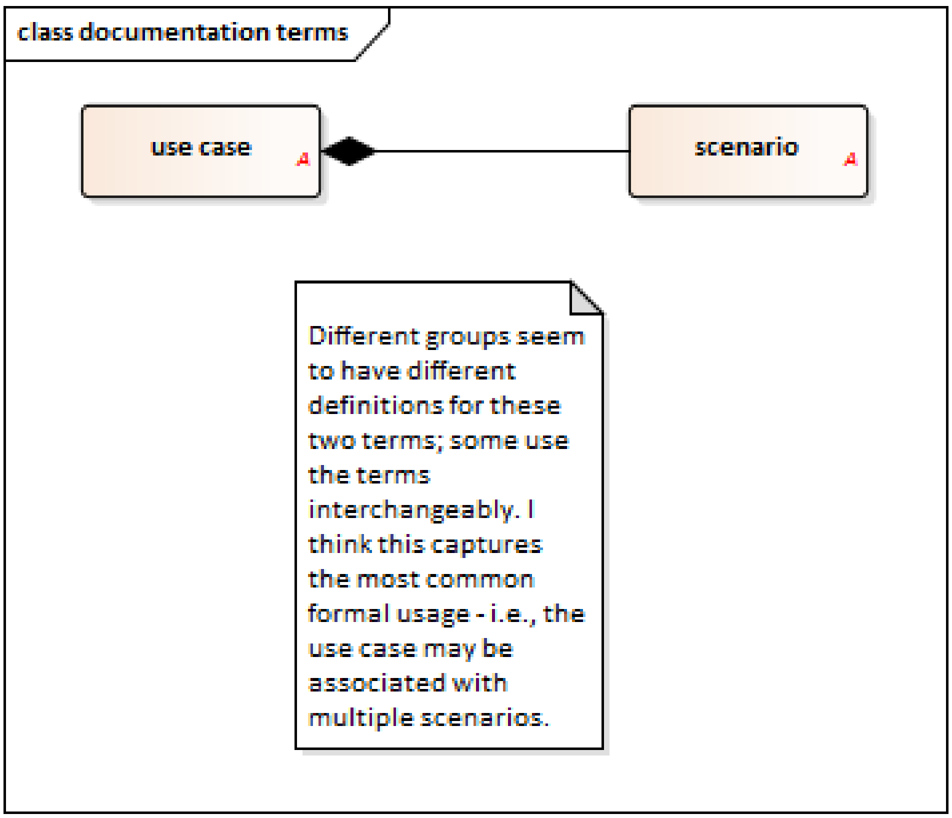


Figure 7: Concept model for documentation terms

**3.1.15.1**
**scenario**
<use case> a description of the sequence of events from the users perspective to perform a task in a specified context\r\n

[Source: ISO/IEC 25062:2006(en), A.17, added the context of a use case]

**3.1.15.2**
**use case**
description of the behavioural requirements of a system and its interaction with a user\r\n

[Source: ISO/IEC/IEEE 26515:2011(en), 4.15]

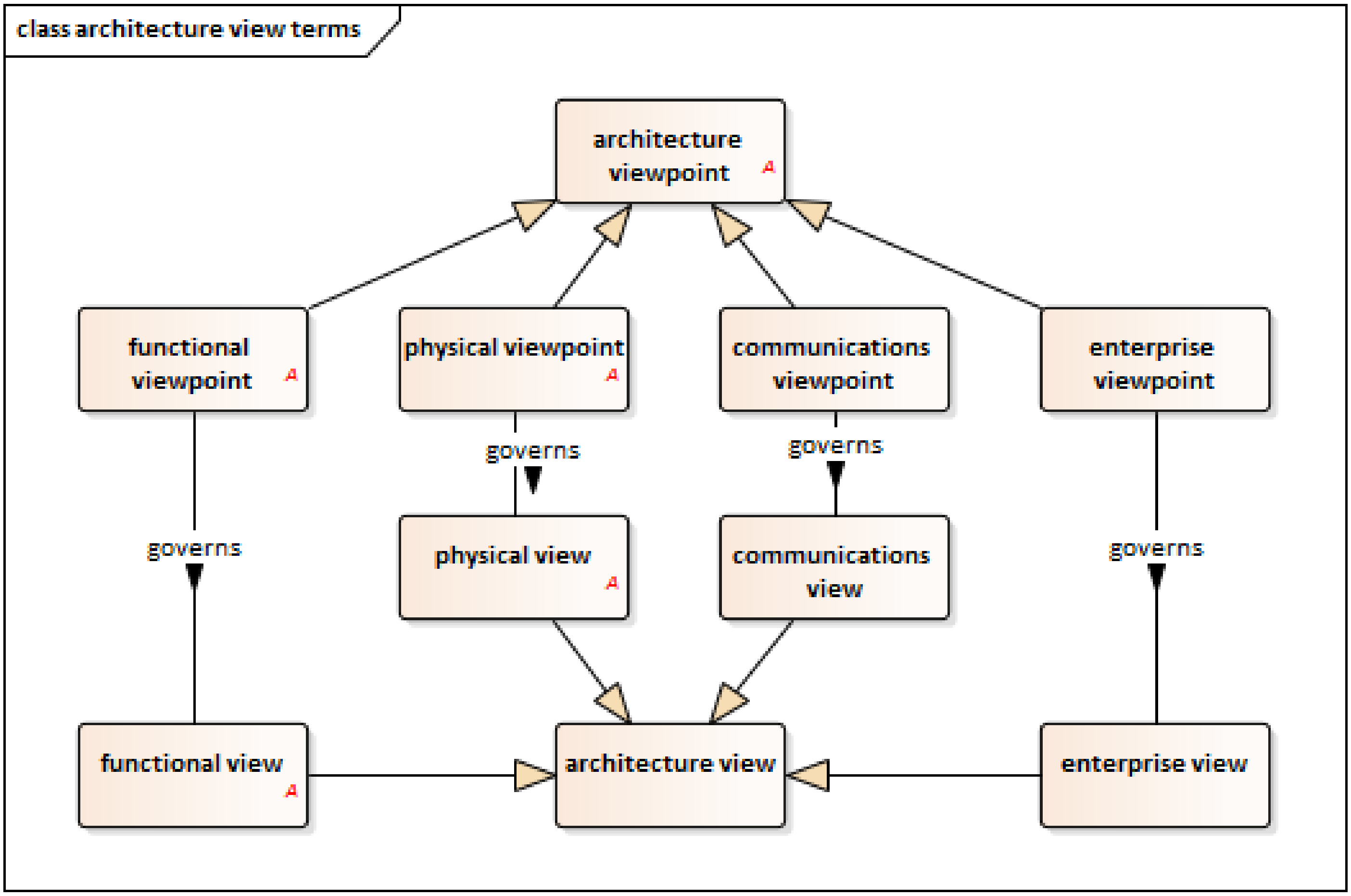


Figure 8: Concept model for architecture view terms

**3.1.2.1**
**communications view**
*architecture view* ( 3.1.1.5) from the *communications viewpoint* ( 3.1.2.2)

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

**3.1.2.2**
**communications viewpoint**
*architecture viewpoint* ( 3.1.1.6) used to frame communication interface concerns, including all layers of the OSI stack and related management and security issues\r\n

**3.1.2.3**
**enterprise view**
*architecture view* ( 3.1.1.5) from the *enterprise viewpoint* ( 3.1.2.4)

**3.1.2.4**
**enterprise viewpoint**
*architecture viewpoint* ( 3.1.1.6) used to frame the policies, funding incentives, working arrangements, and jurisdictional structure that support the technical layers of the architecture\r\n

**3.1.2.5**
**functional view**
*architecture view* ( 3.1.1.5) from the *functional viewpoint* ( 3.1.2.6)

**3.1.2.6**
**functional viewpoint**
*architecture viewpoint* ( 3.1.1.6) used to frame the functionality concerns, including the definition of processes that perform transport functions and data flows shared between these processes\r\n

**3.1.2.7**
**physical view**
*architecture view* ( 3.1.1.5) from the *physical viewpoint* ( 3.1.2.8)

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.

**3.1.2.8**
**physical viewpoint**
*architecture viewpoint* ( 3.1.1.6) used to frame system engineering concerns, including the assignment of functionality to *physical objects* ( 3.1.6.5) and the interfaces among these physical objects\r\n

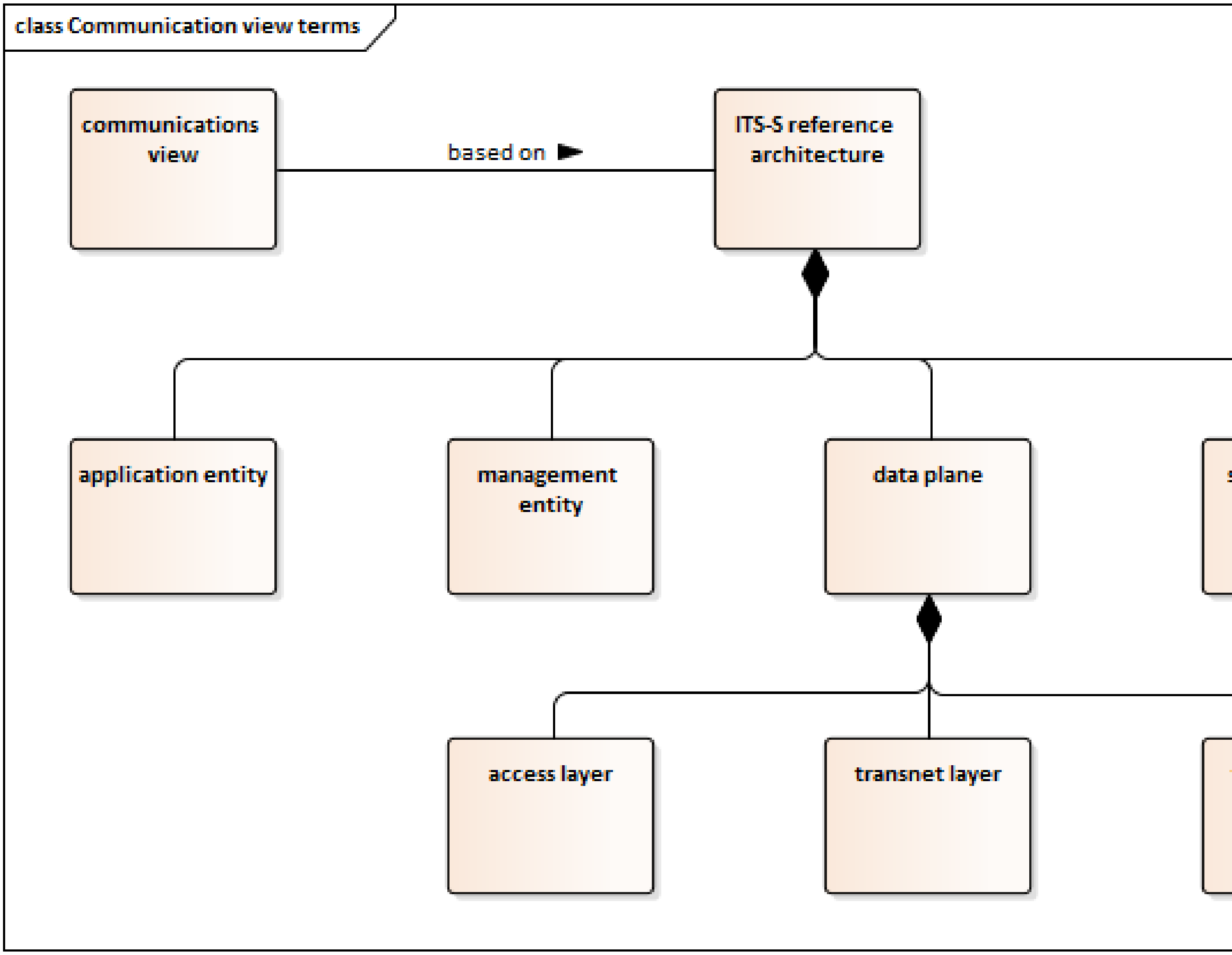

Figure 9: Concept model for Communication view terms

**3.1.3.1**
**access layer**
link layer
subnet layer
part of the *data plane* ( 3.1.3.3) that provides the functionality related to the physical and data link layers of the open systems interconnect (OSI) reference model

Note 1 to entry: Within the IETF, the term "link layer" is used to describe the same functionality as the ITS-S reference architecture 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 reference architecture.

**3.1.3.2**
**application entity**
DEPRECATED: information layer
part of the *ITS station reference architecture* ( 3.1.7.4) that is responsible for providing ITS-related functionality

Note 1 to entry: Within the US, the 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 and the application entity.

**3.1.3.3**
**data plane**
part of the *ITS station reference architecture* ( 3.1.7.4) that is responsible for handling communications with other *physical objects* ( 3.1.6.5)

**3.1.3.4**
**facilities layer**
DEPRECATED: application layer
part of the *data plane* ( 3.1.3.3) that provides the functionality related to the session, presentation, and application layers of the open systems interconnect (OSI) reference model\r\n

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, the term should be avoided.

**3.1.3.5**
**management entity**
part of the *ITS station reference architecture* ( 3.1.7.4) that is responsible for management of communications and configuration information for the local *physical object* ( 3.1.6.5) and possibly remote physical objects

**3.1.3.6**
**security entity**
part of the *ITS station reference architecture* ( 3.1.7.4) that is responsible for providing privacy, communication security, and system security

**3.1.3.7**
**transnet layer**
part of the *data plane* ( 3.1.3.3) that provides the functionality related to the network and transport layers of the open systems interconnect (OSI) reference model\r\n

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.

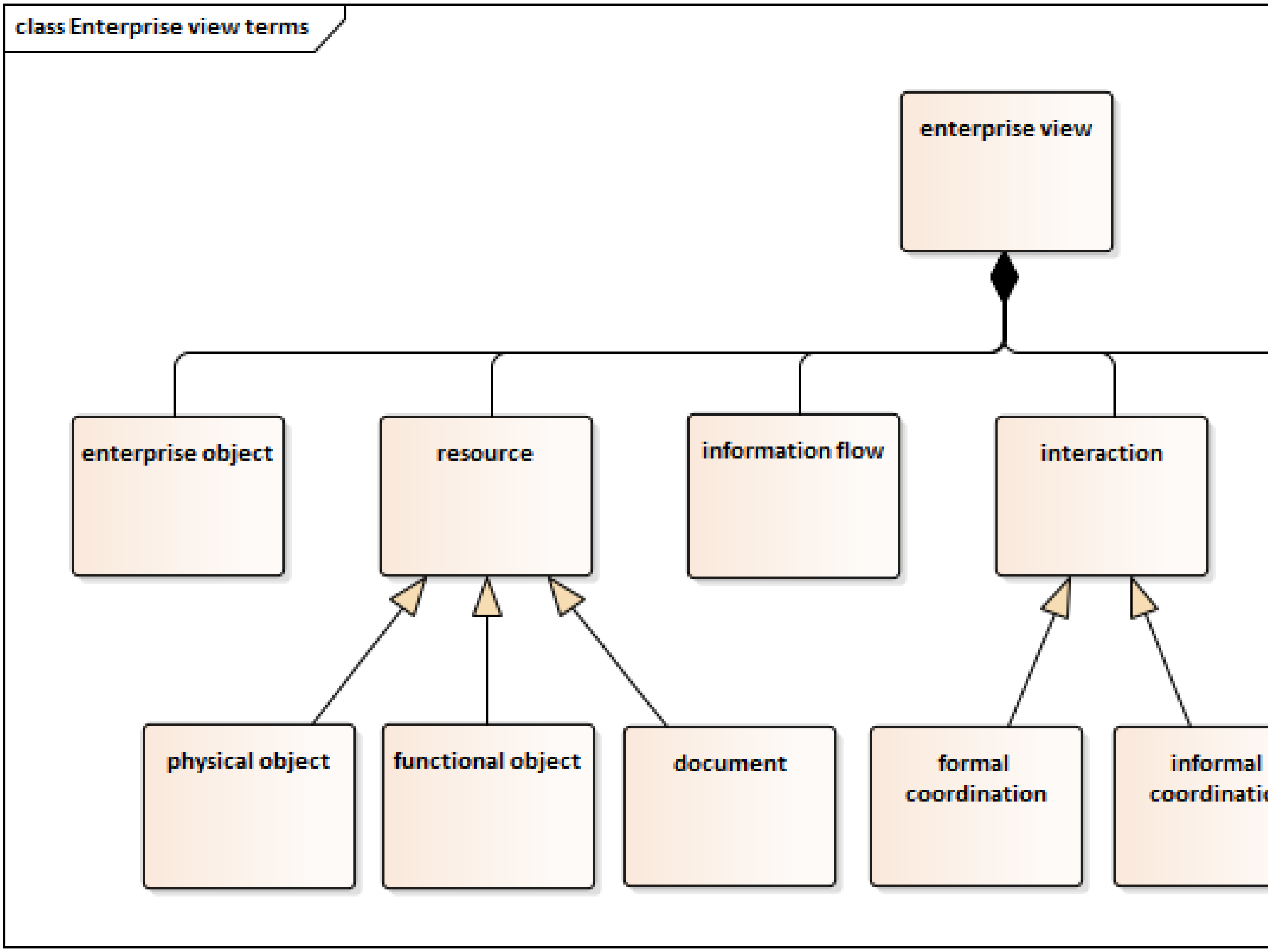


Figure 10: Concept model for Enterprise view terms

**3.1.4.1**
**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 15289:2017 (en), 3.1.10]

**3.1.4.10**
**role**
<enterprise view> *element* ( 3.1.1.8) that represents the association between an *enterprise object* ( 3.1.4.2) and another enterprise view element

EXAMPLE A driver operates a vehicle.

**3.1.4.2**
**enterprise object**
*element* ( 3.1.1.8) within an *enterprise view* ( 3.1.2.3) that represents an organization or individual

**3.1.4.3**
**extends**
<enterprise view> *relationship* ( 3.1.4.8) where one *resource* ( 3.1.4.9) supplements another resource

EXAMPLE A functional object might extend the functionality of another functional object.

**3.1.4.4**
**formal coordination**
<enterprise view> *interaction* ( 3.1.4.7) between two *enterprise objects* ( 3.1.4.2) governed by a documented agreement

EXAMPLE A roadway operator might enter into formal agreement(s) with the owner of a roadway and the owner(s) of the associated roadway equipment.

**3.1.4.5**
**includes**
<enterprise view> *relationship* ( 3.1.4.8) where one *resource* ( 3.1.4.9) contains another resource

EXAMPLE Every ITS component includes one or more functional objects.

**3.1.4.6**
**informal coordination**
<enterprise view> *interaction* ( 3.1.4.7) between two *enterprise objects* ( 3.1.4.2) governed by an understanding that is not documented in a formal agreement between the two parties

EXAMPLE A pedestrian might reasonably expect that the roadway operator will provide a safe environment even though there is no direct formal agreement between the pedestrian and roadway operator.

**3.1.4.7**
**interaction**
<enterprise view> *element* ( 3.1.1.8) that represents coordination between two *enterprise objects* ( 3.1.4.2)\r\n

**3.1.4.8**
**relationship**
<enterprise view> *element* ( 3.1.1.8) that represents an association between two *resources* ( 3.1.4.9)

**3.1.4.9**
**resource**
<enterprise view> *element* ( 3.1.1.8) that represents an entity that is related to an enterprise object

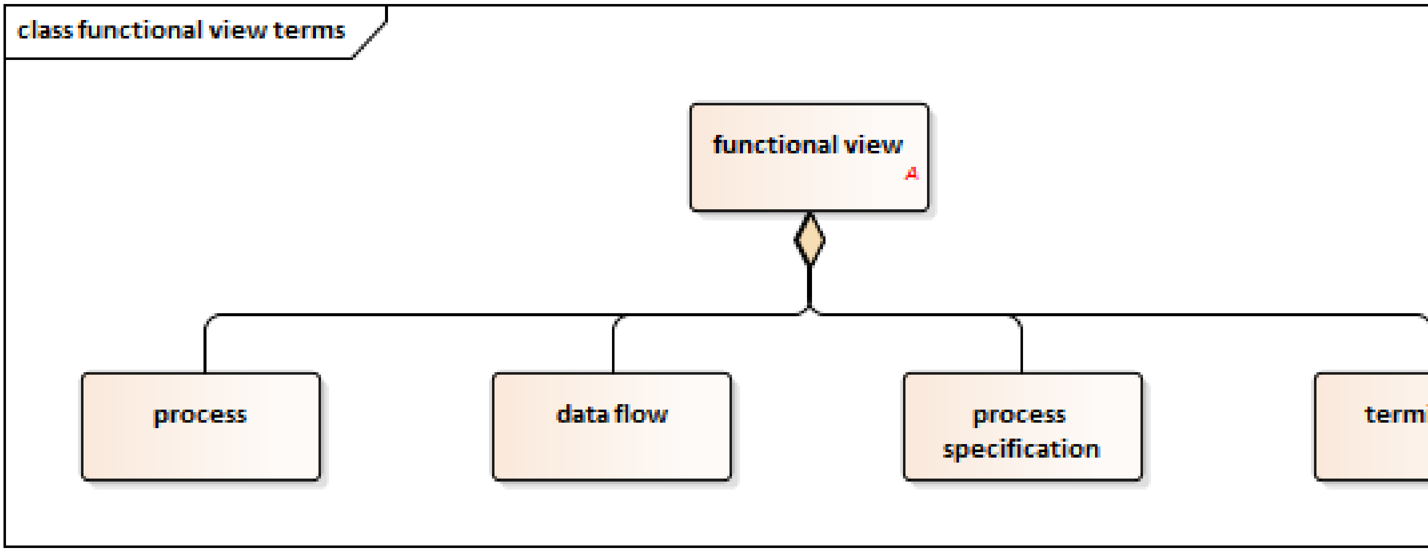


Figure 11: Concept model for functional view terms

**3.1.5.1**
**data flow**
representation of data flowing between two *processes* ( 3.1.5.2) or between a process and a *terminator* ( 3.1.6.6)

**3.1.5.2**
**process**
<functional view> function or activity required to support an *ITS service* ( 3.1.11.1)

**3.1.5.3**
**process specification**
*document* ( 3.1.4.1) that defines a lowest-level *process* ( 3.1.5.2)

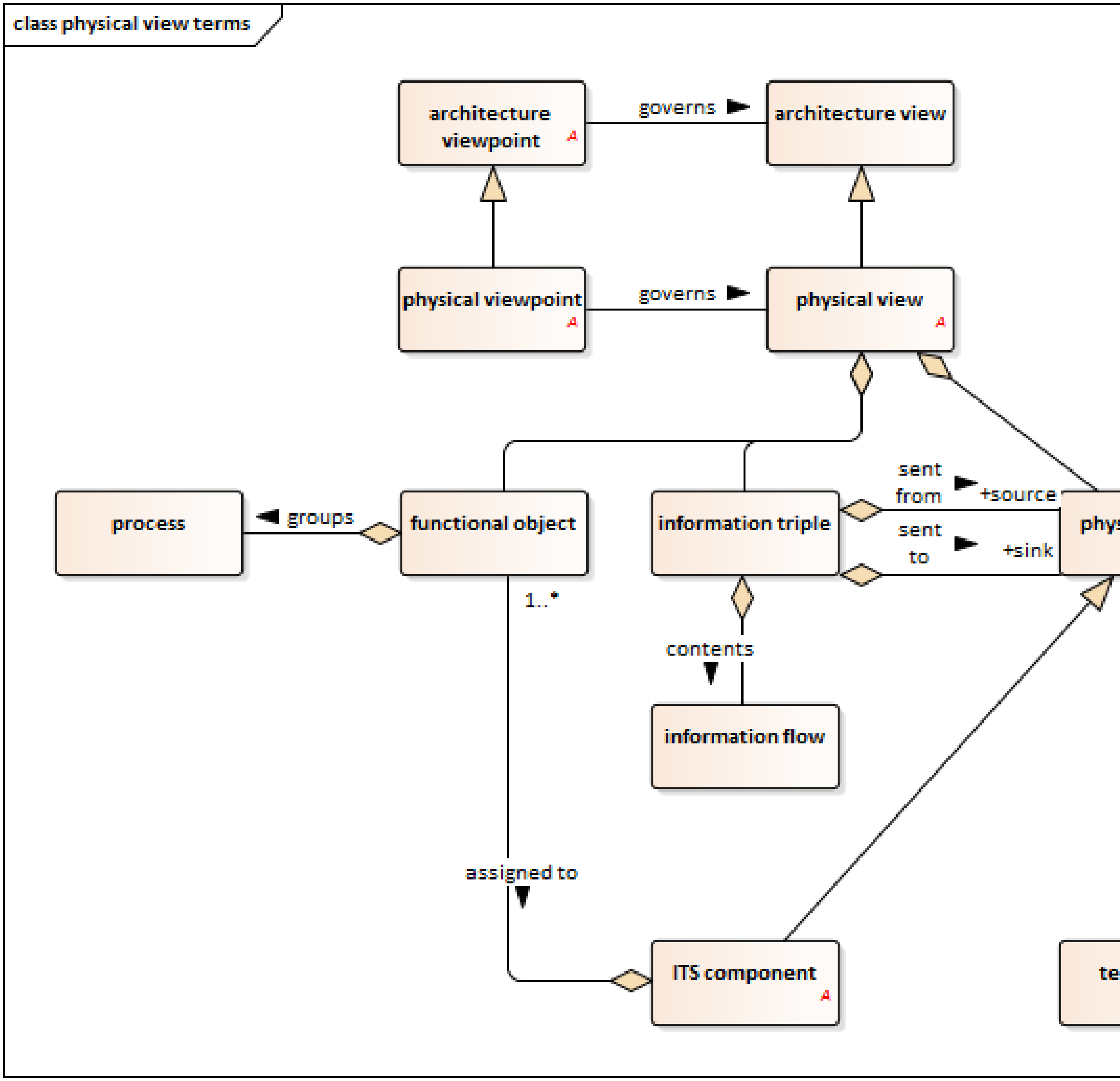


Figure 12: Concept model for physical view terms

**3.1.6.1**

**functional object**

group of similar system *processes* ( 3.1.5.2) from the *functional view* ( 3.1.2.5) of the *architecture* ( 3.1.1.1) that are jointly assigned to a *physical object* ( 3.1.6.5) in the *physical view* ( 3.1.2.7).

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

**3.1.6.2**
**information flow**
information that is exchanged between *physical objects* ( 3.1.6.5)\r\n

**3.1.6.3**
**information triple**
*information flow* ( 3.1.6.2) from a *physical object* ( 3.1.6.5) acting as an information source and sent to another *physical object* ( 3.1.6.5) acting as an information sink\r\n

**3.1.6.4**
**ITS component**
*physical object* ( 3.1.6.4) that has been assigned one or more ITS *functional objects* ( 3.1.6.1)\r\n

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

**3.1.6.5**
**physical object**
*element* ( 3.1.1.8) within the *physical view* ( 3.1.2.7) of an *ITS architecture* ( 3.1.7.5) that represents a physical entity that interacts with other physical entities in the provision of *ITS services* ( 3.1.11.1)\r\n

Note 1 to entry: WIthin many ITS reference architectures, physical objects are placed into one of five categories: centre, support, field, vehicle, or traveller.

**3.1.6.6**
**terminator**
*physical object* ( 3.1.6.5) that represents an external user of *ITS* ( 3.1.14.4)\r\n

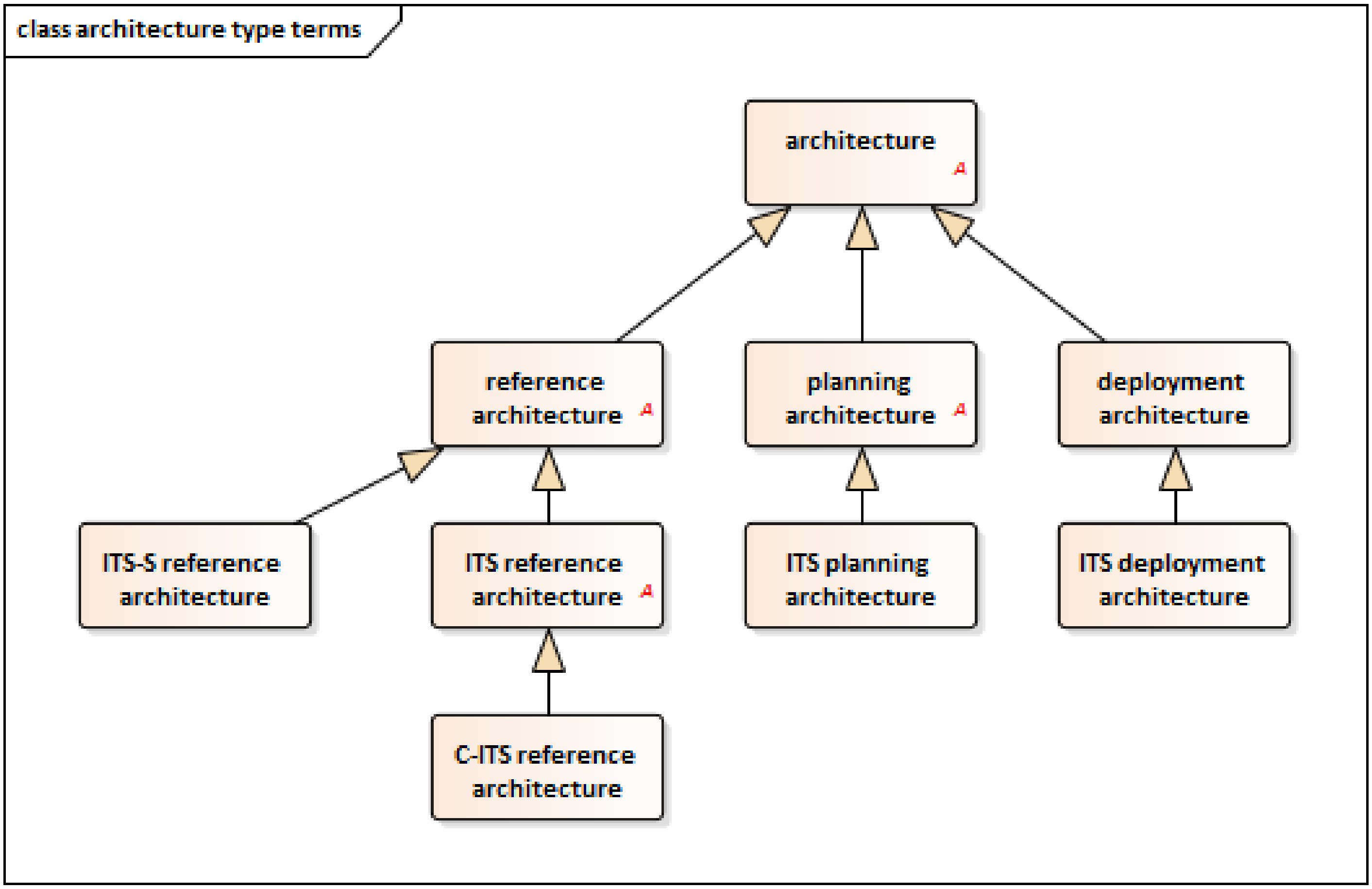


Figure 13: Concept model for architecture type terms

**3.1.7.1**

**reference architecture**

template solution for an *architecture* ( 3.1.1.1) for a particular domain

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

[Source: Wikipedia the free encyclopedia definition of reference architecture [Internet]. [cited 2018 Jul 17]; Available from: http://en.wikipedia.org/wiki/reference_architecture]

**3.1.7.2**

**planning architecture**

regional architecture

*architecture* ( 3.1.1.1) that provides a long-term vision of *system elements* ( 3.1.1.8) that may be deployed and managed by different projects and/or entities 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.

**3.1.7.3**
**deployment architecture**
*architecture* ( 3.1.1.1) that provides a vision of a specific deployment of a system within a geographic area

**3.1.7.4**
**ITS-S reference architecture**
*reference architecture* ( 3.1.7.1) for handling communications within a *physical object* ( 3.1.6.5) as defined in ISO 21217

Note 1 to entry: The ITS-S reference architecture is the preferred model for describing communication designs for information exchanges between physical objects, even if the design does not meet the minimum requirements for an ITS station. For example, the ITS-S reference architecture can be used to describe a communications stack that does not provide a bounded, secured, managed domain; however an implementation of such a design would not be an ITS station.

**3.1.7.5**
**ITS reference architecture**
*reference architecture* ( 3.1.7.1) for one or more *ITS services* ( 3.1.11.1)\r\n

Note 1 to entry: An ITS architecture might be a reference, planning, or deployment architecture.

Note 2 to entry: The Harmonised Architecture Reference for Technical Standards (HARTS; http://htg7.org) is an example of an ITS reference architecture.

**3.1.7.6**
**C-ITS reference architecture**
*reference architecture* ( 3.1.7.1) for one or more *ITS services* ( 3.1.11.1) where each service requires at least one *C-ITS data exchange*

**3.1.7.7**
**ITS planning architecture**
*planning architecture* ( 3.1.7.2) for one or more *ITS services* ( 3.1.11.1)

**3.1.7.8**
**ITS deployment architecture**
*deployment architecture* ( 3.1.7.3) for one or more *ITS services* ( 3.1.11.1)

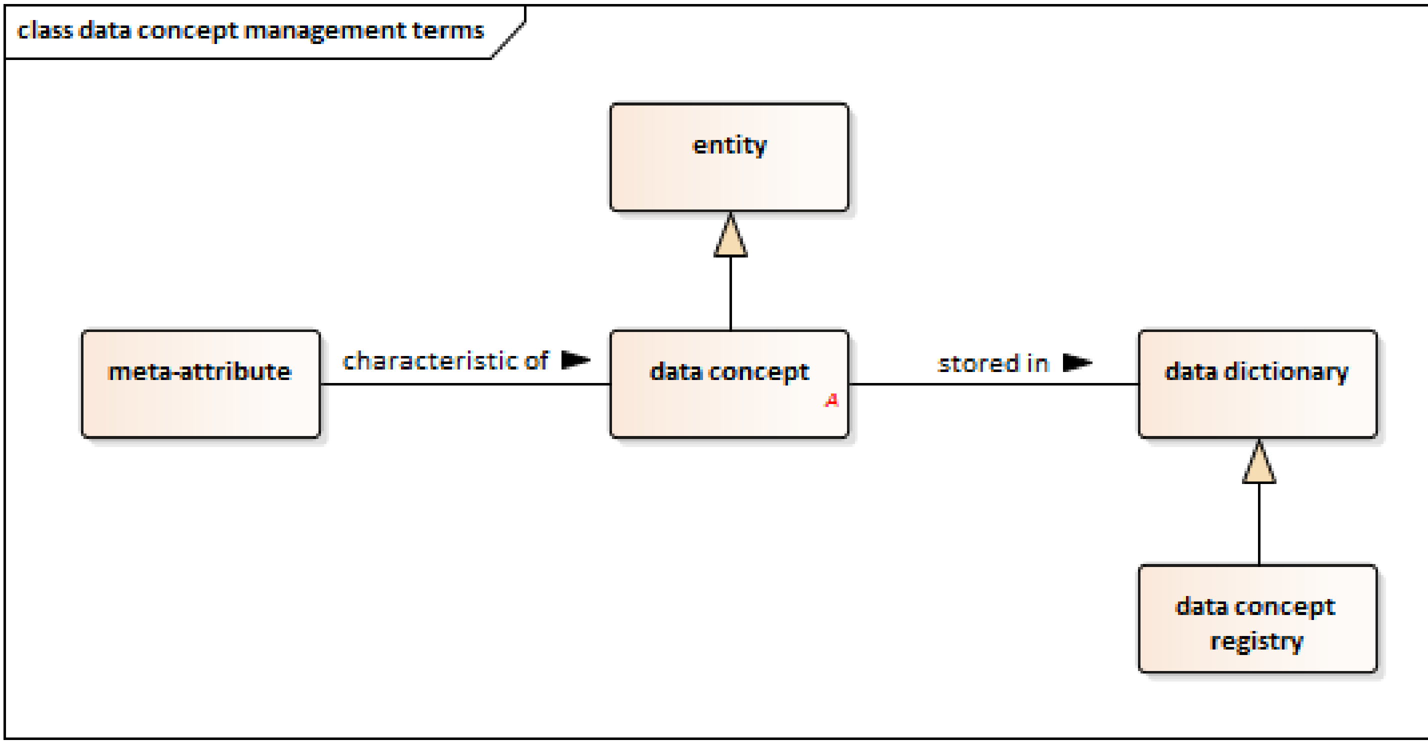


Figure 14: Concept model for data concept management terms

**3.1.8.1**
**data concept**
entity that refers to an abstraction or thing in the natural world that can be identified with explicit boundaries and meaning and whose properties and behaviour all follow the same rules\r\n

Note 1 to entry: Data concepts can be classified into the following types: object class, value domain, data element, aggregate domain, data frame, message, interface dialogue, dictionary document, or module

[Source: ISO 14817-1]

**3.1.8.2**
**data concept registry**
electronic *data dictionary* ( 3.1.8.3) that follows precise documented rules for the registration and management of stored *data concepts* ( 3.1.8.1); it typically also includes advanced features for adding, retrieving, and working with its contents

Note 1 to entry: The data concept registry contains meta-attributes about data concepts in terms of their names and representational forms as well as the semantics associated with the data concepts. A data concept registry may contain data that assists information interchange and re-use, both from the perspective of human users and for machine-interpretation of data concepts.

**3.1.8.3**
**data dictionary**
listing of *data concepts* ( 3.1.8.1) and their meta-attributes in a consistent format

**3.1.8.4**
**meta-attribute**
documenting characteristic of a *data concept* ( 3.1.8.1) that is stored in a *data dictionary* ( 3.1.8.3)

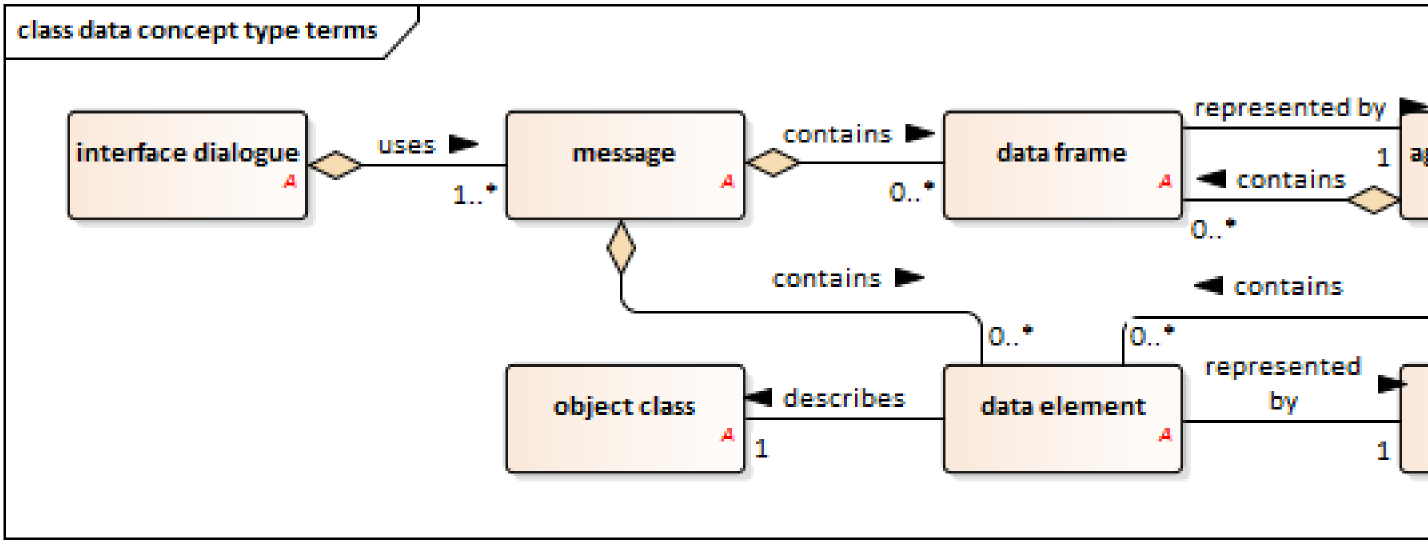


Figure 15: Concept model for data concept type terms

**3.1.9.1**
**aggregate domain**
*data concept* ( 3.1.8.1) that defines a grouping of *data elements* ( 3.1.9.2) and/or *data frames* ( 3.1.9.3) \r\n

**3.1.9.2**
**data element**
*data concept* ( 3.1.8.1) represented by a specific *value domain* ( 3.1.9.7) and that describes a single atomic property about an *object class* ( 3.1.9.6).

Note 1 to entry: A data element is composed of an object class, a property of the represented object class and a value domain.

**3.1.9.3**
**data frame**
*data concept* ( 3.1.8.1) represented by a specific *aggregate domain* ( 3.1.9.1) and that describes information of interest through a useful grouping of more atomic properties about one or more *object classes* ( 3.1.9.6).

Note 1 to entry: The grouping may be a set, sequence, or a choice.

**3.1.9.4**
**interface dialogue**
*data concept* ( 3.1.8.1) that defines bi-directional communication sequence between two parties in accordance with predetermined protocols\r\n

**3.1.9.5**
**message**
*data concept* ( 3.1.8.1) that is a grouping of *data elements* ( 3.1.9.2), *data frames* ( 3.1.9.3), or *data elements* ( 3.1.9.2) and *data frames* ( 3.1.9.3) that is used to convey a complete set of information

**3.1.9.6**
**object class**
description of a set of objects that share the same properties, relationships, and semantics

Note 1 to entry: Adapted from ISO/IEC 11179-1:2013; an object class is conceptually similar to an ISO/IEC 11179 object, but it does not include operations or methods and ISO/IEC 11179 "attributes" are called "properties" in this International Standard.

**3.1.9.7**
**value domain**
*data concept* ( 3.1.8.1) that defines a set of permissible values\r\n

## 3.2 Application terms

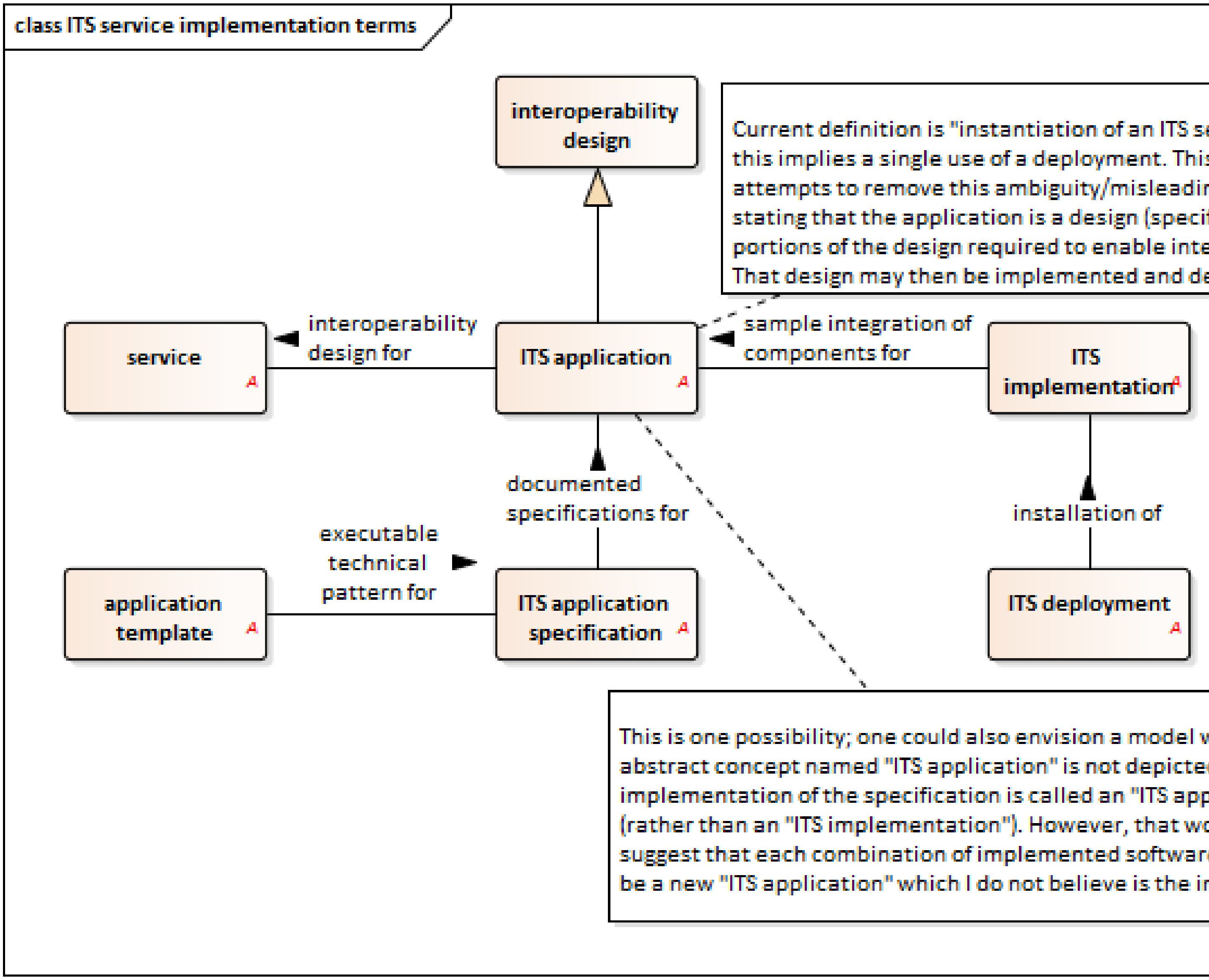


Figure 16: Concept model for ITS service implementation terms

**3.2.1.1**
**ITS application**
*interoperability design* ( 3.2.1.2) for an *ITS service* ( 3.1.11.1)

**3.2.1.2**
**interoperability design**
characteristics necessary to fully define how various *physical objects* ( 3.1.6.5) interoperate to provide a *service* ( 3.1.10.3)\r\n

Note 1 to entry: Characteristics often include but are not limited to functional, performance, and interface requirements.

**3.2.1.3**
**ITS application specification**
one or more documents that detail all necessary requirements for an *ITS application* ( 3.2.1.1)\r\n

**3.2.1.4**
**ITS implementation**
integration of each *physical object* ( 3.1.6.5) necessary to implement one or more *ITS applications* ( 3.2.1.1)

Note 1 to entry: An ITS application typically requires multiple components (e.g., a ITS-S acting as a user and another ITS-S acting as a provider). An ITS implementation includes a sample of each component necessary for the service but often does not represent a complete deployment.

Note 2 to entry: An ITS implementation is typically used for a laboratory or other experimental environment prior to a full-scale deployment.

**3.2.1.5**
**ITS deployment**
installation capable of implementing one or more *ITS applications* ( 3.2.1.1)\r\n
\r\n

Note 1 to entry: An ITS deployment typically refers to the support, central and roadside ITS stations coupled with a tacit acknowledgement of the mobile ITS stations that will communicate with the support, central, or roadside ITS stations.

**3.2.1.6**
**application template**
<ITS> executable technical pattern of an *ITS application specification* ( 3.2.1.3)

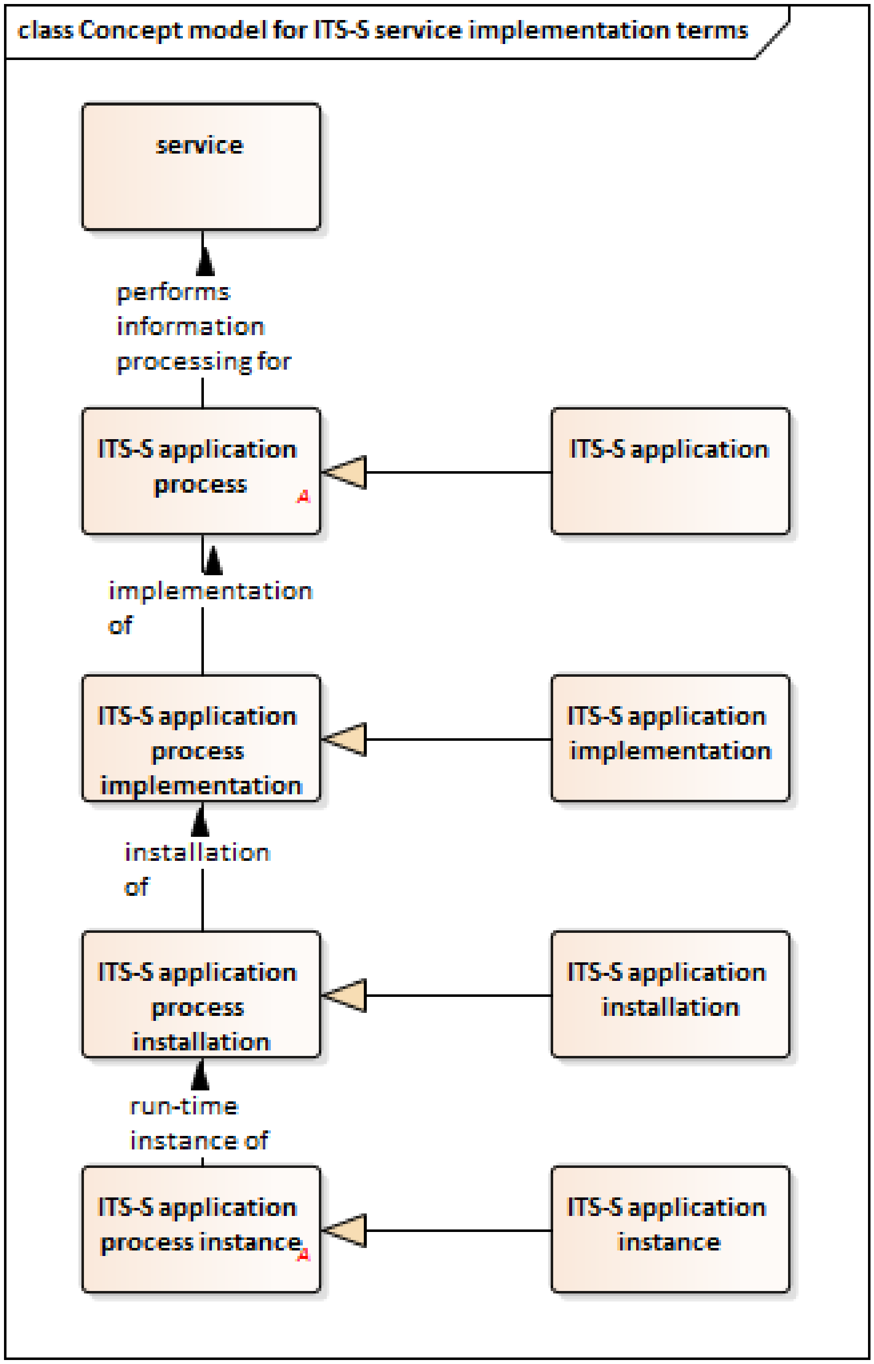


Figure 17: Concept model for Concept model for ITS-S service implementation terms

**3.2.2.1**

**ITS-S application process**

element in an *ITS station* ( 3.7.7.2) that performs information processing for an *ITS-S service* ( 3.1.12.2)\r\n

**3.2.2.2**

**ITS-S application process implementation**

implementation of an *ITS-S application process* ( 3.2.2.1)

Note 1 to entry: A unique implementation is typically associated with an implementation name, a version, and release number.

### 3.2.2.3
**ITS-S application process installation**

installation of an *ITS-S application process implementation* ( 3.2.2.2)\r\n

Note 1 to entry: A unique installation is typically associated with a specific license code or serial number.

### 3.2.2.4
**ITS-S application process instance**

run-time instance of an *ITS-S application process installation* ( 3.2.2.3)\r\n

### 3.2.2.5
**ITS-S application**

*ITS-S application process* ( 3.2.2.1) within the *application entity* ( 3.1.3.2)

### 3.2.2.6
**ITS-S application implementation**

*ITS-S application process implementation* ( 3.2.2.2) within the *application entity* ( 3.1.3.2)

### 3.2.2.7
**ITS-S application installation**

*ITS-S application process installation* ( 3.2.2.3) within the *application entity* ( 3.1.3.2)

### 3.2.2.8
**ITS-S application instance**

*ITS-S application process instance* ( 3.2.2.4) within the *application entity* ( 3.1.3.2)

### 3.3 Infrastructure terms

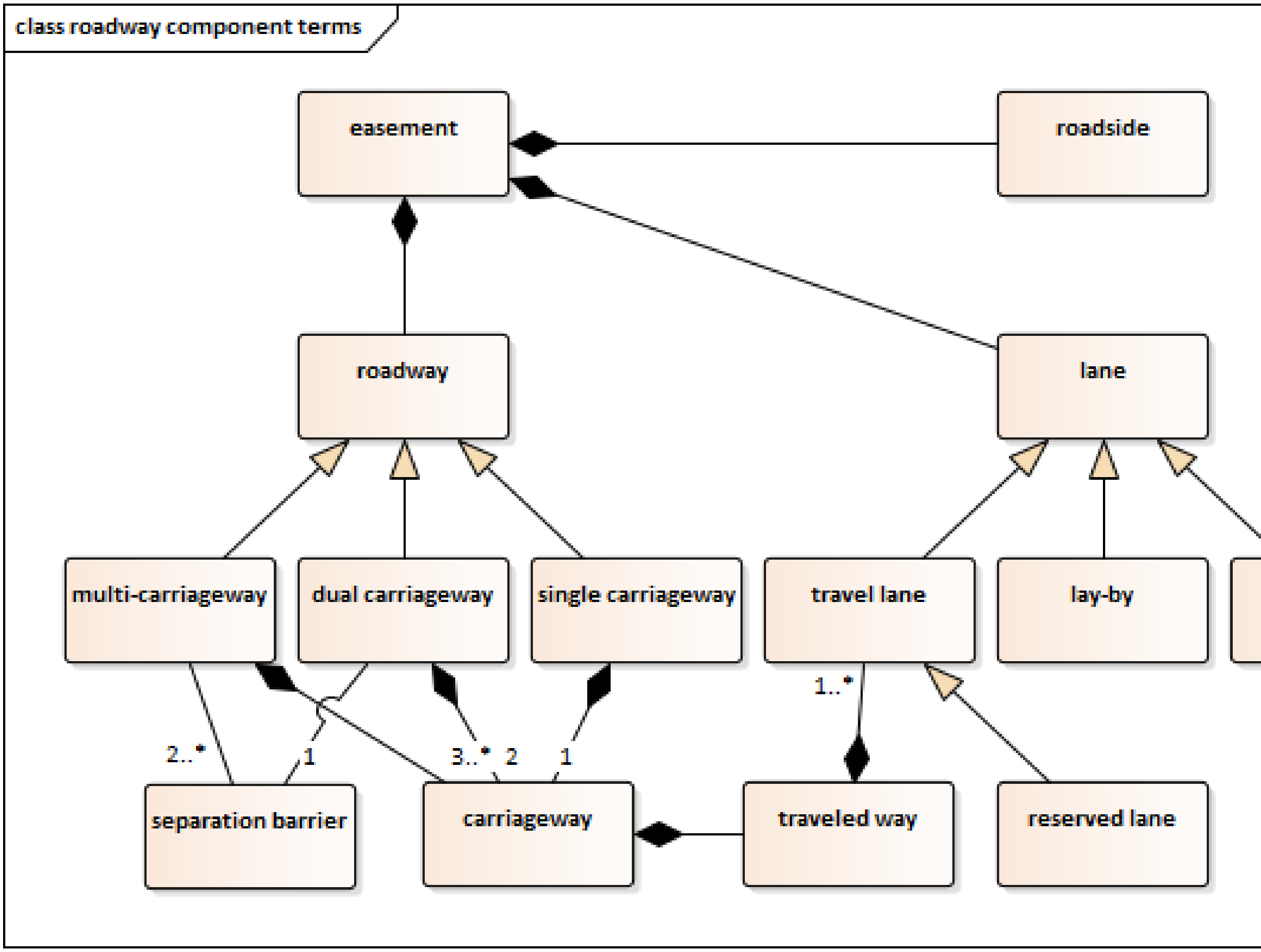


Figure 18: Concept model for roadway component terms

**3.3.1.1**

**easement**

DEPRECATED: right-of-way

stretch of land reserved for transportation purposes

Note 1 to entry: The easement includes all carriageways as well as a significant width to allow for roadside devices, clearance zones, sidewalks, drainage facilities, sound walls, etc.

Note 2 to entry: This concept is sometimes referred to as "right-of-way"; however, the preferred meaning of "right-of-way" is to identify which vehicle has the legal authority to access a portion of roadway.

**3.3.1.10**
**lay-by**
short *lane* ( 3.3.1.8) at the edge of a *carriageway* ( 3.3.1.6) designed to allow a *motor vehicle* ( 3.8.1.3) to temporarily stop while traffic in other *lanes* ( 3.3.1.8) proceed

**3.3.1.11**
**shoulder**
*lane* ( 3.3.1.8) between the edge of a *carriageway* ( 3.3.1.6) and any slope or edge of *right-of-way* ( 3.3.1.1)

Note 1 to entry: The shoulder might be used for emergency stops or other purposes in addition to providing a clear zone and to promote ground stability at the edge of the carriageway.

**3.3.1.12**
**reserved lane**
*travel lane* ( 3.3.1.9) restricted to a specific subset of *motor vehicles* ( 3.8.1.3)

EXAMPLE 1Bus lane

EXAMPLE 2High-occupancy vehicle lane

**3.3.1.13**
**traveled way**
collection of all travel lanes of a carriageway

**3.3.1.14**
**roadside**
portion between one edge of the *easement* ( 3.3.1.1) and the closest edge of a *carriageway* ( 3.3.1.6)

**3.3.1.2**
**roadway**
part of the *easement* ( 3.3.1.1) designed for use by *motor vehicles* ( 3.8.1.3)

Note 1 to entry: Roadway relates to a cross-section of a road facility (i.e., zero length). See "road", "road section", "road segment", and "road link" for different types of stretches of roadway.

**3.3.1.3**
**single carriageway**
undivided highway
*roadway* ( 3.3.1.2) comprised of exactly one *carriageway* ( 3.3.1.6)

**3.3.1.4**
**dual carriageway**
divided highway
*roadway* ( 3.3.1.2) comprised of exactly two *carriageways* ( 3.3.1.6)

Note 1 to entry: The two carriageways are typically designed for travel in opposite directions.

**3.3.1.5**
**multi-carriageway**
*roadway* ( 3.3.1.2) comprised of more than two *carriageways* ( 3.3.1.6)

Note 1 to entry: The separate carriageways are typically designed for separate traffic for (often multiple) specific operational reasons, such as direction of travel, category of vehicle (e.g., high occupancy vehicle), local versus through travel, etc.

**3.3.1.6**
**carriageway**
contiguous width of *roadway* ( 3.3.1.2)

Note 1 to entry: A carriageway is comprised of one or more travel lanes (i.e., the travelled way) and may include shoulders and lay-bys.

Note 2 to entry: When looking at a cross-section of the right-of-way, the roadway consists of all of the carriageways and carriageways are separated by physical barriers.

**3.3.1.7**
**separation barrier**
barrier that separates *carriageways* ( 3.3.1.6)

**3.3.1.8**
**lane**
portion of *easement* ( 3.3.1.1)intended for a specific purpose along its length with adequate clearance for its purpose

EXAMPLE shoulder

Note 1 to entry: Lanes are often bounded by lane markings.

Note 2 to entry: Lanes may be significantly wider than the normal vehicle width to allow variance in lane position of the vehicle as well as for various vehicle dimensions.

Note 3 to entry: The "lane" nomenclature typically refers to motor vehicle usage, but can also refer to other purposes, such as sidewalks.

**3.3.1.9**
**travel lane**
*lane* ( 3.3.1.8) intended to allow *motor vehicles* ( 3.8.1.3) to travel from one end of a *road link* ( 3.3.2.7) to the other

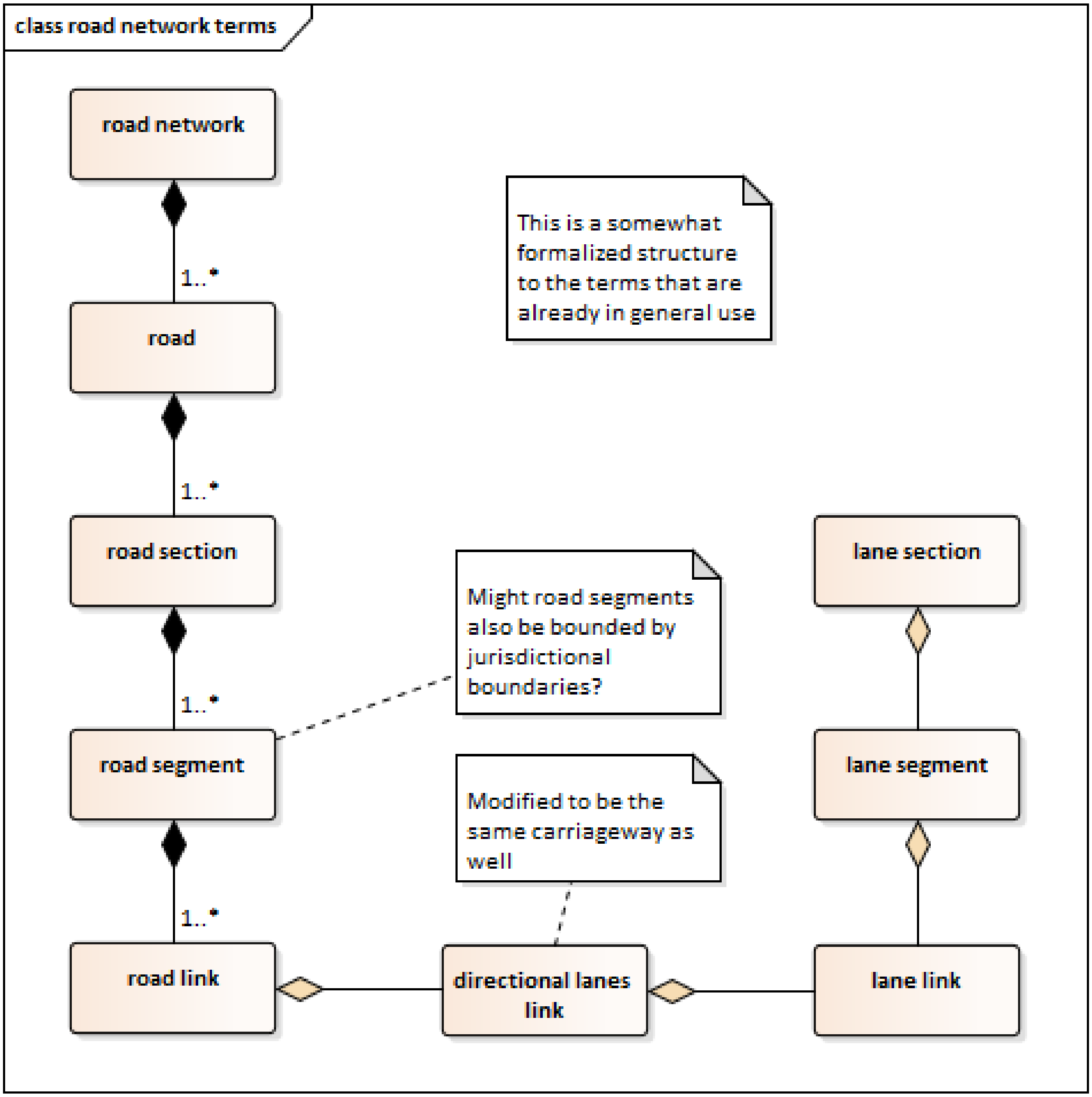


Figure 19: Concept model for road network terms

**3.3.2.1**

**directional lanes**

collection of all *travel lanes* ( 3.3.1.9) of a *road link* ( 3.3.2.7) that are intended to allow travel in the same direction \r\n

Note 1 to entry: In actual use, an indication of the direction typically replaces the term "directional"\r\n

EXAMPLE 1 The eastbound lanes on a road\r\n

EXAMPLE 2 The north approach lanes at an intersection

**3.3.2.10**
**road segment**
contiguous length of a *road section* ( 3.3.2.9) bounded by a *junction* ( 3.3.3.1), a jurisdictional boundary, a road section boundary, or a termination point at both ends

**3.3.2.2**
**directional lanes link**
collection of all *lane links* ( 3.3.2.3) of the same *road link* ( 3.3.2.7) and *carriageway* ( 3.3.1.6) designed for travel in the same direction

**3.3.2.3**
**lane link**
*lane* ( 3.3.1.8) with starting and ending points that correspond to the starting and ending points of a *road link* ( 3.3.2.7)

**3.3.2.4**
**lane section**
complete sequential series of *lane segments* ( 3.3.2.5) within a *road section* ( 3.3.2.9)

**3.3.2.5**
**lane segment**
complete sequential series of *lane links* ( 3.3.2.3) within a *road segment* ( 3.3.2.10)

Note 1 to entry: A lane segment might start or end at locations other than the start or end of the corresponding road segment (e.g., a lane may start mid-block).

Note 2 to entry: A lane segment only includes the sequential lane links, it does not include lane links from adjacent lanes.

**3.3.2.6**
**road**
contiguous curvilinear length of the *road network* ( 3.3.2.8) that shares the same name

Note 1 to entry: A length of the road network may be referenced by multiple names (e.g., Main Street and Route 7). In this case, there would be two "roads" that share the same set of "carriageways".

Note 2 to entry: A road may turn at a junction.

**3.3.2.7**
**road link**
contiguous length of a *road segment* ( 3.3.2.10) that is described by the same set of physical characteristics

Note 1 to entry: The definition of road segments is highly dependent on what characteristics are modelled by the implementation. Characteristics that might result in a new road segment include: addition or subtraction of a lane, a change in roadway width, the change of road type (e.g., start/end of a bridge), etc.

**3.3.2.8**
**road network**
network of routes designed for the use of *motor vehicles* ( 3.8.1.3)

### 3.3.2.9
**road section**
contiguous length of a *road* ( 3.3.2.6) that shares the same management and operational characteristics

EXAMPLE A traffic signal timing plan is applied to one road section.

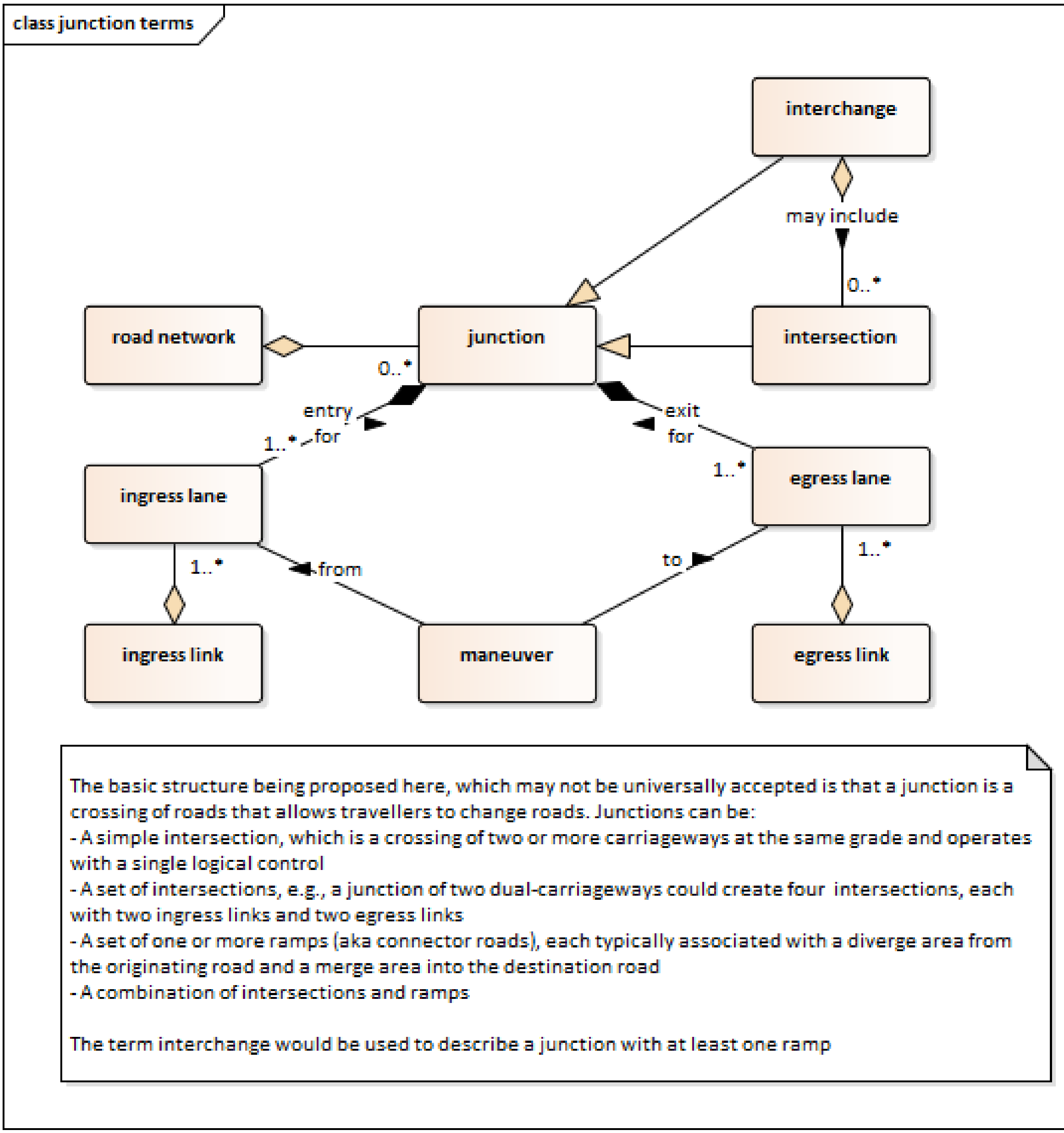


Figure 20: Concept model for junction terms

**3.3.3.1**

**junction**

nexus where two or more roads meet in a manner that allows travellers to change roads

Note 1 to entry: While the nexus is sometimes modelled as a point, it does in fact consume space

**3.3.3.2**
**intersection**
at-grade *junction* ( 3.3.3.1), or a portion thereof, that is operated as a single entity

Note 1 to entry: An at-grade junction of two dual carriageways would be considered a single intersection if right-of-way at the junction is determined by a single set of control logic (e.g., a traffic signal); however, such a junction could be operated as four distinct intersections, especially if the separation barriers were geographically large.

**3.3.3.3**
**interchange**
*junction* ( 3.3.3.1) where at least one movement is grade separated from all other movements

EXAMPLE A diamond interchange has two intersections.

Note 1 to entry: The concept of an interchange includes all movements at the junction, which may include multiple intersections.

Note 2 to entry: The grade separation allows travelers on the link to pass unimpeded through the junction when congestion is not present.

**3.3.3.4**
**ingress lane**
*travel lane* ( 3.3.1.9) designed for entry into a *junction* ( 3.3.3.1)

**3.3.3.5**
**egress lane**
*travel lane* ( 3.3.1.9) designed for exiting from a *junction* ( 3.3.3.1)

**3.3.3.6**
**maneuver**
movement from an *ingress lane* ( 3.3.3.4) to an *egress lane* ( 3.3.3.5)

**3.3.3.7**
**ingress link**
*directional lanes link* ( 3.3.2.2) representing all *ingress lanes* ( 3.3.3.4) on a *road link* ( 3.3.2.7)

**3.3.3.8**
**egress link**
*directional lanes link* ( 3.3.2.2) representing all *egress lanes* ( 3.3.3.5) on a *road link* ( 3.3.2.7)

### 3.4 Location terms

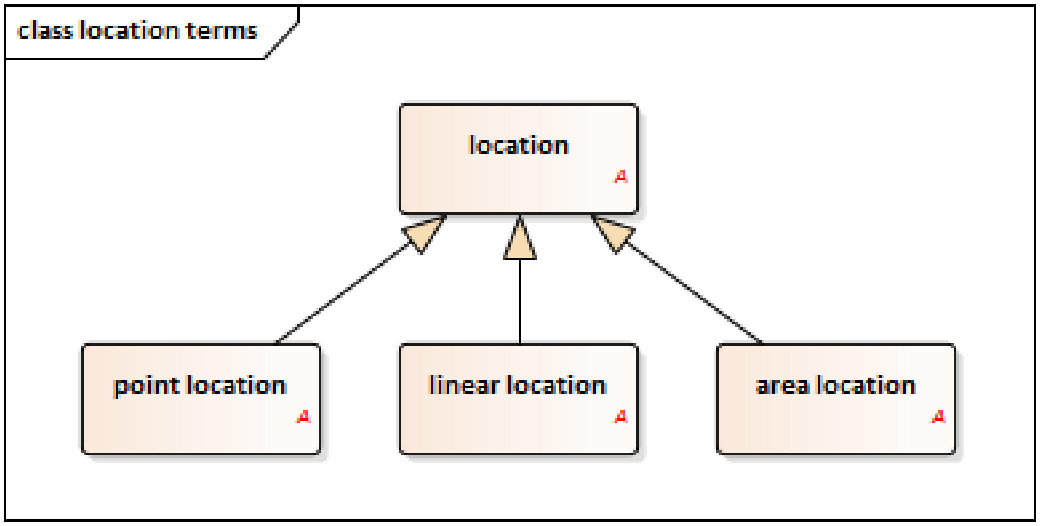


Figure 21: Concept model for location terms

**3.4.1.1**
**location**
identifiable place within a three-dimensional space

Note 1 to entry: Within ITS, locations are typically locations on or near the surface of the earth.

**3.4.1.2**
**point location**
*location* ( 3.4.1.1) that has a zero-dimensional character\r\n
\r\n

[Source: ISO 17572-1:2015(en), 2.1.33]

**3.4.1.3**
**linear location**
*location* ( 3.4.1.1) that has a one-dimensional character

[Source: ISO 17572-1:2015(en), 2.1.19]

**3.4.1.4**
**area location**
*location* ( 3.4.1.1) that has a two-dimensional character\r\n
\r\n

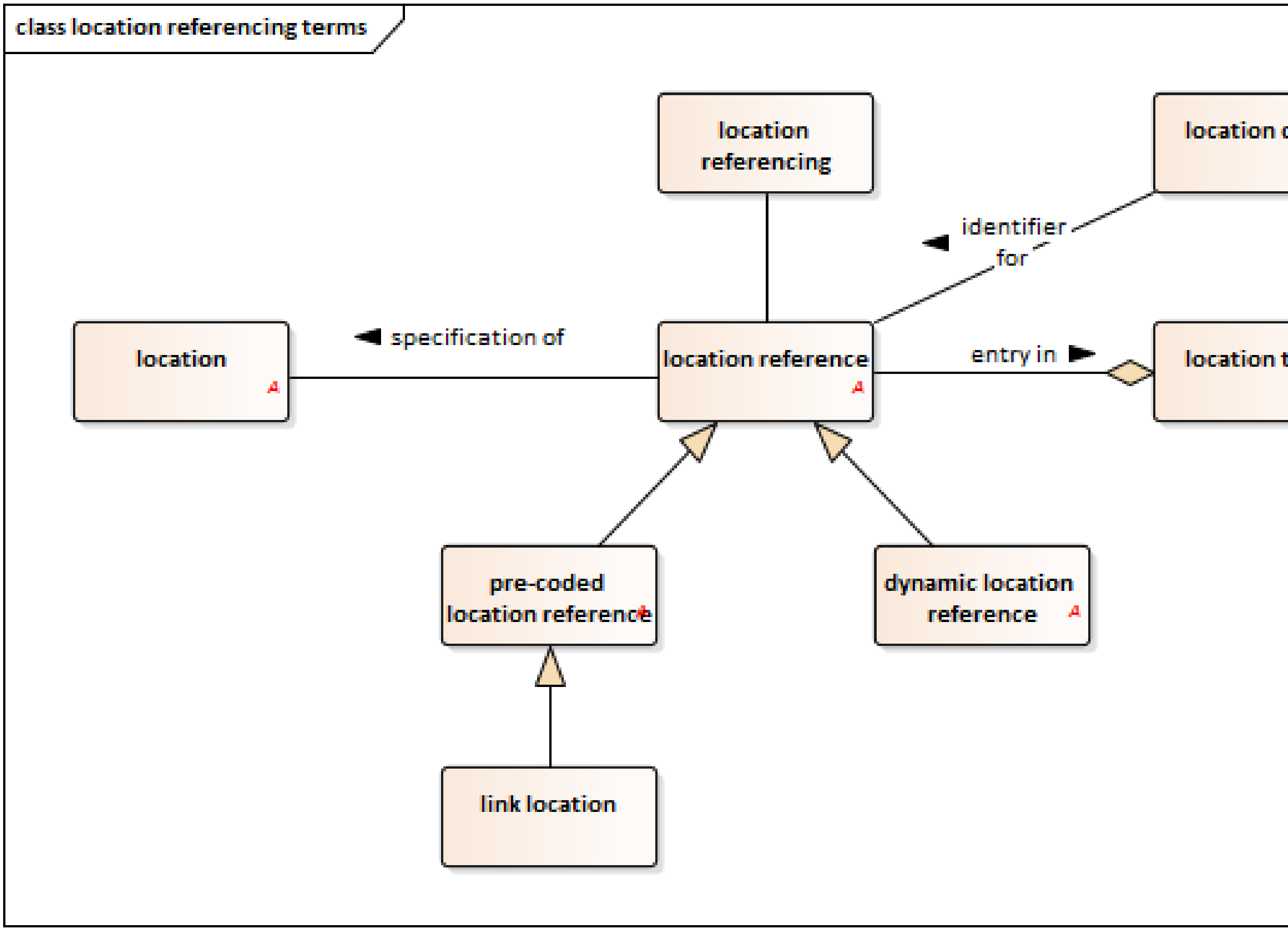


Figure 22: Concept model for location referencing terms

**3.4.2.1**
**location referencing**
method for referencing *locations* ( 3.4.1.1) to facilitate the exchange of location related information between different systems\r\n

[Source: ISO/TS18234-4:2006(en), 3.4]

**3.4.2.2**
**location reference**
specification of a *location* ( 3.4.1.1) according to a specific set of rules\r\n

**3.4.2.3**
**dynamic location reference**
*location reference* ( 3.4.2.2) generated on-the-fly based on geographic properties in a digital map database\r\n

[Source: ISO 17572-1:2015(en), 2.1.11]

**3.4.2.4**
**pre-coded location reference**
*location reference* ( 3.4.2.2) using a unique identifier that is agreed upon in both sender and receiver system to select a *location* ( 3.4.1.1) from a set of pre-coded locations\r\n

[Source: ISO 17572-1:2015(en), 2.1.35]

**3.4.2.5**
**link location**
*pre-coded location reference* ( 3.4.2.4) defined within the *road network* ( 3.3.2.8) database \r\n

[Source: ISO 17572-1:2015(en), 2.1.22]

**3.4.2.6**
**location code**
identifier assigned to a *location reference* ( 3.4.2.2)

Note 1 to entry: A location code is often a numeric or alphanumeric identifier, but could be a textual name, symbol, or any other type of identifier.

**3.4.2.7**
**location table**
table of one or more entries that unambiguously defines a *location* ( 3.4.1.1) according to a known set of conventions

## 3.5 Operations

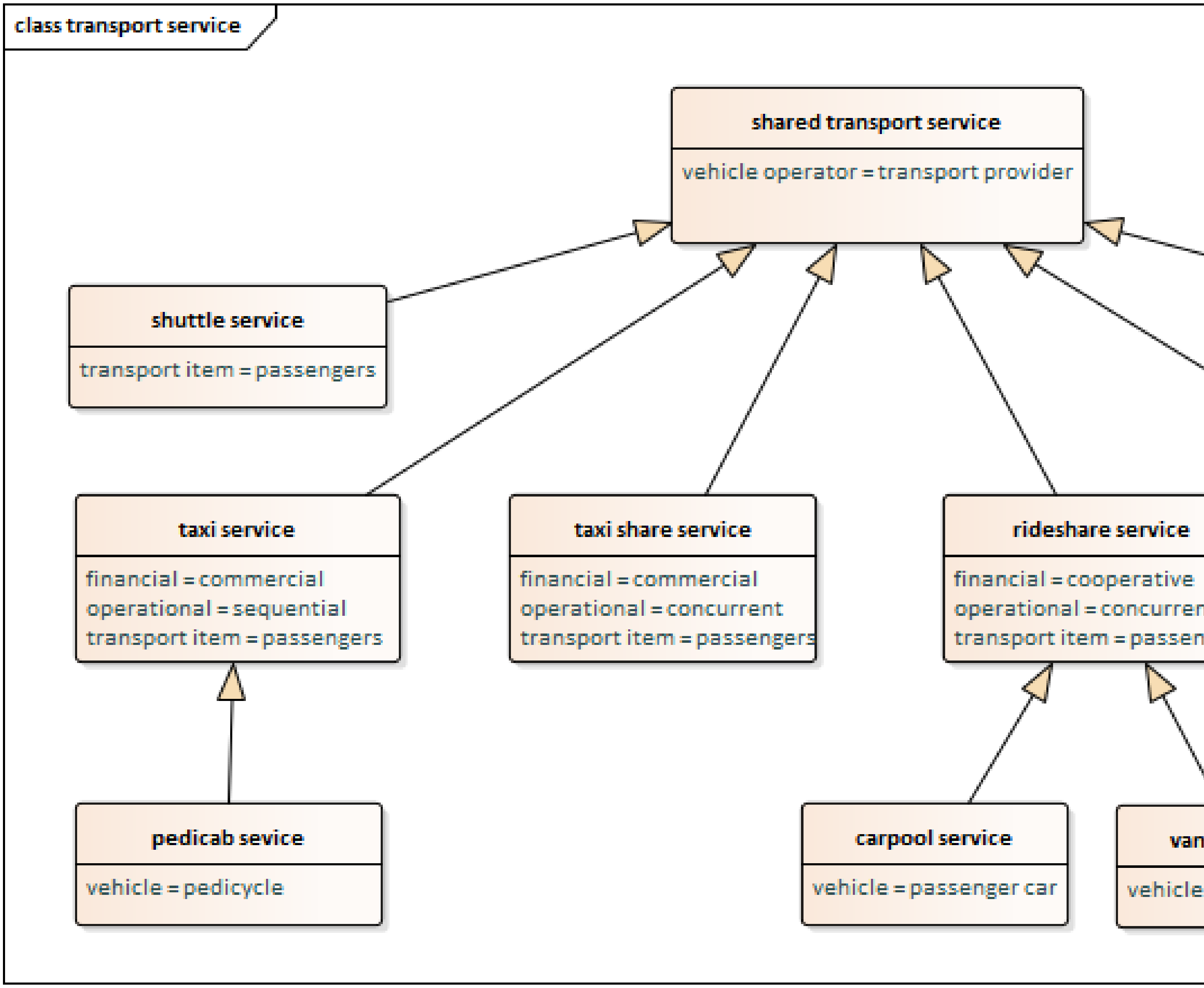


Figure 23: Concept model for Transport service

**3.5.1.1**
**provider**
<transport> *entity* ( 3.1.10.1) that delivers one or more *transport services* ( 3.5.1.2)

**3.5.1.2**
**service**
<transport> *service* ( 3.1.10.3) that delivers item(s) from one location to another on behalf of a *transport consumer* ( 3.5.1.3) to satisfy a *need* ( 3.1.10.5)

Note 1 to entry: The item(s) delivered might be people and/or goods.

**3.5.1.3**
**consumer**
<transport> *consumer* ( 3.1.10.4) that has a *transport need* ( 3.5.1.4) to be fulfilled\r\n

**3.5.1.4**
**need**
<transport> *need* ( 3.1.10.5) to transport one or more transport items to a different location

**3.5.1.5**
**item**
<transport> passenger and/or good

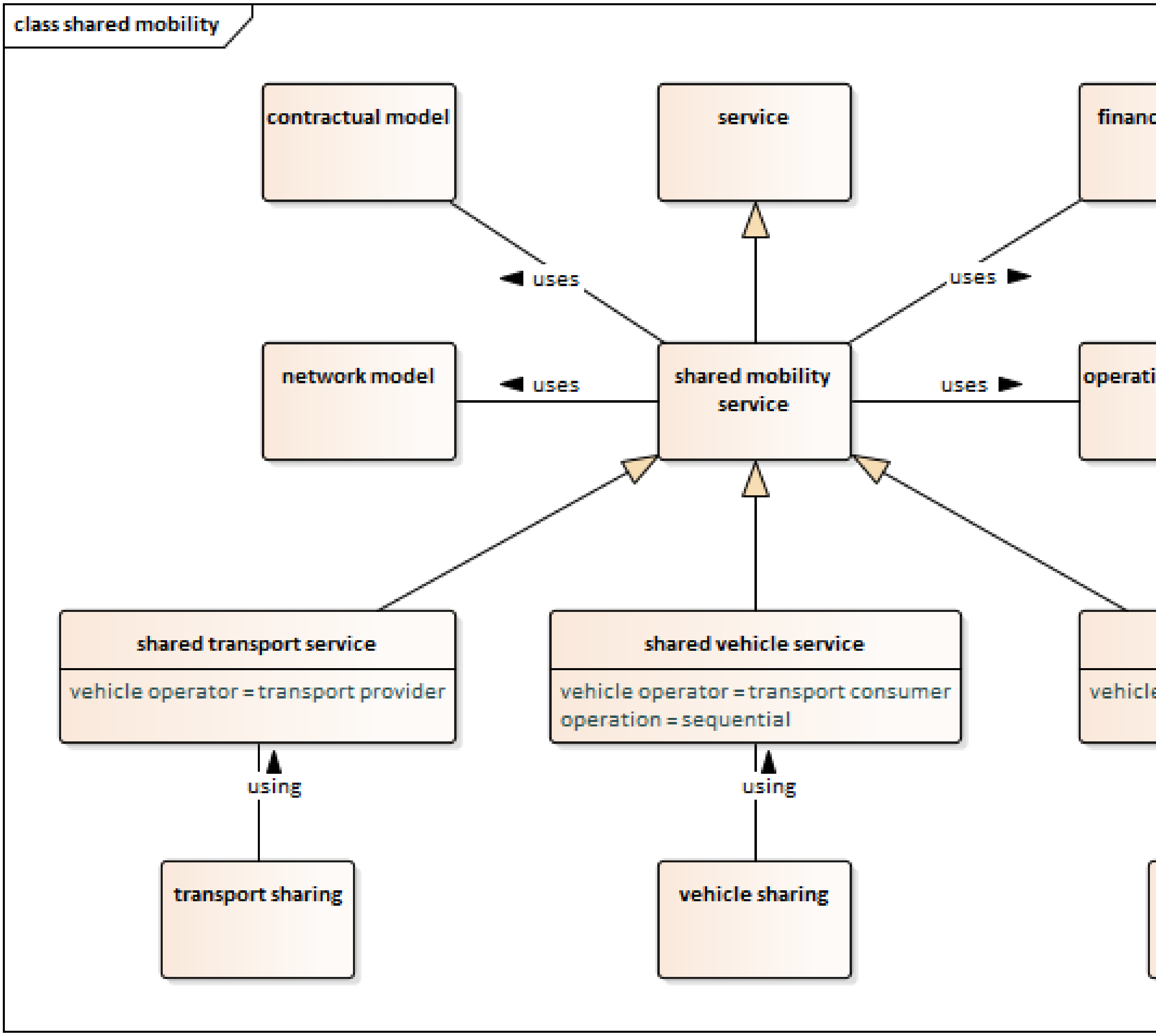


Figure 24: Concept model for shared mobility

**3.5.2.1**

**shared mobility service**

*transport service* ( 3.5.1.2) delivered by a *transport provider* ( 3.5.1.1) that uses the same equipment and/or staff to provide transport services to multiple unrelated *transport consumers* ( 3.5.1.3)

Note 1 to entry: A shared mobility service can be characterized by its contractual, financial, network, and operational models.

**3.5.2.2**
**shared transport service**
*shared mobility service* ( 3.5.2.1) where the *transport provider* ( 3.5.1.1) has the primary responsibility for the selection and operation of the transport mode

Note 1 to entry: A shared transport system might not be dependent upon a vehicle and/or could be multi-modal. For example, a letter courier service could rely on walking and public transport.

Note 2 to entry: Responsibilities of the transport service might be further delegated to others. For example, a courier service relying on public transport would delegate the operation of the transport mode to the public transport operator.

**3.5.2.3**
**shared vehicle service**
*shared mobility service* ( 3.5.2.1) where the *transport consumer* ( 3.5.1.3) has the primary responsibility for the operation of the *vehicle* ( 3.8.1.1)

Note 1 to entry: As there should only be one operator of a vehicle at any time, a shared vehicle service should use a sequential operational model.

Note 2 to entry: This term can be specialized by replacing "vehicle" with any defined vehicle type; however, in some cases the the preferred form is to consolidate terms (e.g., "carsharing" rather than "passenger car sharing").

**3.5.2.4**
**shared AV service**
*shared mobility service* ( 3.5.2.1) where the on-board logic within the vehicle has the primary responsibility for the operation of the *vehicle* ( 3.8.1.1)

**3.5.2.5**
**transport sharing**
using a *shared transport service* ( 3.5.2.2)

**3.5.2.6**
**vehicle sharing**
using a *shared vehicle service* ( 3.5.2.3)

**3.5.2.7**
**AV sharing**
using a *shared AV service* ( 3.5.2.4)

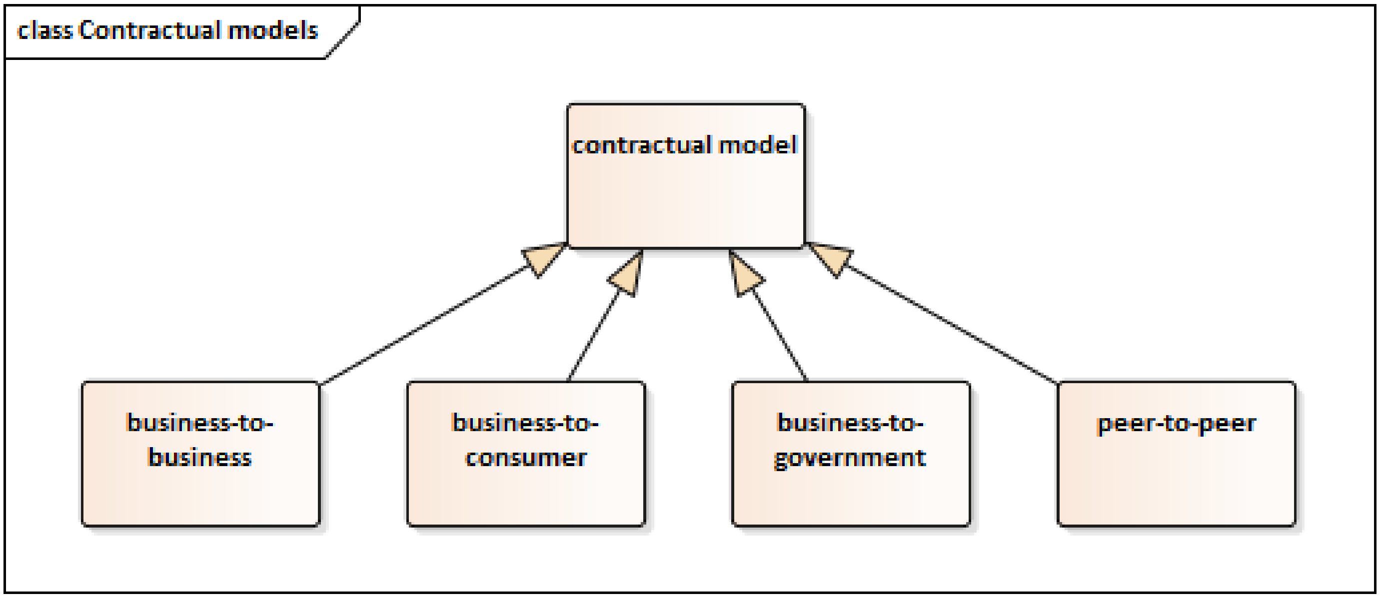


Figure 25: Concept model for Contractual models

**3.5.3.1**
**contractual model**
<shared mobility> legal framework used by a *shared mobility service* ( 3.5.2.1)\r\n

Note 1 to entry: Contracts might be via a third party, implied or verbal, especially in the case of peer-to-peer.

**3.5.3.2**
**business-to-business**
<shared mobility> *contractual model* ( 3.5.3.1) where the *transport provider* ( 3.5.1.1) is a commercial entity or governmental agency and the *transport consumer* ( 3.5.1.3) is a commercial entity

EXAMPLE 1A business purchasing monthly public transport passes for its employees

EXAMPLE 2A commercial entity using a commercial courier service for package delivery

**3.5.3.3**
**business-to-consumer**
<shared mobility> *contractual model* ( 3.5.3.1) where the *transport provider* ( 3.5.1.1) is a commercial entity or governmental agency and the *transport consumer* ( 3.5.1.3) is an individual

**3.5.3.4**
**business-to-government**
<shared mobility> *contractual model* ( 3.5.3.1) where the *transport provider* ( 3.5.1.1) is a commercial entity or governmental agency and the *transport consumer* ( 3.5.1.3) is a governmental entity

EXAMPLE A governmental entity using a commercial courier service for package delivery

### 3.5.3.5
**peer-to-peer**
<shared mobility> *contractual model* ( 3.5.3.1) where both the *transport provider* ( 3.5.1.1) and the *transport consumer* ( 3.5.1.3) are individuals

EXAMPLE ridesourcing

Note 1 to entry: The two individuals may connect and/or contract through a thrid party service.

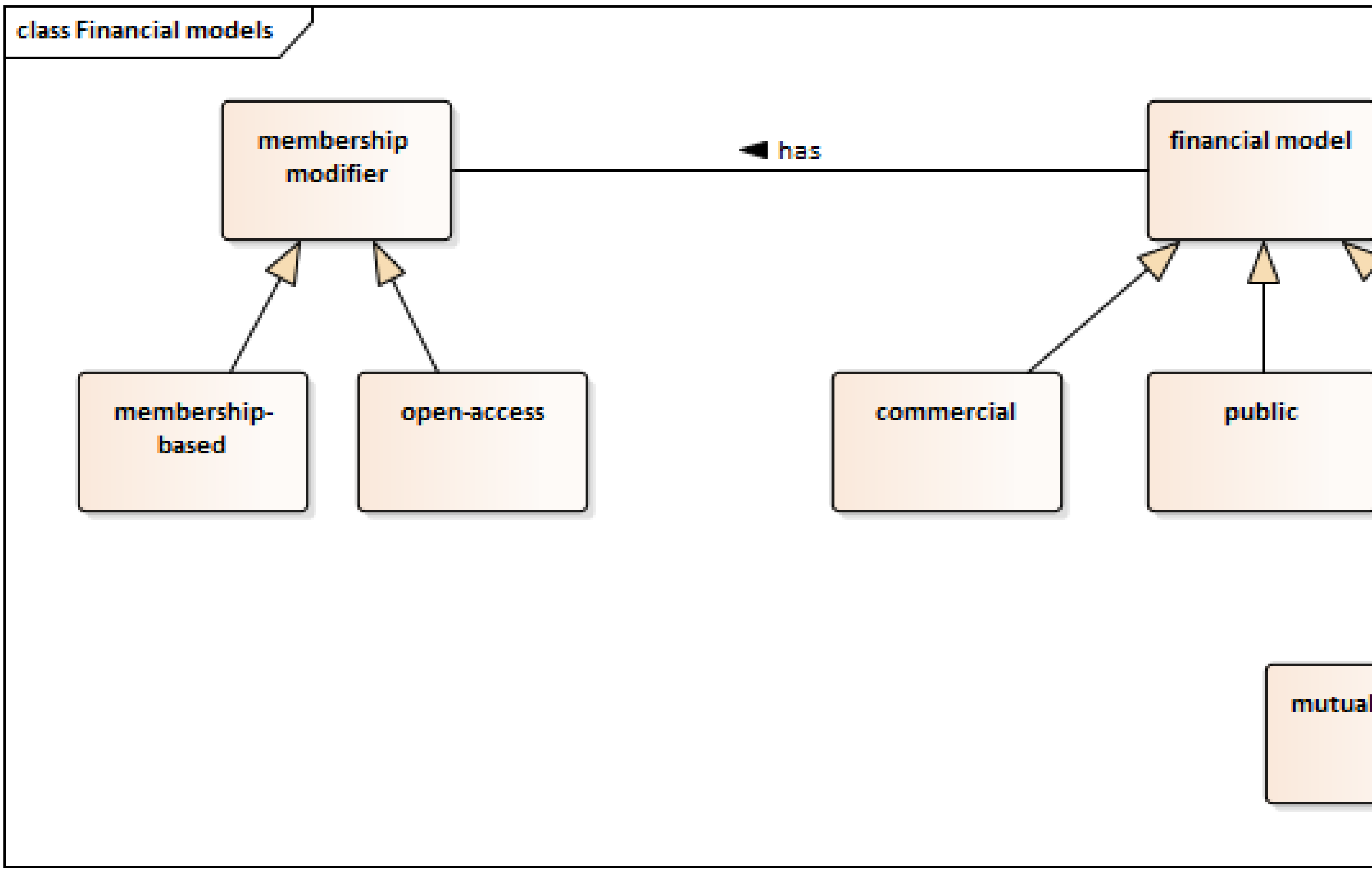


Figure 26: Concept model for Financial models

### 3.5.4.1
**financial model**
<shared mobility> economic framework used by a *shared mobility service* ( 3.5.2.1)

### 3.5.4.2
**commercial**
<shared mobility> *financial model* ( 3.5.4.1) where *transport services* ( 3.5.1.2) are provided with a profit motive

### 3.5.4.3
**public**
<shared mobility> *financial model* ( 3.5.4.1) where *transport services* ( 3.5.1.2) are provided by an administrative authority in an attempt to better serve societal interests

Note 1 to entry: The transport service is typically offered to the transport consumer for less than the full capital and operating cost of providing the service, but this is not a requirement.

Note 2 to entry: Typically, the administrative authority is a local government agency; but it could be another administrative authority, such as the national government or a commercial entity managing transport needs on their campus.

**3.5.4.4**
**cooperative**
<shared mobility> *financial model* ( 3.5.4.1) where *transport consumers* ( 3.5.1.3) partner to defray the costs of *transport services* ( 3.5.1.2)

Note 1 to entry: Cooperative models are exclusive commercial and public models.

**3.5.4.5**
**mutual benefit**
<shared mobility> *cooperative* ( 3.5.4.4) financial model where *transport consumers* ( 3.5.1.3) partner on a per-trip basis

**3.5.4.6**
**fractional ownership**
<shared mobility> *cooperative* ( 3.5.4.4) financial model where *transport consumers* ( 3.5.1.3) partner to support the purchase, maintenance, and overhead costs associated with a vehicle

**3.5.4.7**
**membership modifier**
<shared mobility> characteristic of a *financial model* ( 3.5.4.1) that indicates whether *transport consumers* ( 3.5.1.3) are required to enter into a agreement prior to receiving *transport services* ( 3.5.1.2)

**3.5.4.8**
**membership-based**
<shared mobility> characteristic of a *financial model* ( 3.5.4.1) that requires *transport consumers* ( 3.5.1.3) to enter into a agreement prior to receiving *transport services* ( 3.5.1.2)

Note 1 to entry: The agreement might be associated with fees.

Note 2 to entry: The agreement might be minimal, such as collecting user information for business purposes.

Note 3 to entry: The membership may be granted as a part of a broader agreement. For example, a university bus system might restrict access to students and faculty.

**3.5.4.9**
**open-access**
<shared mobility> characteristic of a *financial model* ( 3.5.4.1) that does not require membership within an organization to receive *transport services* ( 3.5.1.2)

Note 1 to entry: This includes models where membership is optional and might provide extra benefits.

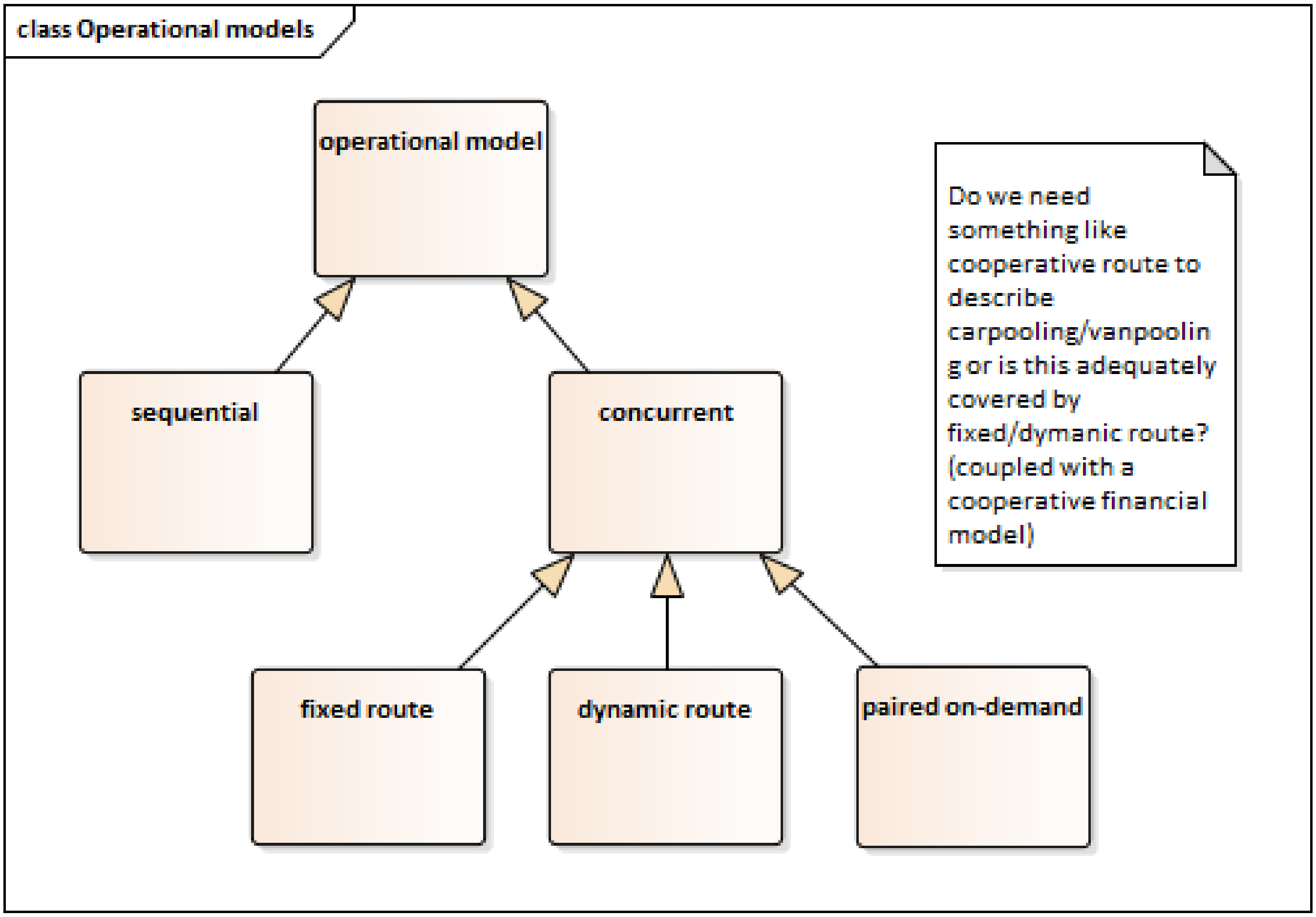


Figure 27: Concept model for Operational models

**3.5.5.1**
**operational model**
<shared transport> logistical framework used by a *shared mobility service* ( 3.5.2.1)

Note 1 to entry: The logistical framework might set restrictions on how a passenger and/or good is received, transported, and/or delivered.

**3.5.5.2**
**sequential**
<shared transport> *operational model* ( 3.5.5.1) where *transport services* ( 3.5.1.2) are provided to a single transport consumer at any one time

EXAMPLE traditional taxi service

Note 1 to entry: A single transport consumer might request the transport of multiple passengers.

**3.5.5.3**
**concurrent**
<shared transport> *operational model* ( 3.5.5.1) where *transport services* ( 3.5.1.2) might be provided to multiple *transport consumers* ( 3.5.1.3) at any one time

**3.5.5.4**
**fixed route**
<shared transport> *concurrent* ( 3.5.5.3) operation where *transported items* ( 3.5.1.5) can only be received or delivered at stopping points contained in a pre-defined sequence

EXAMPLE Traditional fixed-route bus line

**3.5.5.5**
**dynamic route**
<shared transport> *concurrent* ( 3.5.5.3) operation where *transported items* ( 3.5.1.5) can only be received or delivered at stopping points within a pre-defined service corridor

EXAMPLE Airport shuttle

Note 1 to entry: The service corridor is defined by the provider, who may impose further restrictions on where stops are allowed.

Note 2 to entry: The service corridor often includes a communal point of interest (e.g., an airport, transit hub, etc) as a fixed stopping point.

**3.5.5.6**
**paired on-demand**
<shared transport> *concurrent* ( 3.5.5.3) operation where the *transport provider* ( 3.5.1.1) may choose to divert from its path to service a new request from another *transport consumer* ( 3.5.1.3) while servicing an earlier transport consumer

EXAMPLE ridesplitting

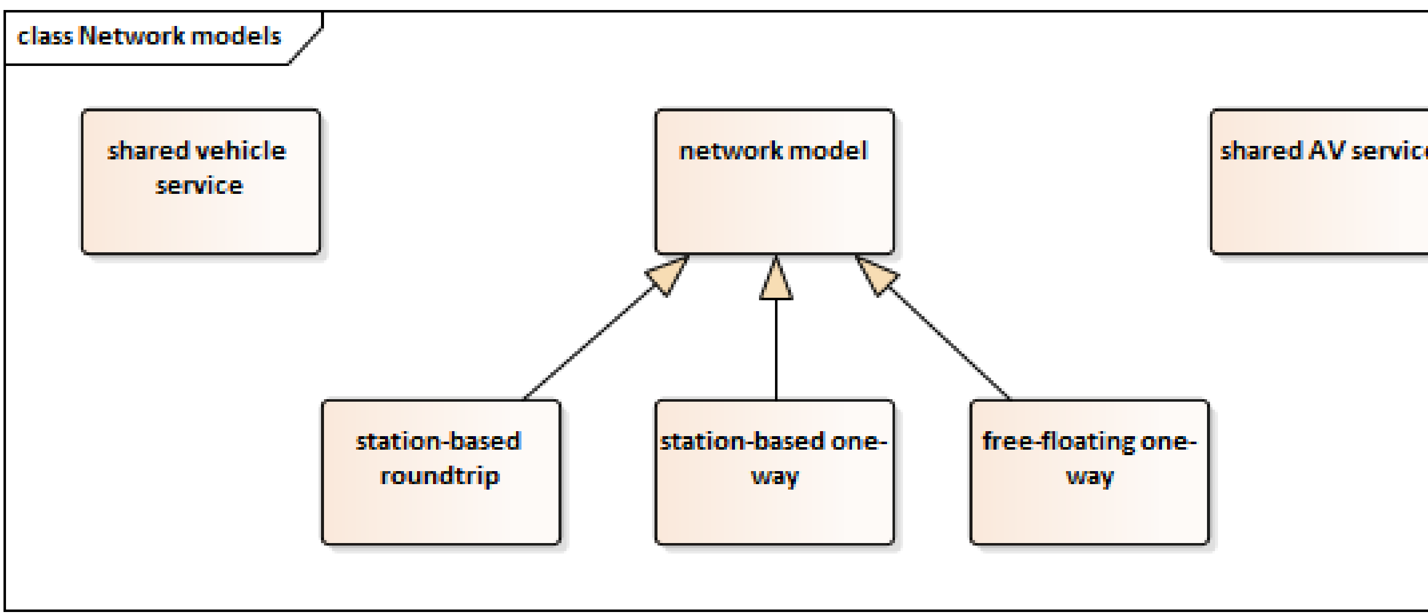


Figure 28: Concept model for Network models

**3.5.6.1**
**network model**
<shared vehicle> infrastructure framework used by a *shared mobility service* ( 3.5.2.1)

**3.5.6.2**
**station-based roundtrip**
<shared vehicle> *operational mode* ( 3.5.6.1) where *vehicle sharing* ( 3.5.2.6) is initiated and terminated at the same facility managed by the *transport provider* ( 3.5.1.1)

**3.5.6.3**
**station-based one-way**
<shared vehicle> *operational mode* ( 3.5.6.1) where *vehicle sharing* ( 3.5.2.6) is initiated and terminated at two different facilities managed by the *transport provider* ( 3.5.1.1)

**3.5.6.4**
**free-floating one-way**
<shared mobility> *network model* ( 3.5.6.1) where sharing may be initiated and terminated at any location meeting basic criteria

Note 1 to entry: The basic criteria typically include geographic limits and requirements related to legal and safe locations.

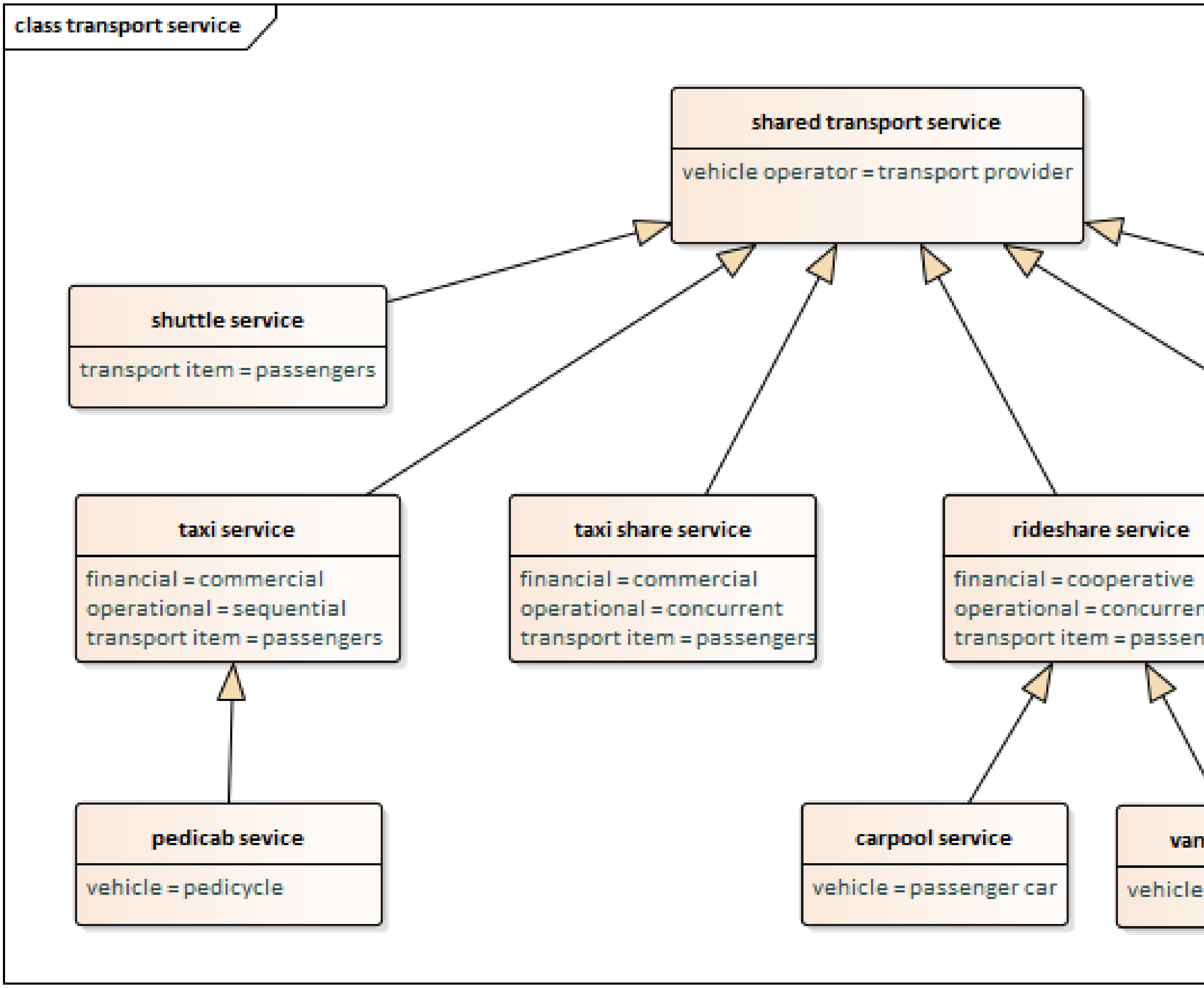


Figure 29: Concept model for transport service

**3.5.7.1**
**shuttle service**
*shared transport service* ( 3.5.2.2) that transports passengers between two specified *locations* ( 3.4.1.1)

Note 1 to entry: Each location might be defined as point, linear, or area locations; however, the areas of the two locations should not overlap.

**3.5.7.10**
**courier network service**
*commercial* ( 3.5.4.2), *peer-to-peer* ( 3.5.3.5) *shared transport service* ( 3.5.2.2) that transports goods

Note 1 to entry: The goods are typically small packages, letters, food, etc.

**3.5.7.2**
**taxi service**
*commercial* ( 3.5.4.2) *shared transport service* ( 3.5.2.2) that transports passengers *sequentially* ( 3.5.5.2)\r\n

**3.5.7.3**
**pedicab sevice**
*taxi service* ( 3.5.7.2) that uses a *pedicycle* ( 3.8.3.1) to provide transport

**3.5.7.4**
**taxi share service**
*commercial* ( 3.5.4.2) *shared transport service* ( 3.5.2.2) that transports passengers *concurrently* ( 3.5.5.3)

**3.5.7.5**
**rideshare service**
*cooperative* ( 3.5.4.4) *shared transport service* ( 3.5.2.2) that transports passengers *concurrently* ( 3.5.5.3)

**3.5.7.6**
**carpool service**
*rideshare service* ( 3.5.7.5) that uses a *passenger car* ( 3.8.2.2) for transport

**3.5.7.7**
**vanpool service**
*rideshare service* ( 3.5.7.5) that uses a *passenger van* ( 3.8.2.3) for transport

**3.5.7.8**
**ridesourced service**
*commercial* ( 3.5.4.2), *peer-to-peer* ( 3.5.3.5) *shared transport service* ( 3.5.2.2) that transports passengers

**3.5.7.9**
**ridesplit service**
*ridesourced service* ( 3.5.7.8) that serves passengers *concurrently* ( 3.5.5.3)

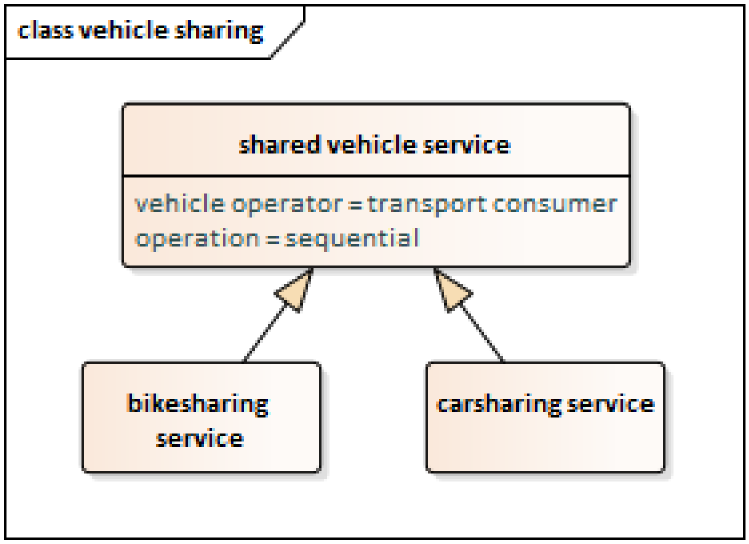


Figure 30: Concept model for vehicle sharing

**3.5.8.1**
**bikesharing service**
bicycle sharing service
*shared vehicle service* ( 3.5.2.3) that shares bicycles

**3.5.8.2**
**carsharing service**
passenger car sharing service
*shared vehicle service* ( 3.5.2.3) that shares passenger cars

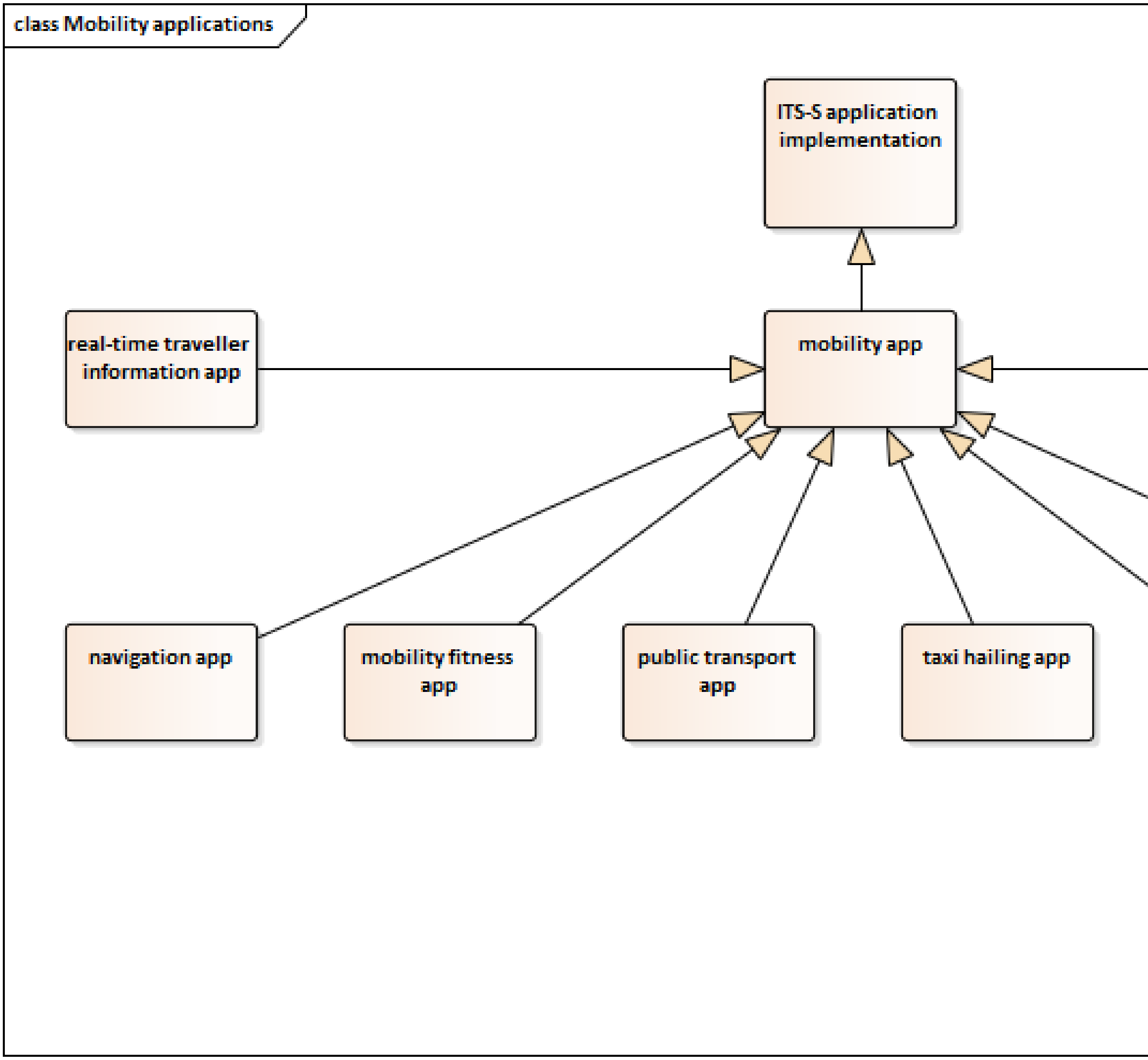


Figure 31: Concept model for Mobility applications

**3.5.9.1**
**mobility app**
*ITS-S application implementation* ( 3.2.2.6) designed to assist an individual transport consumer in understanding transport-related information, making decisions, and/or acting upon decisions

**3.5.9.10**
**trip aggregator app**
*mobility app* ( 3.5.9.1) that assists a *transport consumer* ( 3.5.1.3) in planning trips that may span multiple vehicle modes or transport providers\r\n

Note 1 to entry: The assistance might include reservations, ticketing, and similar services.

**3.5.9.2**
**B2C mobility sharing app**
*mobility app* ( 3.5.9.1) that assists a *transport consumer* ( 3.5.1.3) in acquiring *shared mobility services* ( 3.5.2.1) from a specific business

**3.5.9.3**
**mobility fitness app**
*mobility app* ( 3.5.9.1) that tracks information about a traveller to provide health-related information \r\n

Note 1 to entry: The information collected may include details such as speed, elapsed travel time, heart rate, etc.

Note 2 to entry: The provided health information might include caloric consumption, peak heart rate, distance travelled, etc.

**3.5.9.4**
**navigation app**
*mobility app* ( 3.5.9.1) that assists a *transport consumer* ( 3.5.1.3) to determine the best route to the destination

**3.5.9.5**
**P2P mobility sharing app**
*mobility app* ( 3.5.9.1) that assists a *transport consumer* ( 3.5.1.3) in acquiring *shared mobility services* ( 3.5.2.1) from an individual that participates in the mobility app's network

**3.5.9.6**
**ridesourcing app**
*P2P mobility sharing app* ( 3.5.9.5) for acquiring a *ridesourced service* ( 3.5.7.8)

**3.5.9.7**
**public transport app**
*mobility app* ( 3.5.9.1) that assists a *transport consumer* ( 3.5.1.3) in using a public transport system

Note 1 to entry: A public tranport app might include features such as viewing maps, searching routes and schedules, real-time arrival information, ticketing, electronic boarding pass, etc.

**3.5.9.8**
**real-time traveller information app**
*mobility app* ( 3.5.9.1) that provides information about current travel conditions to a *transport consumer* ( 3.5.1.3)

**3.5.9.9**
**taxi hailing app**
*mobility app* ( 3.5.9.1) that assists a *transport consumer* ( 3.5.1.3) in electronically requesting a taxi \r\n

## 3.6 Person terms

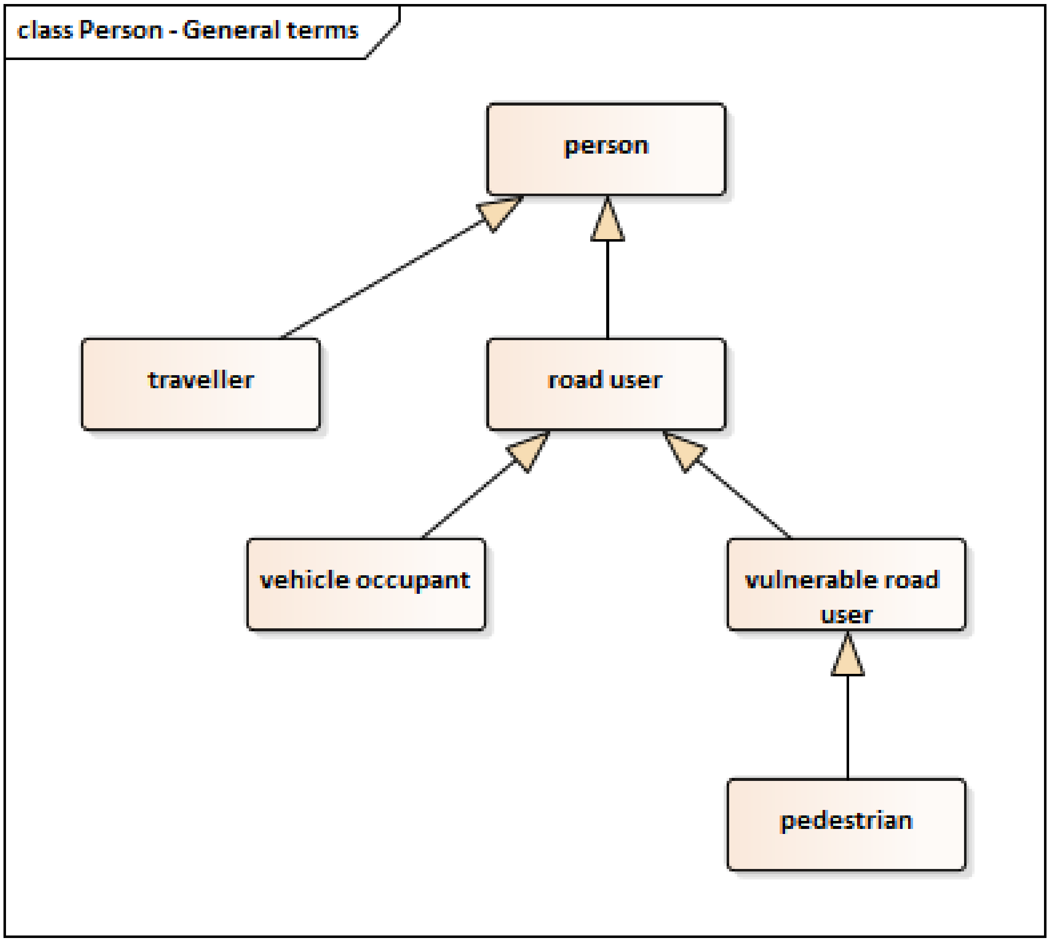


Figure 32: Concept model for Person - General terms

**3.6.1.1**
**person**
entity, i.e. a natural or legal person, recognized by law as having legal rights and duties, able to make commitment(s), assume and fulfil resulting obligation(s), and able to be held accountable for its action(s)

Note 1 to entry: Minimum and common external constraints applicable to a business transaction often require one to differentiate among three common sub-types of Person, namely "individual", "organization", and "public administration".

Note 2 to entry: Person is capitalized to indicate that it is being utilized as formally defined in the standards and to differentiate it from its day-to-day use.

Note 3 to entry: Synonyms for "legal person" include "artificial person", "body corporate", etc., depending on the terminology used in competent jurisdictions.

[Source: ISO/IEC 14662:2010(en), 3.24]

**3.6.1.2**
**traveller**
*person* ( 3.6.1.1) who is headed to a destination

**3.6.1.3**
**road user**
*person* ( 3.6.1.1) who is on or near a *roadway* ( 3.3.1.2) or in a *vehicle* ( 3.8.1.1)

**3.6.1.4**
**vulnerable road user**
*road user* ( 3.6.1.3) other than a *vehicle occupant* ( 3.6.2.3)

**3.6.1.5**
**pedestrian**
*vulnerable road user* ( 3.6.1.4) who is on foot

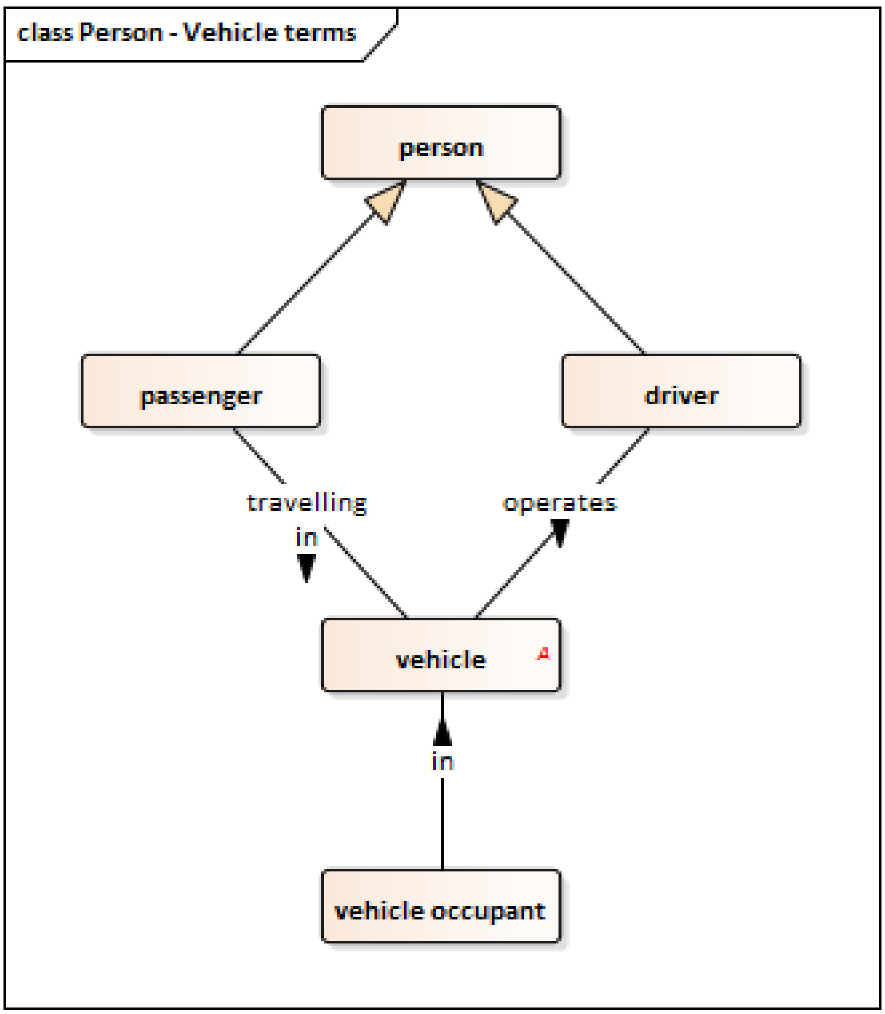

Figure 33: Concept model for Person - Vehicle terms

**3.6.2.1**
**driver**
*person* ( 3.6.1.1) who is operating a *vehicle* ( 3.8.1.1)

**3.6.2.2**
**passenger**
*person* ( 3.6.1.1) who has a reservation to travel or is travelling in a *vehicle* ( 3.8.1.1) except for any crew, staff, or drivers

**3.6.2.3**
**vehicle occupant**
*person* ( 3.6.1.1) in a *vehicle* ( 3.8.1.1)

## 3.7 Physical objects

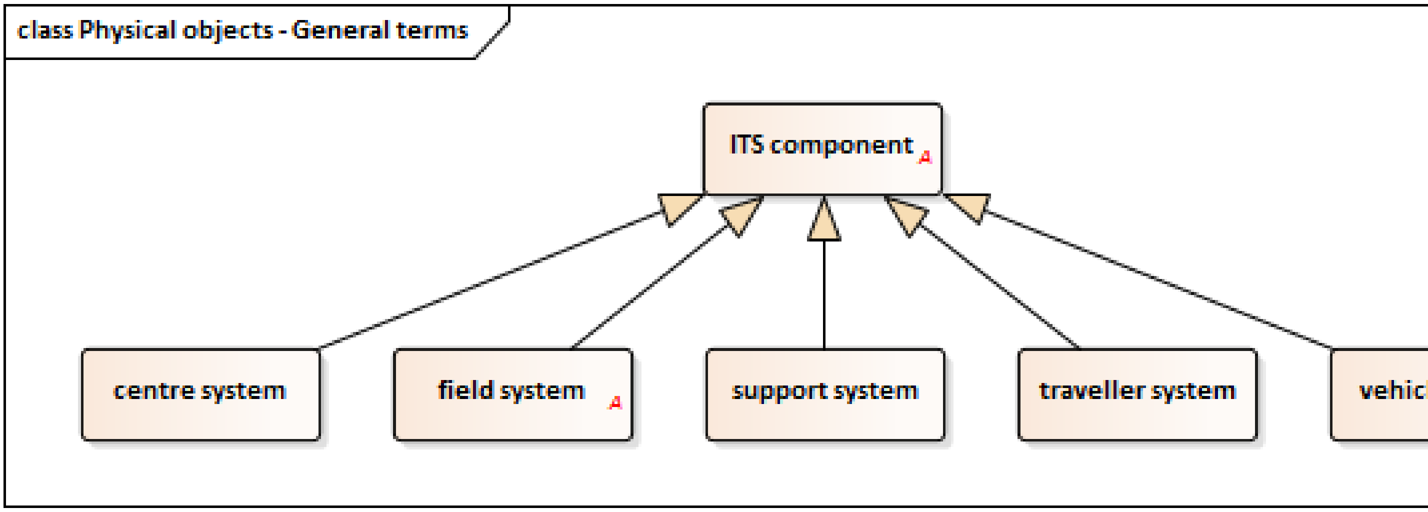


Figure 34: Concept model for Physical objects - General terms

**3.7.1.1**
**centre system**
*ITS component* ( 3.1.6.4) that provides application, management, and/or administrative functions from a centralized location (i.e., not at the *roadside* ( 3.3.1.14))

**3.7.1.2**
**field system**
*ITS component* ( 3.1.6.4) that performs localized surveillance, traffic control, information provision, payment transaction, wireless communication services between mobile elements and fixed infrastructure, and/or other services.

EXAMPLE traffic detector, camera, signal controller, message sign, tolling station

Note 1 to entry: Typically, field systems are located along the roadside.

Note 2 to entry: Typically, the operation of field systems are governed by management functions running in centre systems.

**3.7.1.3**
**support system**
*ITS component* ( 3.1.6.4) that provides support services for one or more other ITS components

**3.7.1.4**
**traveller system**
*ITS component* ( 3.1.6.4), other than a *vehicle system* ( 3.7.1.5), that is used by a person in relation to a past, current, or upcoming journey

**3.7.1.5**
**vehicle system**
*ITS component* ( 3.1.6.4) that is installed as a component of a *vehicle* ( 3.8.1.1)

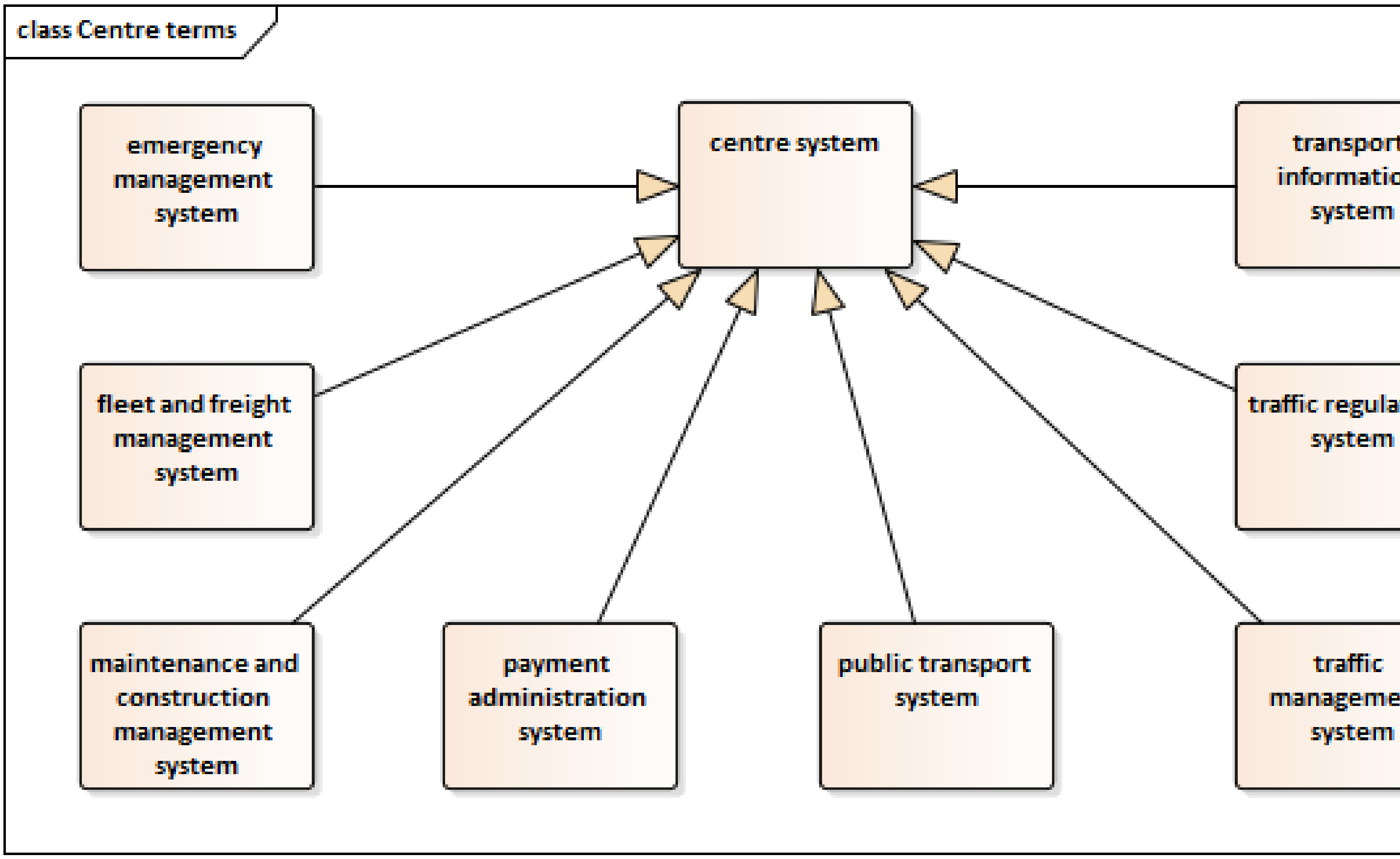


Figure 35: Concept model for Centre terms

**3.7.2.1**
**emergency management system**
*centre system* ( 3.7.1.1) that allows an entity to manage and respond to crashes, events, disasters, evacuation orders, and other incidents

**3.7.2.2**
**fleet and freight management system**
*centre system* ( 3.7.1.1) that allows a fleet or freight operator to manage and control its personnel, equipment, and/or freight

**3.7.2.3**
**maintenance and construction management system**
*centre system* ( 3.7.1.1) that allows an entity to monitor and manage the construction and maintenance of roadway infrastructure

**3.7.2.4**
**payment administration system**
*centre system* ( 3.7.1.1) that allows an entity to manage financial transactions related to transportation, especially the electronic transfer of funds

**3.7.2.5**
**public transport system**
*centre system* ( 3.7.1.1) that allows an entity to manage the activities of a public transport agency

**3.7.2.6**
**traffic management system**
*centre system* ( 3.7.1.1) that monitors and controls traffic and the road network

**3.7.2.7**
**traffic regulatory system**
*centre system* ( 3.7.1.1) that officially records traffic regulations in electronic form so that they can be distributed to other systems

**3.7.2.8**
**transport information system**
*centre system* ( 3.7.1.1) that provides information of interest to the travelling public

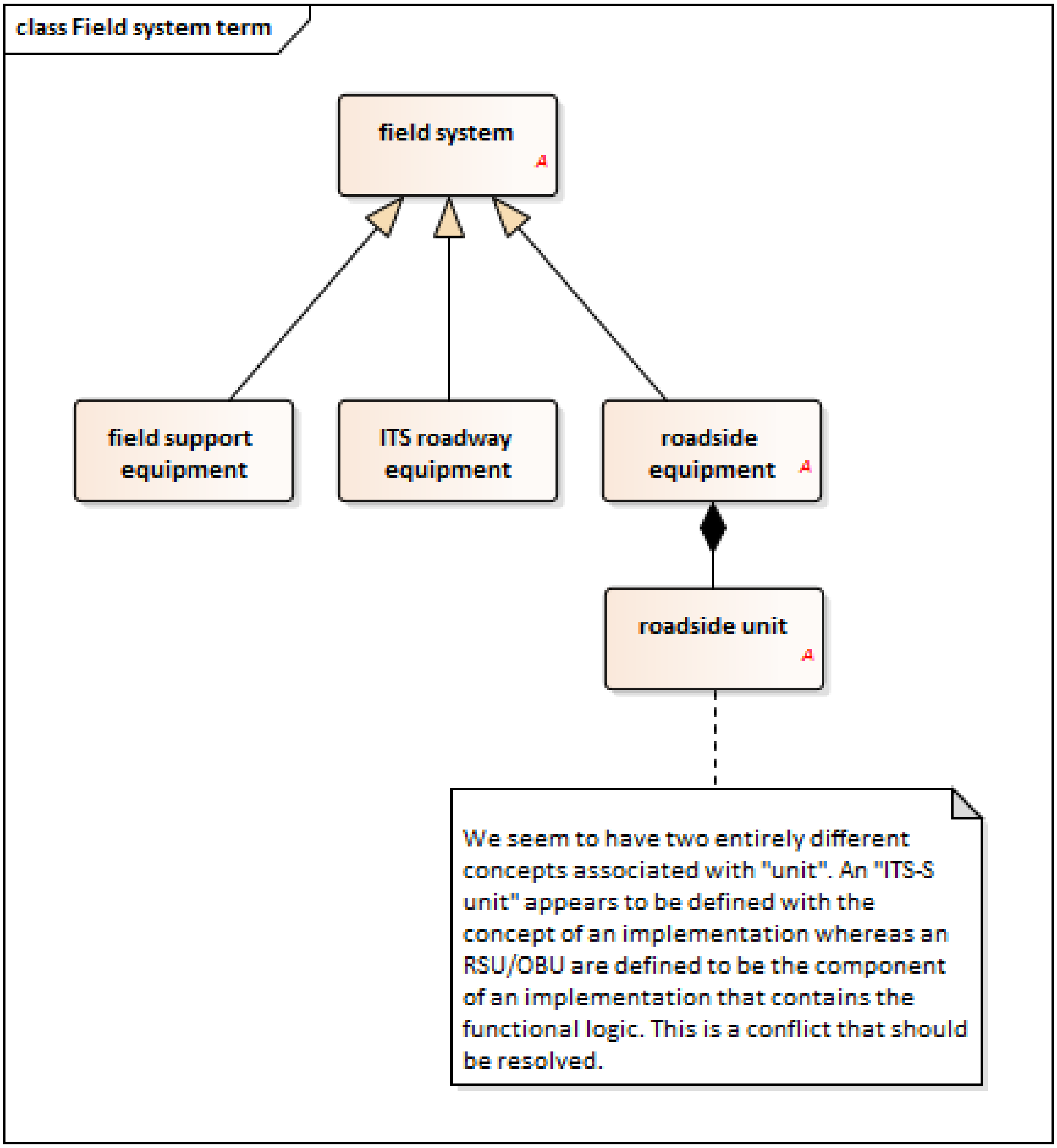


Figure 36: Concept model for Field system term

**3.7.3.1**
**field support equipment**
portable *field system* ( 3.7.1.2) used by field personnel to locally troubleshoot, initialize, reprogram, and test infrastructure equipment

**3.7.3.2**
**ITS roadway equipment**
*field system* ( 3.7.1.2) that performs localized surveillance, traffic control, information provision, and/or payment transaction services

### 3.7.3.3
**roadside equipment**

DEPRECATED: roadside ITS station

*field system* ( 3.7.1.2) used to send electronic messages to and receive messages from nearby *vehicle systems* ( 3.7.1.5) and *traveller systems* ( 3.7.1.4) via wireless technologies

### 3.7.3.4
**roadside unit**

component of *roadside equipment* ( 3.7.3.3) that performs the logical control functions

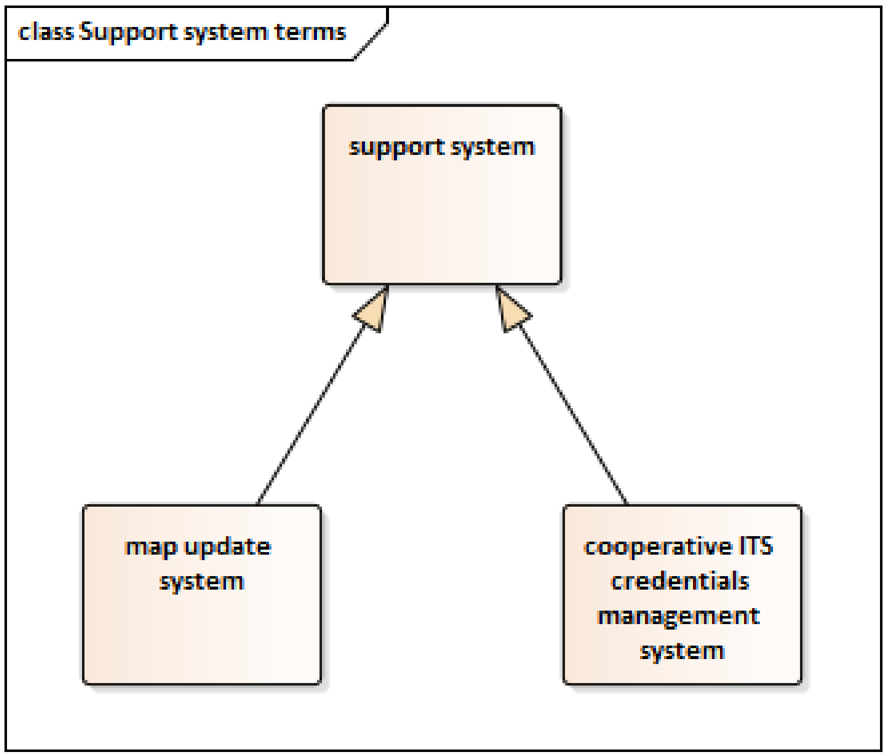


Figure 37: Concept model for Support system terms

### 3.7.4.1
**map update system**

*support system* ( 3.7.1.3) that provides map databases used to support *ITS services* ( 3.1.11.1)

### 3.7.4.2
**cooperative ITS credentials management system**

*support system* ( 3.7.1.3) that enables trusted communications among ITS components and protects data from unauthorized access

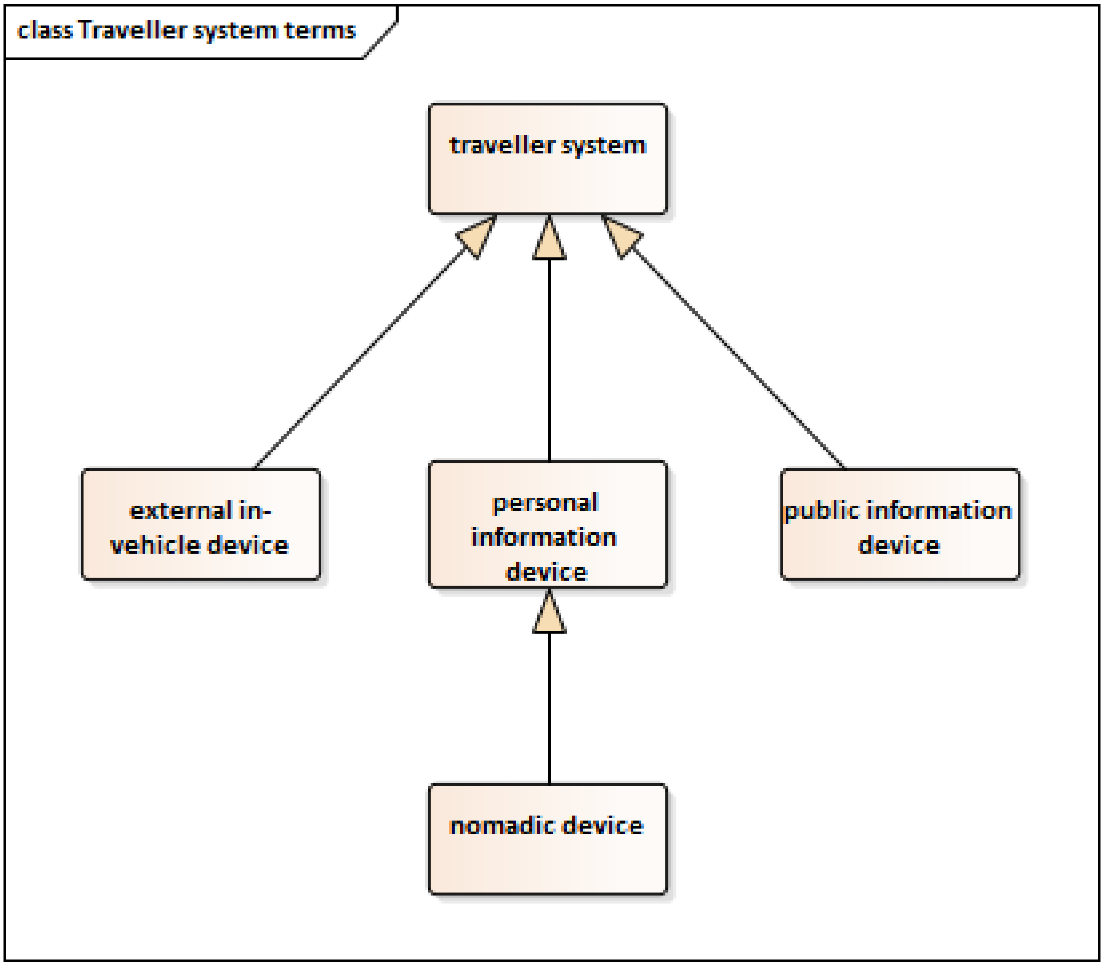


Figure 38: Concept model for Traveller system terms

**3.7.5.1**
**external in-vehicle device**
*traveller system* ( 3.7.1.4) consisting of GNSS and/or cellular modules that are connected to a vehicle during a trip\r\n

**3.7.5.2**
**personal information device**
*traveller system* ( 3.7.1.4) that enables personal access to traveller information

EXAMPLE personal computer

**3.7.5.3**
**nomadic device**
*personal information device* ( 3.7.5.2) that is taken with and can be accessed by the traveller during a journey

**3.7.5.4**
**public information device**
*traveller system* ( 3.7.1.4) that provides public access to traveller information

EXAMPLE kiosk

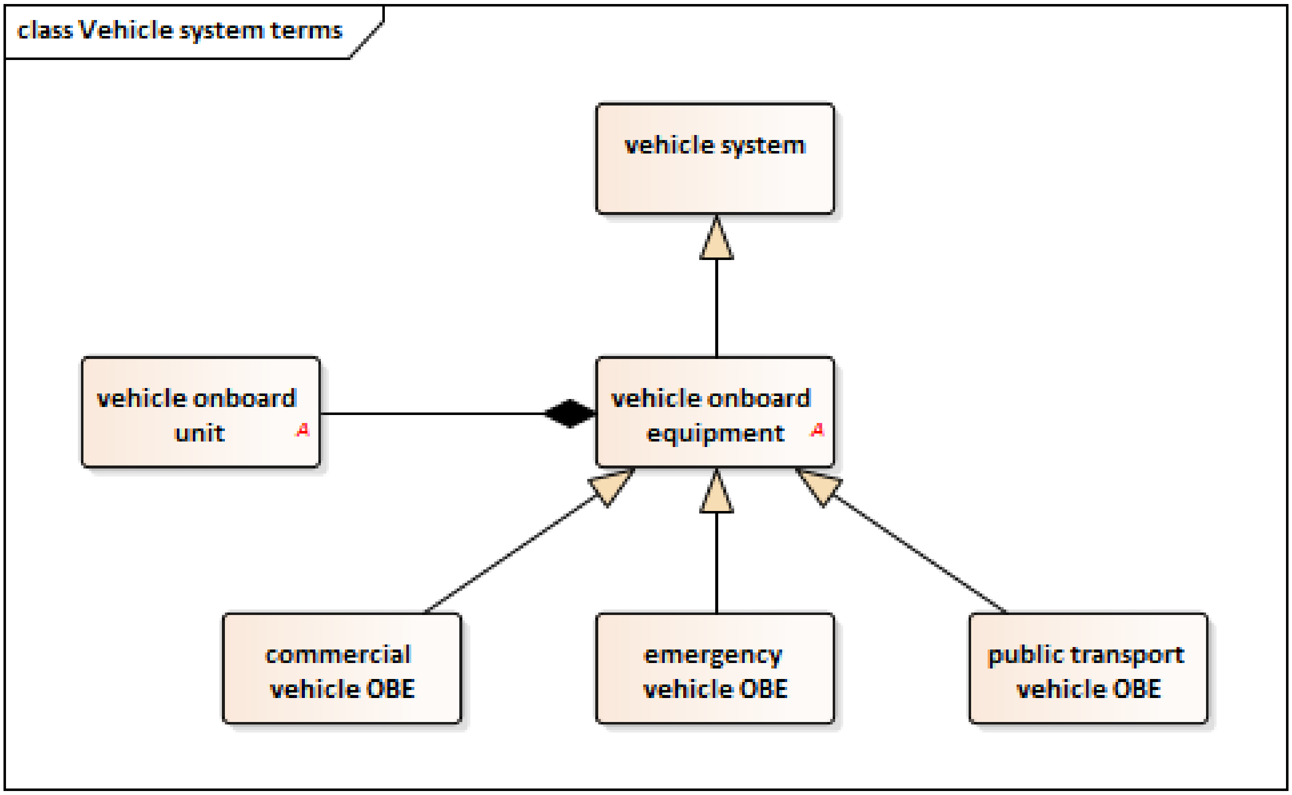


Figure 39: Concept model for Vehicle system terms

**3.7.6.1**
**vehicle onboard equipment**
OBE
onboard equipment
*vehicle system* ( 3.7.1.5) that provides the onboard functions necessary to support the C-ITS services supported by the vehicle

Note 1 to entry: It is preferred to include the word "vehicle" in the term so that it is sufficiently well distinguished from the specialized types of OBEs.

**3.7.6.2**
**vehicle onboard unit**
component of *vehicle onboard equipment* ( 3.7.6.1) that performs the logical control functions

**3.7.6.3**
**commercial vehicle OBE**
*vehicle OBE* ( 3.7.6.1) that provides functionality related to commercial vehicle operations

**3.7.6.4**
**emergency vehicle OBE**
*vehicle OBE* ( 3.7.6.1) that provides functionality related to emergency vehicle operations\r\n

**3.7.6.5**
**public transport vehicle OBE**
*vehicle OBE* ( 3.7.6.1) that provides functionality related to public transport vehicle operations

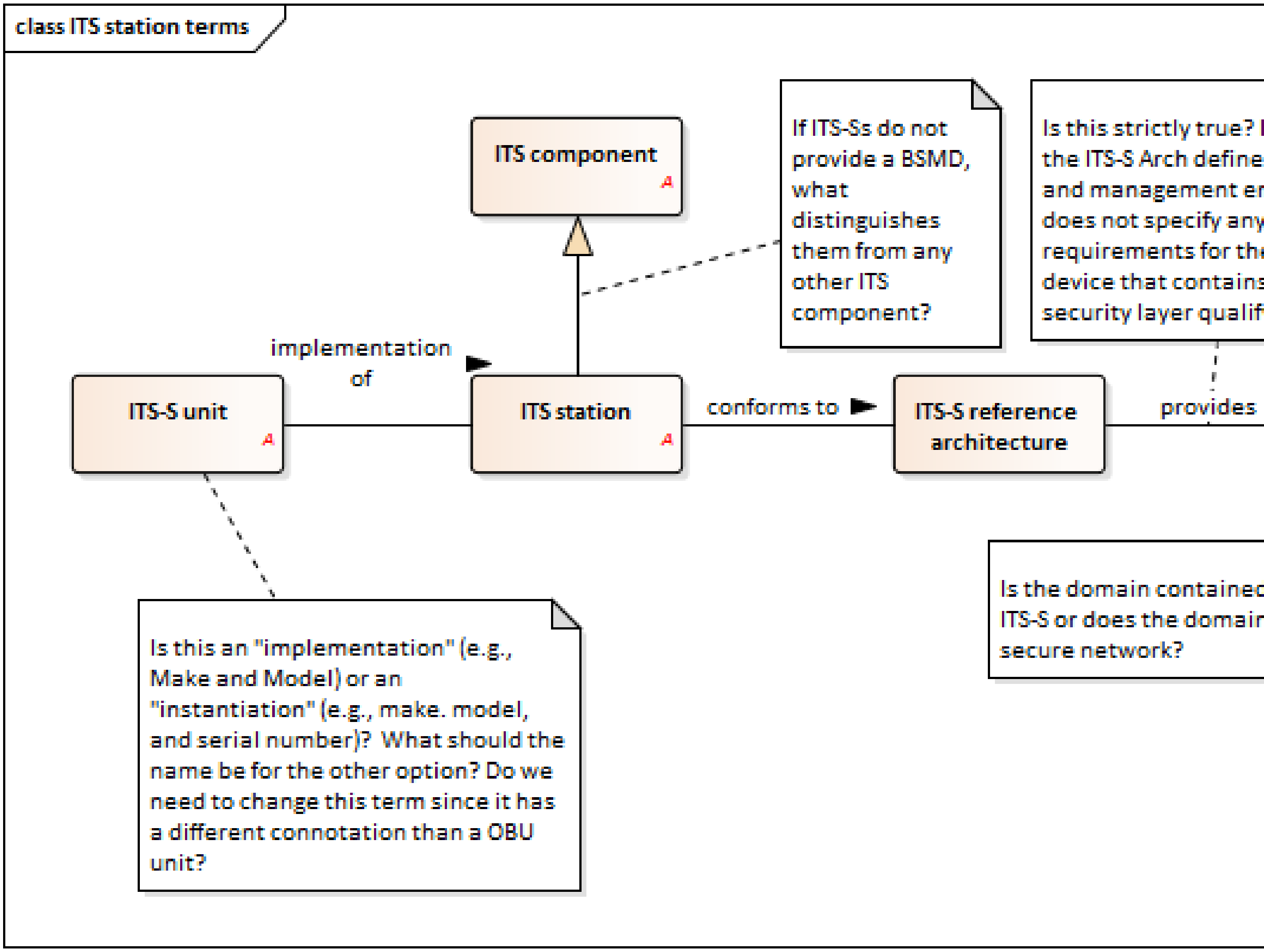


Figure 40: Concept model for ITS station terms

**3.7.7.2**

**ITS station**

*ITS component* ( 3.1.6.4) that provides a *bounded secured managed domain* ( 3.1.12.5) and conforms to the *ITS-S reference architecture* ( 3.1.7.4)\r\n

Note 1 to entry: \r\n

EDITORS NOTE 1 There appears to be ambiguity (and perhaps disagreement within the industry) as to whether a "bounded secured managed domain" is the logical domain within each ITS-S or if it represents the ITS-S network. The proposed definition uses the former concept.\r\n

EDITORS NOTE 2 The proposed definition assumes that an ITS-S does not cease being an ITS-S simply because it is disconnected from any network; therefore "in a communications network" is an invalid constraint.\r\n

EDITORS NOTE 3 As can be seen in a few examples, the phrase "network, comprised of applications" is ambiguous as it is unclear if the ITS-S is comprised of the items or if the network is comprised of the items.\r\n

EDITORS NOTE 4 The proposed definition assumes that ITS-S are not required to have a wireless network interface. It is my understanding that any ITS device that conformed to the ITS-S architecture (which is almost a null requirement) and provides a BSMD (which is ill-defined) would

be considered an ITS-S. Thus, at least at present, I see the term ITS-S to really mean any ITS physical entity that can claim to be secure (and it would be just a claim since there are no measurable requirements). And in fact, some definitions even make the BSMD optional though I think this is wildly unwise.\r\n
EDITORS NOTE 5 Logically, an ITS-S seldom (if ever) provides ITS services because an ITS-S is a component of an ITS network; the ITS service is provided by the ITS as a whole. The ITS-S logically should provide ITS-S services, or more specifically, the ITS-S is comprised of the ITS-S architectural components (i.e., applications entity, facilities layer, etc), which all provide ITS-S services. \r\n

Note 1 to entry: The ITS station architecture is defined in ISO 21217.

**3.7.7.3**
**ITS-S unit**
implementation of an *ITS station* ( 3.7.7.2)

## 3.8 Vehicle type terms

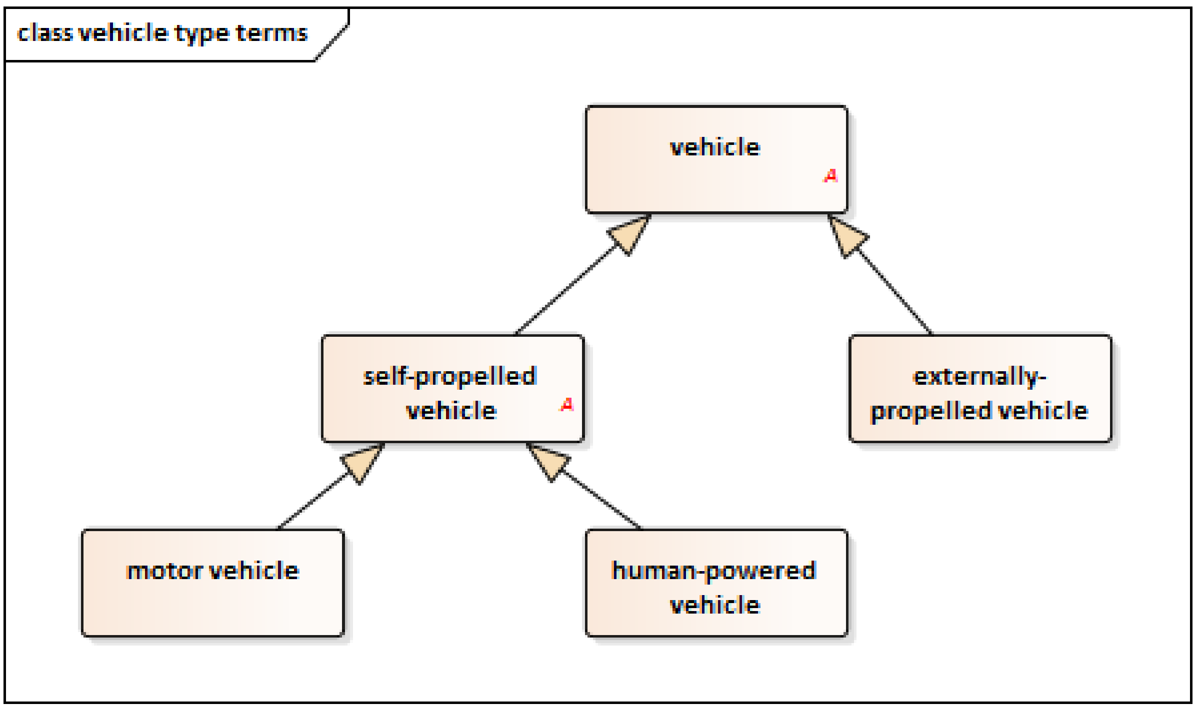


Figure 41: Concept model for vehicle type terms

**3.8.1.1**
**vehicle**
*entity* ( 3.1.10.1) used to transport people or physical goods\r\n

**3.8.1.2**
**self-propelled vehicle**
*vehicle* ( 3.8.1.1) propelled by an on-board source\r\n

Note 1 to entry: Contrast to externally propelled vehicle.

**3.8.1.3**
**motor vehicle**
*self-propelled vehicle* ( 3.8.1.2) having at least two wheels, designed to be used on a road network, and propelled by an on-board motor\r\n

**3.8.1.4**
**human-powered vehicle**
*self-propelled vehicle* ( 3.8.1.2) propelled by the muscular energy of one or more on-board person(s)\r\n

**3.8.1.5**
**externally-propelled vehicle**
*vehicle* ( 3.8.1.1) propelled by an external entity\r\n

Note 1 to entry: The external entity is often a self-propelled vehicle, but may be any external source, including and not limited to an animal (e.g., an ox pulling a cart), a cable (e.g., San Francisco Trolley cars), or magnets (e.g., a maglev train).

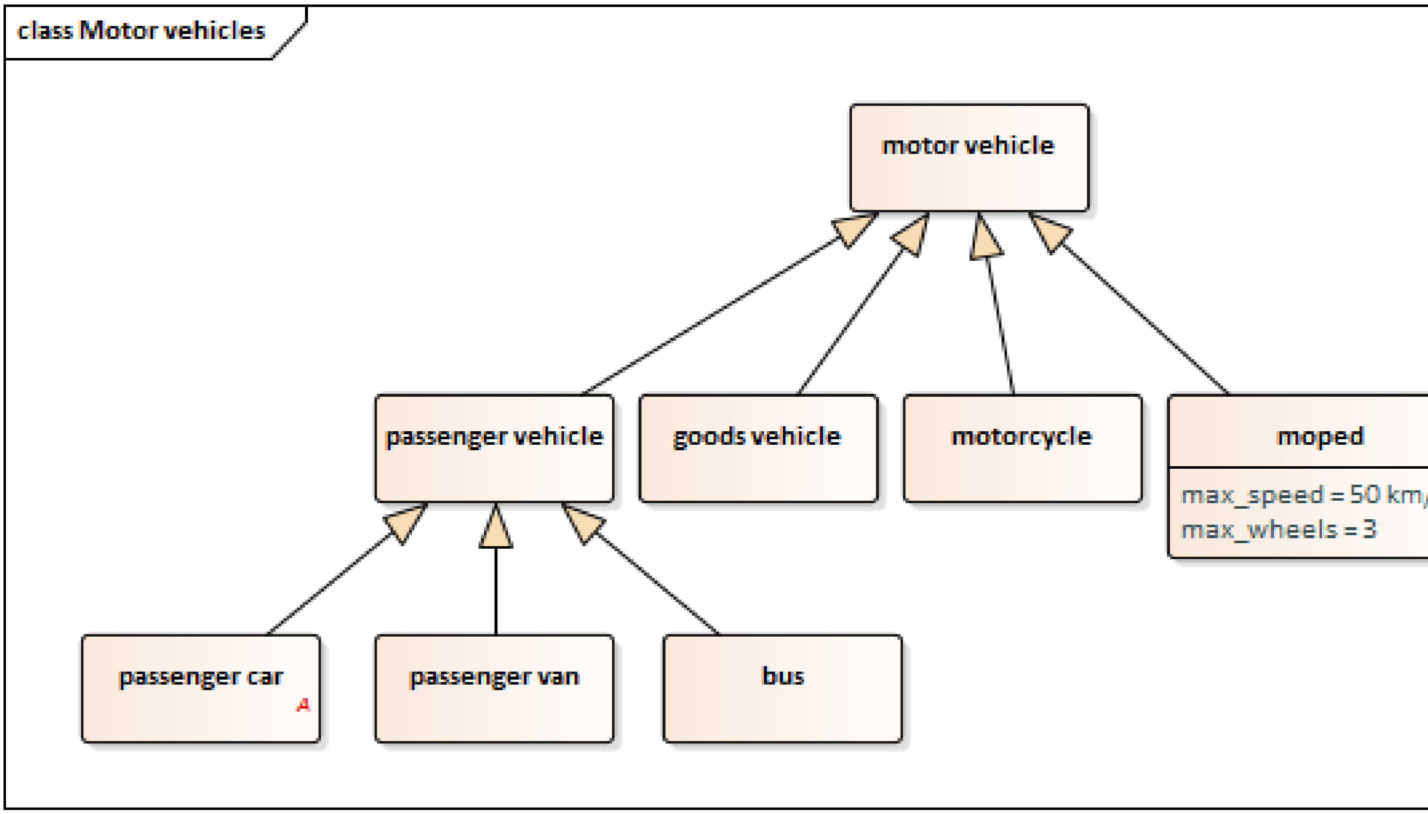


Figure 42: Concept model for Motor vehicles

**3.8.2.1**
**passenger vehicle**
*motor vehicle* ( 3.8.1.3) with four or more wheels designed primarily for the carriage of (a) person(s)\r\n

**3.8.2.2**
**passenger car**
*passenger vehicle* ( 3.8.2.1) with not more than eight seating positions in addition to the drivers seating position (if any) and not designed for standing passengers\r\n

**3.8.2.3**
**passenger van**
*passenger vehicle* ( 3.8.2.1) designed for the carriage of more than eight but fewer than 16 passengers, whether seated or standing, in addition to the driver (if any)\r\n

**3.8.2.4**
**bus**
*passenger vehicle* ( 3.8.2.1) designed for the carriage of more than 15 passengers, whether seated or standing, in addition to the driver (if any)\r\n

**3.8.2.5**
**goods vehicle**
*motor vehicle* ( 3.8.1.3) with four or more wheels designed primarily for the carriage of goods per UNECE WP.29/1045\r\n

Note 1 to entry: UNECE WP.29/1045 provides a formula to disambiguate between passenger vehicles (Category 1 vehicles) and goods vehicles (Category 2 vehicles).

**3.8.2.6**
**motorcycle**
*motor vehicle* ( 3.8.1.3) with 2 or 3 wheels and a maximum design speed exceeding 50 km/h\r\n

**3.8.2.7**
**moped**
*motor vehicle* ( 3.8.1.3) with 2 or 3 wheels and a maximum design speed not exceeding 50 km/h\r\n

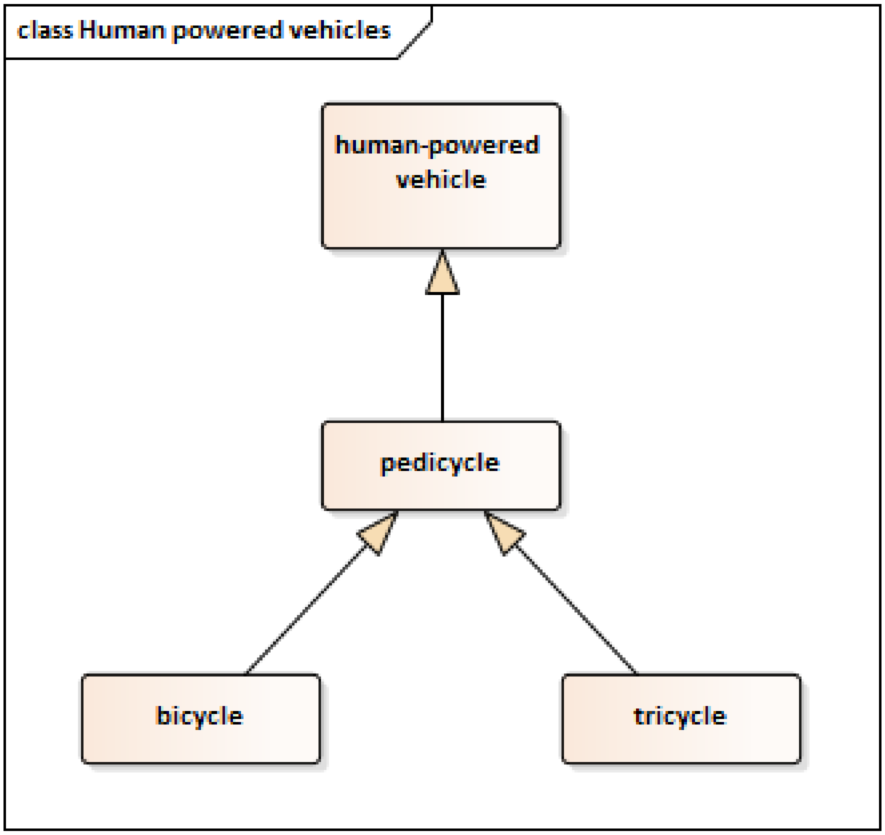


Figure 43: Concept model for Human powered vehicles

**3.8.3.1**
**pedicycle**
*human-powered vehicle* ( 3.8.1.4) with two or more wheels \r\n

**3.8.3.2**
**bicycle**
*human-powered vehicle* ( 3.8.1.4) with two wheels

**3.8.3.3**
**tricycle**
*human-powered vehicle* ( 3.8.1.4) with three wheels

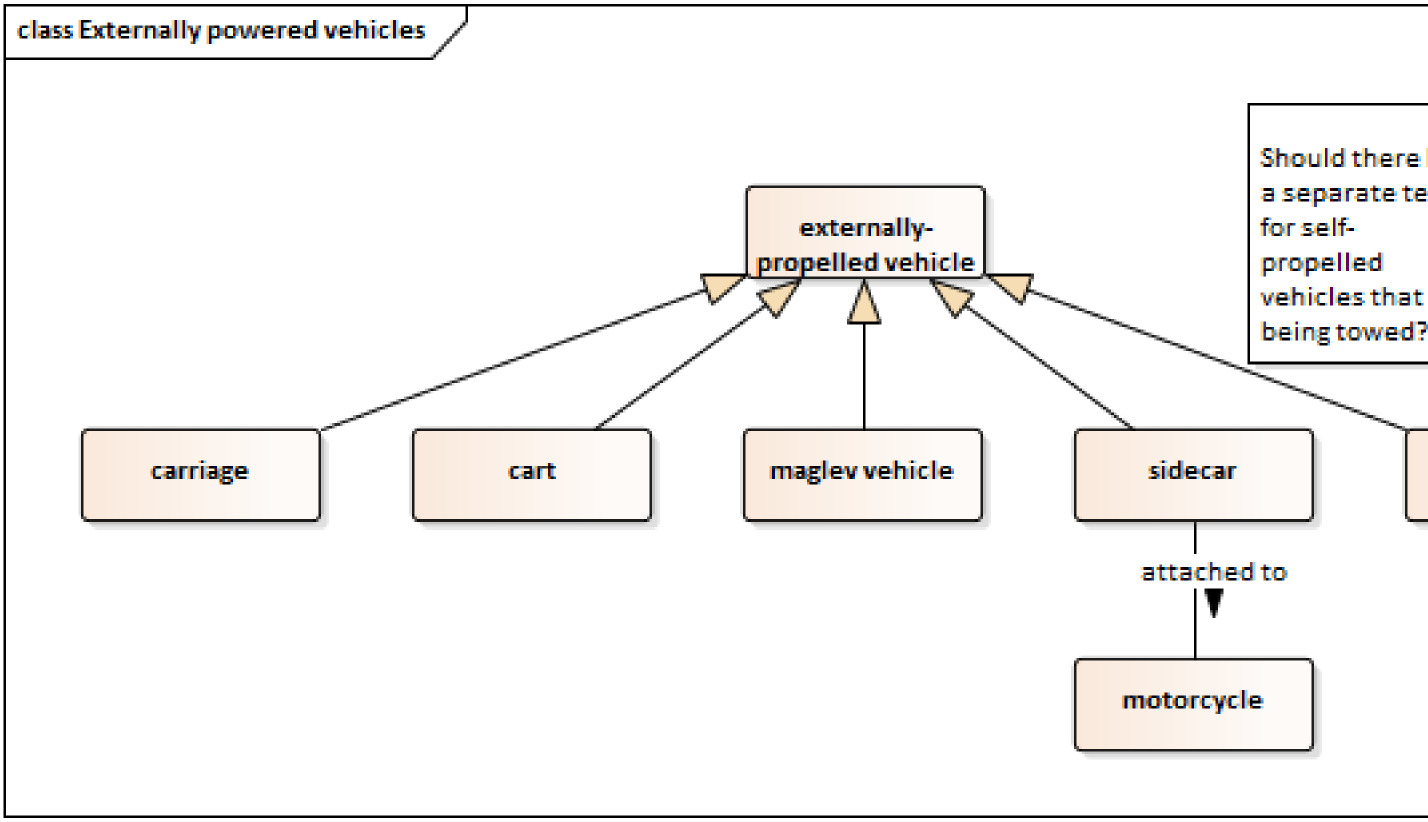

Figure 44: Concept model for Externally powered vehicles

**3.8.4.1**
**carriage**
*externally-propelled vehicle* ( 3.8.1.5) with more than two wheels propelled by an animal or person on foot\r\n

**3.8.4.2**
**cart**
*externally-propelled vehicle* ( 3.8.1.5) with two wheels propelled by an animal or person on foot\r\n

**3.8.4.3**
**maglev vehicle**
*externally-propelled vehicle* ( 3.8.1.5) that is levitated through the use of opposing magnets and propelled through the use of coordinated electro-magnets along a track

**3.8.4.4**
**sidecar**
*externally-propelled vehicle* ( 3.8.1.5) attached to a *motorcycle* ( 3.8.2.6)\r\n

**3.8.4.5**
**trailer**
*externally-propelled vehicle* ( 3.8.1.5) pulled by another vehicle

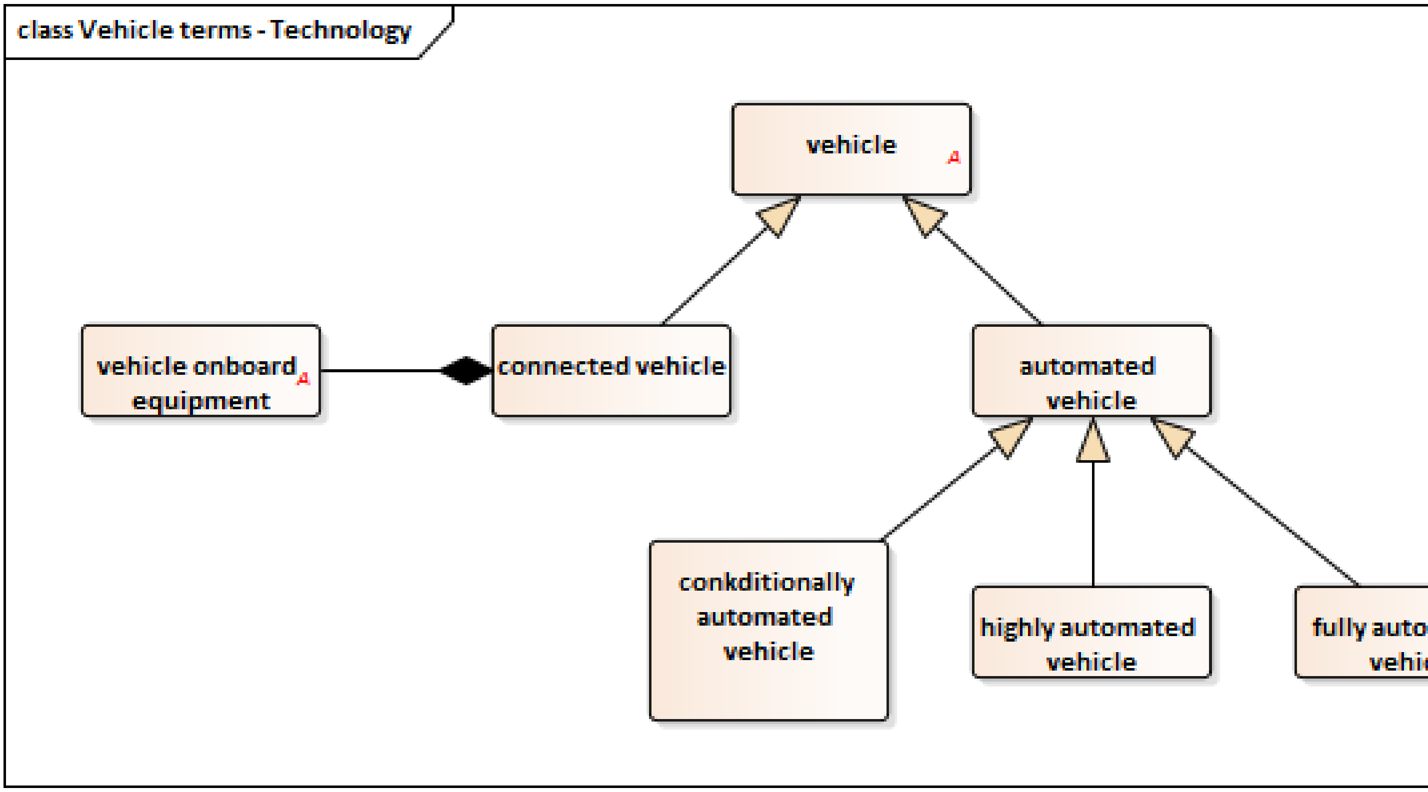


Figure 45: Concept model for Vehicle terms - Technology

**3.8.5.1**
**connected vehicle**
*vehicle* ( 3.8.1.1) that includes *vehicle onboard equipment* ( 3.7.6.1)

**3.8.5.2**
**automated vehicle**
*vehicle* ( 3.8.1.1) conforming to at least SAE J3016 Level 3 automation

**3.8.5.3**
**conkditionally automated vehicle**
*automated vehicle* ( 3.8.5.2) conforming to SAE J3016 Level 3 driving automation

**3.8.5.4**
**highly automated vehicle**
*automated vehicle* ( 3.8.5.2) conforming to SAE J3016 Level 4 driving automation

**3.8.5.5**
**fully automated vehicle**
*automated vehicle* ( 3.8.5.2) conforming to SAE J3016 Level 5 driving automation

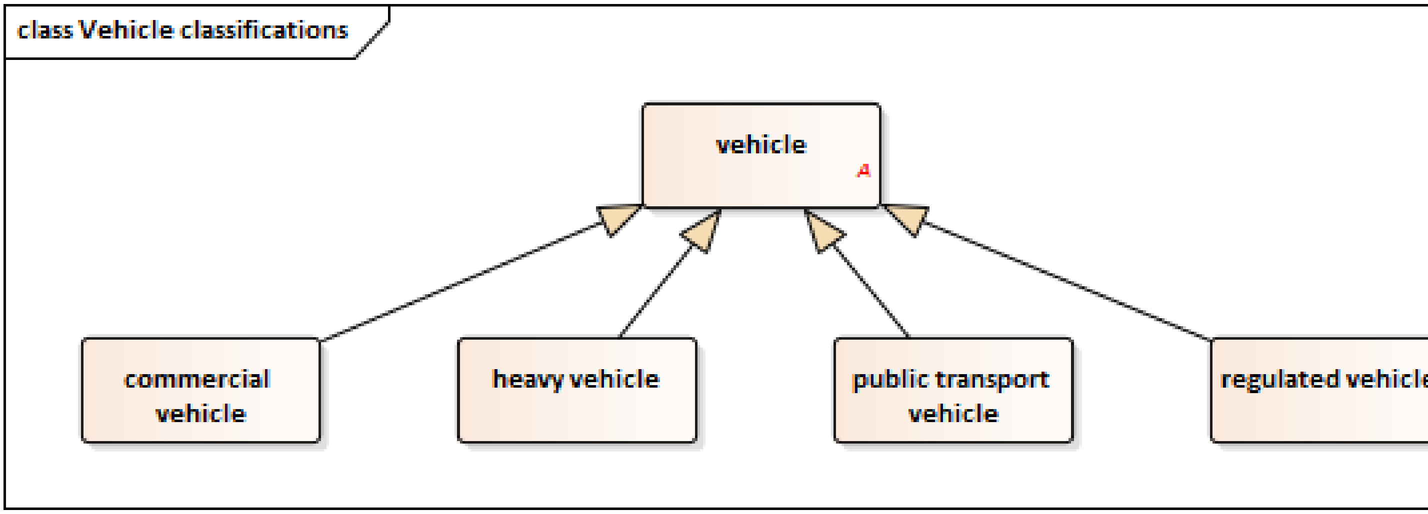


Figure 46: Concept model for Vehicle classifications

**3.8.6.1**
**commercial vehicle**
*vehicle* ( 3.8.1.1) used for transporting goods or passengers for payment

**3.8.6.2**
**heavy vehicle**
*passenger van* ( 3.8.2.3), *bus* ( 3.8.2.4), or *goods vehicle* ( 3.8.2.5)

**3.8.6.3**
**public transport vehicle**
*passenger van* ( 3.8.2.3) or *bus* ( 3.8.2.4)

**3.8.6.4**
**regulated vehicle**
*vehicle* ( 3.8.1.1) that is subject to special regulations based on the classification of the vehicle

# Annex A
# (informative)

# Purpose and methodology for ITS vocabulary

## A.1 Purpose

ISO/TC 204 and other ITS standards development organisations have produced a large number of published documents, each defining its own terms. In most cases, identical terms in different documents describe the same concept, but often with slight variations in the text of the definition.

The ISO 14812 project was initiated to:

- Promote a more consistent set of terminology and definitions that can be used throughout ITS discussions and thereby enable better understanding,
- Improve the quality of the definitions by conforming to the terminological principles defined in ISO 704:2009, and
- Graphically represent relationships between concepts to better promote understanding of concepts as defined in ISO 24156-1:2014.

ISO/TC 204 does not enforce consistency or require revisions to definitions in existing standards. The authority for the appropriate terminology and definitions in each standard is the Working Group (WG) producing the source standard. Revision of definitions in source standards is accomplished only through approval of subsequent revisions of the standards, addenda, or corrigenda as produced by the appropriate WG.

In keeping with established resolutions and policy, editors of new and updated ISO/TC 204 standards are to consult ISO 14812 in drafting new and revised terms and definitions. Editors either refer to the terms as defined in the vocabulary or recommend new definitions and terms as required.

## A.2 Methodology

Developing a set of harmonized definitions for terms already defined in existing standards can be a challenge. Even if there is general agreement on the underlying concept being described, it may be difficult for multiple groups to agree on a single definition unless everyone agrees to a clear set of principles at the start of the effort.

Luckily, terminology experts within ISO have standardized the principles that should be followed when developing a vocabulary for ISO standards. These are defined in ISO 704:2009 *Terminology work – Principles and methods*. Interested parties should become familiar with this document, but a summary of the suggested process is provided below.

1. Select the field for which a vocabulary is to be defined.

   In the case of this document, the field is Intelligent transport systems.

2. Analyse the intension and extension of each concept.

   In other words, analyse the characteristics that jointly distinguish each concept from other concepts (i.e., the intension) and the set of objects that are represented by the concept (i.e., the extension). By considering these both simultaneously, one can refine the characteristics that the extension objects share in common.

EXAMPLE A “moped” has the following characteristics (intension):

- type of entity
- used to transport a person and optionally goods
- designed to be used on a road network
- propelled by an on-board motor
- has a maximum design speed not exceeding 50 km/h
- has 2 or 3 wheels

EXAMPLE The following images provide sample extensions of “moped”.

*From left to right: Swedish moped class I[15], Norsjö Shopper 3-wheel moped red[16], and Moped in Myrtos[17]*

*Figure A-1: Three example mopeds*

3. Determine the relationships to other concepts.

   Identify how each concept relates to other concepts within the domain. Typical relationships include:

   a. Generic relations (i.e., when the characteristics of one concept includes all of the characteristics of another concept plus at least one additional characteristic)

EXAMPLE The “moped” concept has a generic relationship with the “vehicle” concept, where “vehicle” is the superordinate concept and “moped” is the subordinate concept.

   a. Partitive relations (i.e., when once concept forms a part of another concept)

EXAMPLE The “wheel” concept has a partitive relationship with the “moped” concept, where “moped” is the superordinate concept and “wheel” is the subordinate concept.

   a. Associative relations (i.e., when one concept has some other relationship to another concept)

EXAMPLE The “road network” concept has an associative relationship with the “moped” concept, where the “moped” is “designed to be used on” the “road network”.

4. Illustrate these relationships with a diagram

   Once the relationships have been determined, they should be documented with the use of diagrams. While various diagrammatic techniques are allowed, this document uses UML to depict the relationships according to the conventions defined in ISO 24156-1:2014 *Graphic notations for concept modelling in terminology work and its relationship with UML – Part 1: Guidelines for using UML notation in terminology work*. The rules in this document are summarised in A.3.

EXAMPLE The following figure depicts the relationships among concepts according to the rules of ISO 24156-1. The example demonstrates how many of the characteristics of “moped” are inherited from more generalised concepts.

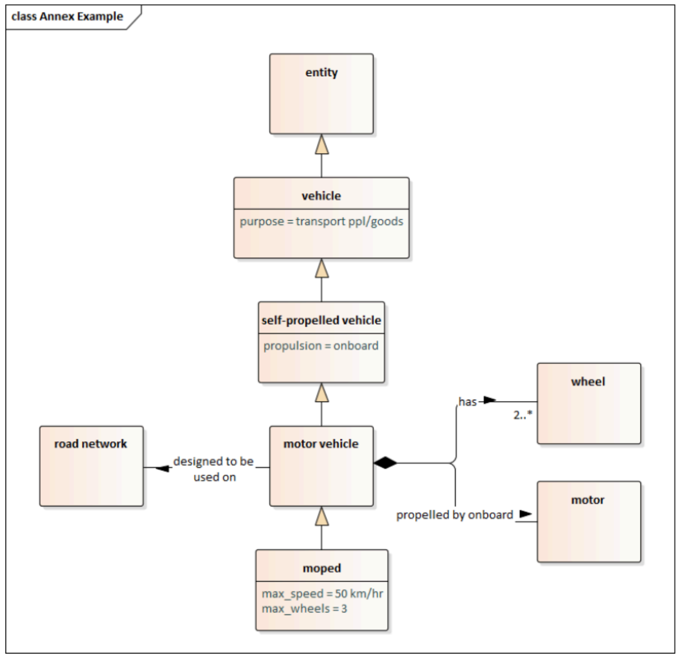


*Figure A-2: Example concept model diagram*

*The figure indicates that a **moped** is a type of **motor vehicle** with the characteristics that it has a maximum speed not greater than 50 km/hr and no more than 3 **wheels**. A **motor vehicle** is a type of **self-propelled vehicle** that is propelled by an onboard **motor**, has at least two **wheels**, and is designed to be used on the **road network**. A **self-propelled vehicle** is a type of **vehicle** that has an onboard propulsion source. A **vehicle** is a type of **entity** for the purpose of transporting people and/or goods.*

5. Formulate definitions based on relationships

   The definition of each concept should be directly derived from the defined relationships. The definition should not restate characteristics inherited by other concepts; it should merely reference the more general term. The definition should not provide supplemental information as might appear in an encyclopaedic entry. If there is a need to provide such information, it should be provided in a note or an example immediately after the definition or provided as a part of the main body of the document. The intent of the definitions is that they should be worded such that they can be inserted in place of the term wherever the term occurs in the document (i.e., they are not complete sentences and they do not start with an article (e.g., they do not start with “a” or “an”)).

EXAMPLE motor vehicle with 2 or 3 wheels and a maximum design speed not exceeding 50 km/h

6. Assign a designation to each concept

   In other words, the term is only given its final name (i.e., designation) once the relationships and definitions have been determined. In practice, every concept is given a name as soon as we begin to formulate it, but this name should be considered temporary until we have completed the analysis. In this case of this document, the vast majority of concepts defined have previously been included and named in other documents. As a general rule, terms already in use should retain their name, unless there are significant reasons to change. For example, if an existing term is confusing with another concept or if different groups use different terms for the same concept, the community will have to weigh the benefits of retaining usage of the term versus changing to a more descriptive term.

EXAMPLE moped

## A.3 Overview of the concept model diagrams

Concept models can be depicted using a variety of different notations. One of the most common notations to use is the Unified Modelling Language (UML). UML is a graphical notation originally standardised by the Object Management Group in 1997 and later adopted by ISO in 2005 as ISO 19501. It was designed primarily for describing software systems, but it was also found to be useful in documenting concept models. In 2008, ISO published ISO 24156 that defined how to use a subset of UML to represent the results of a terminological concept analysis. This standard was last updated by ISO 24156-1 in 2014.

The primary aspect of UML used in modeling concepts is the UML class diagram. Each rectangle on a diagram represents a distinct concept and is given a name. Typically, UML requires the name to be a single word (i.e., no spaces) with an initial uppercase character; but in concept modelling, the names should be the term names (i.e., typically lowercase with spaces between words).

EXAMPLE Figure A-2 depicts 8 concepts: entity, vehicle, self-propelled vehicle, motor vehicle, road network, wheel, motor, and moped.

The rectangles may be shown with a single compartment or divided into two compartments by a horizontal line. If only one compartment is present, it will depict the name of the concept. If two compartments are present, the upper compartment depicts the name of the concept and the lower compartment describes the characteristics of the concept by setting named attributes to specific values.

EXAMPLE In Figure A-2, the concept named “entity” has a single compartment.

EXAMPLE In Figure A-2, the concept named “moped” has two compartments with the lower compartment showing two attributes: max_speed and max_wheels.

Concept relationships are shown by lines connecting the concepts. Lines with a filled-in arrowhead indicate that the concept without the arrowhead is a specialized subordinate concept to the superordinate concept near the arrowhead. In this case, all examples (extensions) of the subordinate concept are also included in the extension of the superordinate concept.

EXAMPLE In Figure A-2, a “moped” is defined to be a subordinate concept to the more general “motor vehicle” concept. This means that all mopeds are also motor vehicles and the characteristics of a motor vehicle also applies to a moped.

Lines with a diamond on the end indicate a partitive relationship where the concept near the diamond is a composite or aggregation and the concept on the other end is a part of the larger concept.

EXAMPLE In Figure A-2, motor vehicle has a partitive relationship to both wheel and motor. In each case, the motor vehicle is the composite/aggregate and the wheel and motor are the components of the larger whole.

Lines without a diamond or arrowhead indicate associative relationships.

EXAMPLE In Figure A-2, motor vehicle has an associative relationship to road network.

Associative relationships in concept models should (and partitive relationships may) have a name that describe the relationship further. The name is often adorned with a filled-in triangle to indicate the directionality of the named relation.

EXAMPLE In Figure A-2, the associative relationship between “motor vehicle” and “road network” has the name “designed to be used on”. The name is adorned with a filled-in triangle to indicate that the motor vehicle is designed to be used on the road network (i.e., the road network is not “designed to be used on” the motor vehicle).

Finally, the ends of partitive and associative relationships can be adorned with numbers to indicate any required numerical constraints.

EXAMPLE In Figure A-2, a motor vehicle is required to have 2 or more (i.e., “2..*”) wheels.

## A.4 Concept models and data models

### A.4.1 General principles

The use of UML to model concepts in terminological work is very similar to the task of using UML to define data concepts in systems engineering. In fact, it only makes sense that the resulting models should be entirely consistent with one another, even though the specifics will vary.

Terminological work is intended to define the meaning of terms in natural (human) language. Data concepts are intended to define the meaning of data when exchanged between computer systems – or really, between the programmers of the computer systems. In general, it is desirable for each concept to have a single designation (i.e., name) and definition used within both terminology (human terms) and systems engineering (computer terms).

### A.4.2 Practical considerations

In practice, differences between the models are often required, but care should be taken to ensure that the models are entirely consistent with each other. Differences might include:

- Variations to conform to specific language rules,

EXAMPLE A data model might require class names to use UpperCamelCase. As such, the term “vehicle” becomes the data concept “Vehicle”, the term “motor vehicle” becomes the data concept “MotorVehicle”, etc.

- Variations to improve systems engineering design efficiencies, and

EXAMPLE In order to promote efficiency, it might be advantageous to develop a data model without classes for “Entity”, “Vehicle”, and “SelfPropelledVehicle” as long as all of the associated functionality is implemented in the “MotorVehicle” class.

EXAMPLE In the above example, it is strongly recommended that the implemented class be called “MotorVehicle” rather than “Vehicle” to promote consistent terminology and understanding as well as providing a data model that can be maintained in a consistent fashion over time. If the class were to be named “Vehicle”, it may confuse some users and result in inappropriate usage of the class.

- Variations to represent data elements versus classes. Within terminology, all concepts are shown as rectangular boxes; a literal translation to a data model would mean each term would be defined as its own class with a value field – this would be a highly inefficient way to implement code. Within data models, the rectangular boxes depict classes and the second compartment is used to define attributes, each of which can be assigned a value at runtime. The class and all of its attributes should have definitions that are consistent with the defined concept model.

EXAMPLE A data model might include a "numberOfWheels" attribute for the "MotorVehicle" class rather than associating the "MotorVehicle" with multiple "Wheel" objects.

EXAMPLE A data model might include a "motorFuelType" attribute for the "MotorVehicle" class rather than associating the "MotorVehicle" class with a "Motor" class and then associating the "Motor" class with a "MotorFuelType" class which would then have a value.

### A.4.3 Additional specifications

Within systems engineering, a data concept must have additional specifications, which should be defined in separate meta-data fields. For example, ISO 14817-1 defines a number of meta-attributes that should be defined for each type of data concept. The meta-attributes include a "descriptive name" as well as a "definition". Within the limitations as described above, these should be consistent with the "designation" and "definitions" defined in the concept model. However, ISO 14817-1 defines an array of other meta-attributes, such as "data concept version", "data type", "format", etc. These provide additional details that are often required or useful for implementing systems but are less important for terminology work. In fact, within data models, the same base concept might be implemented with multiple variants. In such cases, the name of the data concept needs to indicate the variance.

EXAMPLE The term "vehicle speed" might be defined to be "the instantaneous **speed** of a **vehicle**", where "speed" and "vehicle" are defined separately. Within a data model, the concept "vehicle" would likely be portrayed as a "Vehicle" class and "vehicle speed" would be portrayed as the attribute "speed" of the "Vehicle" and would receive the name "Vehicle.speed" using ISO 14817-1 conventions. A data element goes one step further and defines how the data is presented. The preferred solution for such a data element is to use the same definition as used by the term (i.e., "the instantaneous **speed** of a **vehicle**") and to use the other meta-attributes to further specify how the information is presented, such as:

- Descriptive name: Vehicle.speed:measure-kph
- Data type: INTEGER
- Unit of measure: km/hr

## A.5 Maintaining consistency between terminological model and data model

Over time, the terminological concept models and data models will need to be maintained. As one is changed, the other will need to be updated as well. While the need is known, the exact process has not yet been defined, but will likely become the subject of another ISO/TC 204 standard or technical report.

# Annex B
# (informative)

# Usage examples

## B.1 Incorporating terms into other documents

### B.1.1 Including terms contained in ISO 14812 (this document)

Other ISO/TC 204 documents are strongly encouraged to adopt the terms and definitions defined within this document. Ensuring that all ISO/TC 204 standards use a consistent terminology will promote understanding of the information contained within standards and improve interoperability of systems as the domains of different working groups merge into a common Internet of Things (IoT) environment.

The terms and definitions should be referenced in a manner that is consistent with the rules defined in the ISO Directives. In short, this means that ISO/TC 204 standards should identify ISO 14812 as a normative reference and not include definitions of terms that are already defined within ISO 14812. Furthermore, efforts should be undertaken to ensure that terminology used withiin each standard is consistent with the defininitions provided in ISO 14812.

EXAMPLE The following shows an example of how another document should reference the terms and definitions contained within this document. The phrase "and the following" should only be included if the document defines terms locally.

> **2 Normative references**
> ISO TR 14812:2019 *Intelligent transport systems - Vocabulary*
>
> **3 Terms and definitions**
> For the purposes of this document, the terms and definitions given in ISO TR 14812 and the following apply.
>
> ISO and IEC maintain terminological databases for use in standardization at the following addresses:
> — ISO Online browsing platform: available at http://www.iso.org/obp
> — IEC Electropedia: available at http://www.electropedia.org/

### B.1.2 Defining terms not contained in ISO 14812

This document is intended to provide the definitions of terms as used within intelligent transport system discussions, however, this scope is limited by:

- The fact that this document is the initial version of a document that reflects an on-going work-in-progress. At the initiation of this project, ISO/TC 204 had already defined roughly 2,000 terms, many with inconsistencies. Rather than trying to reach TC-wide consensus on all of these terms for the first version, it was determined that it would be better to focus on the most widely used terms.
- Some of the terms defined might be specific to the scope of a single standard and defining them within a TC-wide vocabulary may not be useful.
- As the industry evolves, new terms are likely to emerge.

The existence of this document should not be construed to prohibit the definition of additional terms; every document should define the terms that it needs to unambiguously express its intent.

However, when developing such terms, the respective working group is encouraged to work with ISO/TC 204/ WG 1 so that the definition can be developed in a consistent manner with all of the other terms.

### B.1.3 Including terms contained in ISO 14812 (this document)

B.1.3.1 General

Most existing standards already define their own terms. It is in the interest of the industry that all ITS standards use consistent definitions; as such those updating existing standards are encouraged to revise their documents to use terminology that is consistent with this document, ISO 14812. Each existing term will fall into at least one of the following categories as discussed below:

- The existing term and definition are consistent with the ISO 14812 content
- The existing term and definition are largely consistent with the ISO 14812 content, but some nuance is missing
- The existing term is defined in ISO 14812, but describes a different concept
- The existing concept is included within ISO 14812, but is assigned to a different term
- Neither the existing term or concept are included within the current version of ISO 14812

B.1.3.2 Existing term and definition are consistent with ISO 14812

In a few cases, you may find that an existing term and definition are *identical* to what is contained in ISO 14812; however, this will likely be exceptional as the ISO 14812 definitions have been developed according to the rules defined in ISO 704 and therefore are based on the conceptual terminology model that was defined as a part of the development of ISO 14812.

However, just because the exact text of the definition is different does not mean that the term is describing a different concept. In general, the terms defined in ISO 14812 are intended to be completely consistent with their meanings prior to the development of ISO 14812; the new definitions were developed to improve comprehension by creating an ITS-wide concept model that relates terms to one another, as recommended by terminological experts. Thus, in most cases, it is expected that existing terms will be consistent with the definitions in ISO 14812.

In this case, the existing standard should simply be updated by referencing ISO 14812 in the introduction to its "terms and definitions" section and removing the locally defined term.

B.1.3.3 Existing term has a nuanced difference in definition from ISO 14812

Any time a definition changes, one has to be concerned about introducing subtle differences in meaning. If a working group believes that ISO 14812 has introduced such a change, the working group should work with ISO/TC 204/WG 1 according to the procedures in Annex C to resolve the issue. The intent of the resolution process is to develop a consistent vocabulary for the whole of the intelligent transport system domain while also ensuring the necessary precision needed by the various standards.

B.1.3.4 Existing term with a different definition in ISO 14812

In some cases, the same term may be used to describe different concepts between ISO 14812 and an existing document. In most such cases, the development of the ISO 14812 definition was likely done in coordination with the working group responsible for maintaining the existing standard, in which case the resolution for the inconsistency should already be known (and might be achieved by ISO 14812 assigning a different term to the existing concept as described by B.1.3.5). Otherwise, the editor will need to determine if it is appropriate to continue using the existing term or if a change might be more appropriate.

In general, it is desirable for each term to only have a single meaning; but in practice, multiple meanings for the same term is not uncommon. Multiple meanings are acceptable as long as the context provides adequate disambiguation among the multiple meanings and each meaning is clearly labeled to be applicable to a specific domain. Where the context might be unclear, the domain name can be used as a modifier to clarify the intent.

EXAMPLE The physical object representing a **user** of an **ITS service** is called a **terminator**.

The above sentence is accurate and sufficiently unambiguous based on the definitions included in this document. If the word "ITS" was removed in front of "service", the sentence (at least when read by itself) would imply a generic service and the sentence would no longer necessarily be true as the word "terminator" is only applicable to the physical view of the system architecture. In theory, one could add the term "ITS" in front of the term "user" as well (e.g., "The physical object representing an ITS user of an ITS service is called a terminator."), but this would make the sentence rather redundant and would detract from the information that the sentence is trying to convey.

However, multiple meanings should always be avoided for terms where similar concepts are likely to be confused with one another. In these cases, the working group responsible for maintaining the existing standard will need to work with ISO/TC 204/ WG1 to determine the appropriate resolution.

The resolution will often require the editor of the document to perform a search for every occurrence of the existing term and to make edits as needed so that the updated standard is consistent with the TC 204 vocabulary.

B.1.3.5 Same concept assigned to a different term in ISO 14812
In some cases, ISO 14812 has chosen to use a different term to describe concepts already defined. This might be done to resolve existing differences between existing standards or because the terms themselves are not fully descriptive of the concept being defined.

The resolution will often require the editor of the document to perform a search for every occurrence of the existing term and to make edits as needed so that the updated standard is consistent with the TC 204 vocabulary.

B.1.3.6 Neither concept nor term defined in ISO 14812
As mentioned above, the current version of ISO 14812 does not claim to define all terms applicable to ITS. Any document is allowed to extend its vocabulary as needed by defining its own terms; however, ISO/TC 204/ WG 1 encourages working groups defining new terms to work with them to ensure the terms fit into the broader ITS terminology concept model.

## B.2 Using terms within the text of the document

### B.2.1 General

Upon the first use of a defined term within a document, editors are encouraged to highlight the fact that the term has a formal definition by presenting the term in *italics* and optionally following the term with a parenthetical reference to the standard and clause where the term is defined. This convention allows users to recognize that the term has a formal definition. Subsequent uses may use the same convention, just use italics, or use plain text; but all terms within the document should follow consistent rules.

EXAMPLE The *physical object* (ISO TR 14812, 3.4.5.5) representing a *user* (ISO TR 14812, 3.2.2.3) of an *ITS service* (ISO TR 14812, 3.2.2.1) is called a *terminator* (ISO TR 14812, 3.4.5.6).

To assist in maintenance, ISO/TC 204/WG 1 intends to minimize changes to clause numbers of terms as much as possible. When new terms are defined; they will generally be added as new clause numbers. If terms are deleted, their numbers will remain unused in the document.

### B.2.2 Disambiguation

Within ITS, some terms are used as the designation of more than one concept (e.g., “service”). When this occurs, each concept is provided with its own terminological entry and the definition is preceded by the domain to which the definition applies within brackets.

A document that needs to precisely reference such a concept when the domain is not obvious can disambiguate among multiple concepts by adding the domain as a modifying term.

EXAMPLE If the term “service” is too ambiguous, it can be clarified by adding a domain, which produces a term such as “ITS service”.

### B.2.3 Data dictionaries

Documents may reference both terms and data concepts within the text of the document. The definition of both should be consistent with one another as described within A.4; however, the data concept will be more specific and often include representational form information. When wishing to reference a data concept, editors are encouraged to use `a fixed width font` whereas terminology should be shown in the normal font with a *italics*.

# Annex C
# (informative)

# Procedures for maintaining the vocabulary

## C.1 Scope of maintenance procedures

This Annex describes how additions, revisions, and withdrawals of terms and definitions in ISO TR 14812, *Intelligent transport systems – Vocabulary* will be managed. Extensive or complex revisions of the entire document are not necessarily within scope of this Annex.

## C.2 Maintenance environment

All definitions are to be developed according to the principles of ISO 704. Definitions of general concepts that apply beyond the scope of ISO/TC 204 might import definitions from other well-established sources, typically ISO standards from other technical committees. Any such definitions explicitly cite the source of the definition.

All other terms are defined according to their relationships to other defined terms as documented within a concept model. The concept model is documented in UML according to the conventions contained in ISO 24156.

The model is maintained using three key software products:

- Enterprise Architect11 (EA) by Sparx,
- Github (https://github.com/isotc204/14812/projects), and
- LemonTree by LieberLieber.

The UML file is created and stored within an EA file. Each subsection within this document is generally represented by a separate package within the EA file. Definitions, notes, examples, and all other information for each term is stored within the "notes" field of the concept within the EA file.

The EA file is version controlled using a Github. Branches and forks are created to manage enhancements to the current file while allowing easy access to the approved version. When an expert or group proposes changes, reviewers can use LemonTree22 to identify differences between the proposal and the base version of the model (or any other version). Users with appropriate rights are able to merge selected changes into a new master file. The exact maintenance process is described below.

## C.3 Maintenance process

The general maintenance process is depicted in Figure C-3. The process starts (Step 1) with the current version of the EA file as stored in the development branch of the ISO/TC 204 Github site.

Individuals or groups ('submitters') wishing to suggest changes to the vocabulary should fork the current version of the development branch onto their own Github account. A fork copies the EA file onto the submitter's own site where the submitter can edit the file without affecting the actual

1[1] Enterprise Architect is a software tool developed by Sparx, who has provided free licenses to experts of ISO/TC 204 for the development of ISO standards.
2[2] LemonTree is a software tool developed by LieberLieber, who has provided free licenses to experts of ISO/TC 204 for the development of ISO standards.

development copy. Figure C-1 shows the creation of two such forks (Steps 2 and 3) where two different submitters make changes in parallel (Steps 4 and 5).

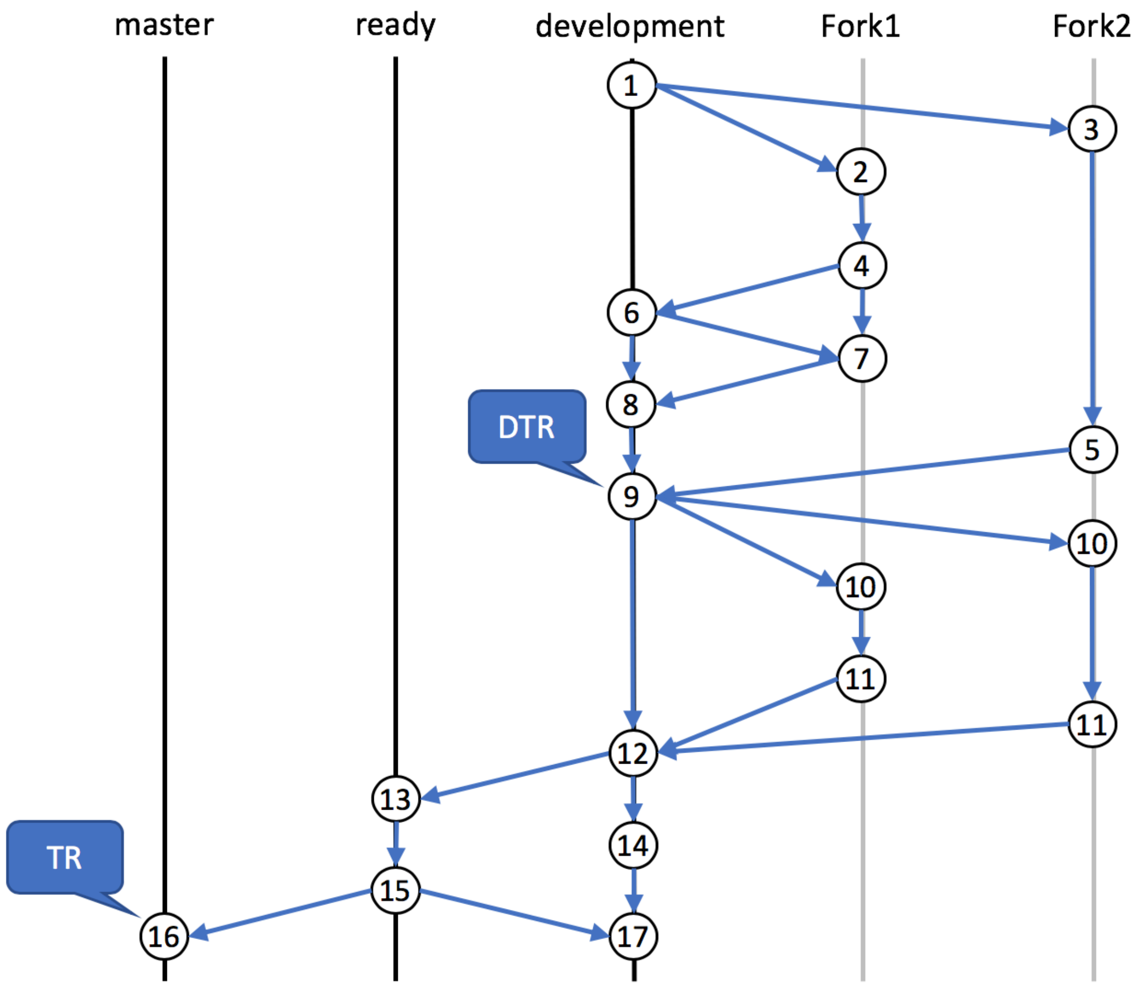


*Figure C-1: Maintenance process*

Each fork may include an unlimited number of proposals to:

- Add one or more new terms (with definitions),
- Revise one or more terms and/or definitions, and/or
- Withdraw one or more obsolete terms and definitions (e.g., due to withdrawal of a standard).

When a submitter is done (or nearly done) with proposed edits, the submitter will use Github to issue a 'pull request' to the 14812 Vetting Team. The Vetting Team then uses LemonTree to identify differences between the current development branch and the proposal. LemonTree allows the Vetting Team to approve or reject each incremental change and thereby create a new development version (Steps 6 and 9). If the Vetting Team is unable to complete the review of a submission at a single meeting, the submitter is still able to update their proposal (Step 7) based on on-going discussions and the new file can be used in the next review by the Vetting Team to develop a new version of the development branch (Step 8).

Once the Vetting Team believes the development version is ready to be distributed as a Draft Technical Report (DTR), the Github version is tagged as such (Step 9) and the documentation is generated from the EA file using the scripts developed and maintained on the Github site. Once generated, the documentation is formatted and submitted to ISO for a DTR ballot.

When sent to DTR ballot, outside entities are encouraged to review the file and they may make comments either by the process described above (Steps 10 and 11) or may make comments through the standard ISO procedure. The Vetting Team will consider this input and produce a new development version (Step 12). Once the file is considered final by the Vetting Team, the file will be stored in a “ready” branch (Step 13) and the generated documentation will be submitted to ISO for publication. This allows continued development of the document within the development branch (Step 14) while the ISO TR is finalized for publication. If the editorial process requires any changes to the EA file, those changes are made in the ready branch (Step 15). Once the TR is published, the ready branch version is merged back into the master branch (Step 16) and the development branch (Step 17).

The process then starts over (i.e., Step 17 becomes the next Step 1).

## C.4 Formation of Validation Team

The ISO 14812 Validation Team is composed of interested experts of ISO/TC 204/ WG 1.

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# Index

***U***



***V***