

ISO/TC 204

Secretariat: ANSI

Voting begins on:
2022-10-28

Voting terminates on:
2022-12-23

Intelligent transport systems — Mobility integration — Enterprise view

*Systèmes de transport intelligents - Intégration des services de la
mobilité - Vue globale des rôles des organisations et des relations avec
les utilisateurs*

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Reference number
ISO/DTR 7878:2022(E)

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Published in Switzerland

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Foreword

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

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

Introduction

Urbanization, changes in climate and demographic and societal changes are some of the major trends that have had an impact on transport systems and services over the last decades. Combined with the implementation of ITS services and Internet of Things (IoT), new transport concepts have been developed. User requirements on efficiency, availability and interoperability have also been driving forces for new transport concepts for the integration of multimodal, existing and new transport services as described and implemented in mobility concepts like Mobility as a service (MaaS) and Mobility on Demand (MOD). Cooperative, connected and automated mobility (CCAM) will also have a significant effect on how travellers plan and implement their journeys between multiple modes of transport in the integrated mobility environment.

Integrated mobility concepts are evolving around the world, mostly based on the MaaS and MOD concepts. Hence, there is a need for a generic, common and world-wide concept description mapping all existing and foreseen concepts for interoperable, integrated and seamless multimodal transport services.

The role and responsibility models for MaaS and MOD have already been described in ISO/TR 4447, but there is also a need for a common role and responsibility model for integrated and multimodal mobility services, recognizing and including the work already done by the two mainstream organizations for integrated mobility services, MaaS and MOD. A common role and responsibility model can be described from an enterprise view^[3] where the stakeholders, actors and roles in the MaaS/MOD ecosystem are merged into one enterprise view. The enterprise view addresses the relationships between the entities (e.g. organizations) involved in the provision of the mobility services. However, there is also a need for enhancing the MaaS and MOD models to include more services, e.g. security services, certification services and interoperability management. The following documents have been used for the enhancement of the common MaaS/MOD model (ecosystem):

- ISO 24014-1 on interoperable fare management;
- ISO 17573-1 on electronic fee collection;
- ISO/TR 21724-1 on common transport service account systems;
- EN 12896-5 on public transport fare management.

The objective of this document is to describe integrated mobility from an enterprise view to which existing implementations of integrated mobility systems can potentially be mapped. This is intended to enable a common understanding, an exchange of information and knowledge, and a convergence towards one world-wide integrated mobility concept description.

Intelligent transport systems — Mobility integration — Enterprise view

1 Scope

This document describes the enterprise view (see ISO/TS 14812:2022, 3.1.4.3) of integrated mobility based on the role and responsibility models in the mobility as a service (MaaS) and mobility on demand (MOD) ecosystems as described in ISO/TR 4447. Other ISO documents (e.g. ISO 24014-1, ISO 17573-1 and ISO/TR 21724-1) have been reviewed in order to enhance and merge the MaaS and MOD role models.

The enterprise view addresses the relationships between organizations and users, and the roles those entities play in the delivery and consumption of mobility services. Relationships between entities are dependent on the roles those entities take in the delivery of user services.^[3]

Enterprise objects interact to exchange information, manage and operate systems beyond the scope of one organization. The enterprise view focuses on the relationships between those enterprise objects, but also defines how enterprise objects interact with physical objects, which appear in the enterprise view as "resources".

This document focuses on mobility service concepts where the included transport services are publicly available. Examples of such transport services are listed in [Clause 3](#).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 14812, *Intelligent transport systems — Vocabulary*

3 Terms and definitions

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

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

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

3.1

mobility service

service that provides an integrated interface for multiple transport services

Note 1 to entry: The integrated interface can include an online interface, a payment interface, and/or rules for physically accessing the various transport services.

Note 2 to entry: The typical goal of a mobility service is to fulfil the needs of a transport user in an optimal fashion, even if that requires using multiple transport services.

3.2

mobility service provider

entity that delivers one or more mobility services

4 Abbreviated terms

AI	artificial intelligence
ARC-IT	Architecture Reference for Cooperative and Intelligent Transportation
GNSS	Global Navigation Satellite System
ICT	information and communication technologies
IFM	interoperable fare management
IFMS	interoperable fare management systems
ITS	intelligent transport systems
MaaS	mobility as a service
MOD	mobility on demand
PT	public transport
PTA	public transport authority
PTO	public transport operator
UITP	Union Internationale des Transport Publics
USDOT	United States Department of Transportation
VRU	vulnerable road user

5 Mobility service and transport service

5.1 Mobility service

Integrated mobility is based on two crucial services: the mobility service and the transport service.

The European MaaS concept describes a mobility service as the integration of various forms of transport services into a single mobility service accessible on demand.^[4] According to Reference [4], the core purposes of the service are:

- to facilitate a diverse menu of transport alternatives, for example public transport, ride-sharing, car-sharing, bike-sharing, taxi or car rental/lease, or a combination thereof;
- to offer added value to the user through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations;
- to be the best-value proposition for users by helping them to meet their mobility needs and solve the inconvenient parts of individual journeys as well as the entire system of mobility services.

The main goal of the mobility service is to provide an alternative to the use of the private car that can be as convenient, more sustainable, help in reducing congestion and constraints in transport capacity, and reduce costs.^[4]

The United States Department of Transportation (USDOT) uses the term mobility on demand (MOD) to represent its vision for future mobility, which is a safe, reliable and carefree mobility ecosystem that supports complete trips for all, both personalized mobility and goods delivery.^[11]

According to Reference [11], the core purpose of the service is:

- to leverage innovative technologies and facilitate public private partnerships to allow for a user-centric approach that improves mobility alternatives for all travellers and the delivery of goods and services.

USDOT's MOD vision does recognize private car for private use as a possible mobility service option for some, just like walking and cycling.

The International Association of Public Transport (Union Internationale des Transport Publics - UITP) defines the mobility service as the integration of, and access to, different transport services (such as public transport, ride-sharing, car-sharing, bike-sharing, scooter-sharing, taxi, car rental, ride-hailing, etc.) in one single digital mobility offer, with active mobility and an efficient public transport system as its basis.^[4]

According to Reference [1], the core purposes of the service are:

- to provide a tailor-made service suggesting the most suitable solutions based on the user's travel needs;
- to be available anytime and to offer integrated planning, booking and payment, as well as en-route information in order to provide easy mobility and enable a way of living that does not require car ownership.

These three definitions for the term "mobility" service can be synthesized as:

A mobility service is the integration of, and access to, different transport services that are integrated into a single mobility service representing the best value proposition for the user and being accessible anytime on demand.

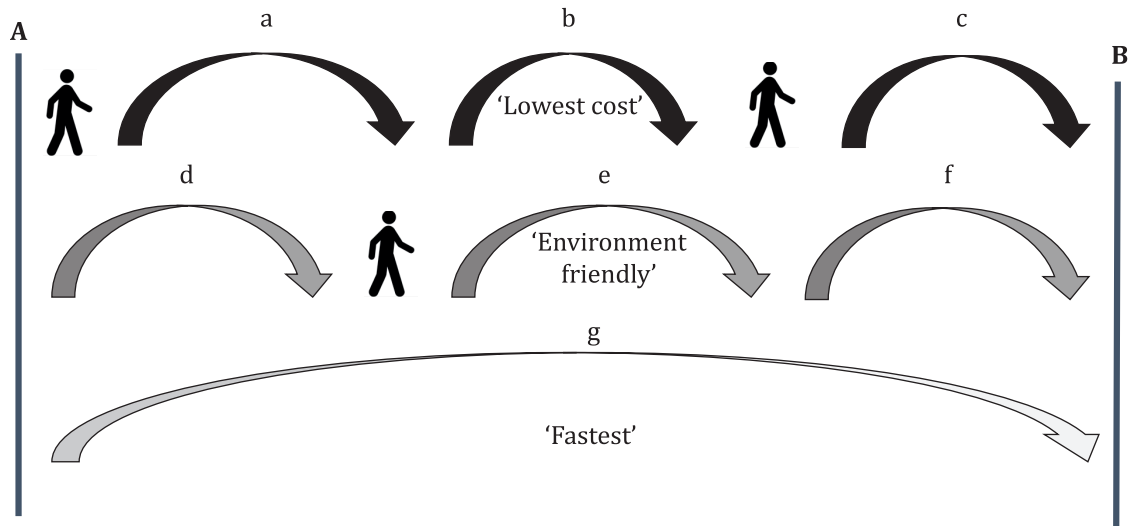
In this document, the term "mobility service" is defined as a service that provides an integrated interface for multiple transport services; see 3.1.

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5.2 Transport service

The term transport service is defined in ISO/TS 14812 as a service that delivers one or more material entities from one location to another to satisfy a need. A note to the definition says that the entities delivered can be people and/or goods.

Figure 1 shows the relationship between a mobility service and multiple transport services. In the example shown in the figure, the user used a mobility service provider to generate alternatives for transport from A to B. In this example, the user receives three different proposals representing the "lowest cost", most "environment-friendly" and "fastest" way to get from A to B. Two of the proposals include walking between transport services while the third one is a single door-to-door transport service, e.g. by taxi.



Key

- a subway line 1 (jurisdiction A)
- b subway line 2 (jurisdiction A)
- c bus line 3 (jurisdiction B)
- d bus line 4 (jurisdiction A)
- e bus line 5 (jurisdiction B)
- f e-scooter sharing (privately operated)
- g car (e.g. taxi)

NOTE Each link (i.e. key references "a" through "g") represents a transport service.

Figure 1 — The relationship between mobility services and transport services

Transport services are categorized in different ways by different concepts, e.g. the MaaS, MoD and UITP concepts. A synthesis of different categories can be summarized in the four main attributes that describe a transport service.

- 1) Accessibility: whether the transport service is accessible by the public or only for private access.
- 2) Financing: whether the transport service is fully or partly financed by the authorities, or if it is commercial, it is a public-private financial model, it is mutual benefit, fractional or completely paid by the user.
- 3) Item transported: whether it is a person or goods.
- 4) Operational: whether the service is sequential or concurrent, where concurrent can be further divided into fixed-route, dynamic route and paired on-demand.

6 The core enterprise objects in the provision and use of mobility services

6.1 Overview

Figure 2 shows an enterprise view of the three core objects, "mobility service user", "mobility service provider" and "transport service provider", based on the responsibilities described in 6.2 to 6.4.

The enterprise view presented in Figure 2 is based on a service provider model where the mobility service provider buys the transport services from the different transport operators and resells them under their own conditions, i.e. by repackaging and repricing the services. In this model, the mobility service provider would take over the user relations including responsibilities. From a legal point of

view, issues could arise around the pricing, e.g. for public transport services where fares and discounts are often fixed by laws or regulations that have to be respected.^[2]

NOTE See Reference [2] for a description of other models, e.g. agency model, merchant model and transactional model.

Sharing of data and responsibilities as well as commercial rules are crucial issues in integrated mobility service ecosystems.

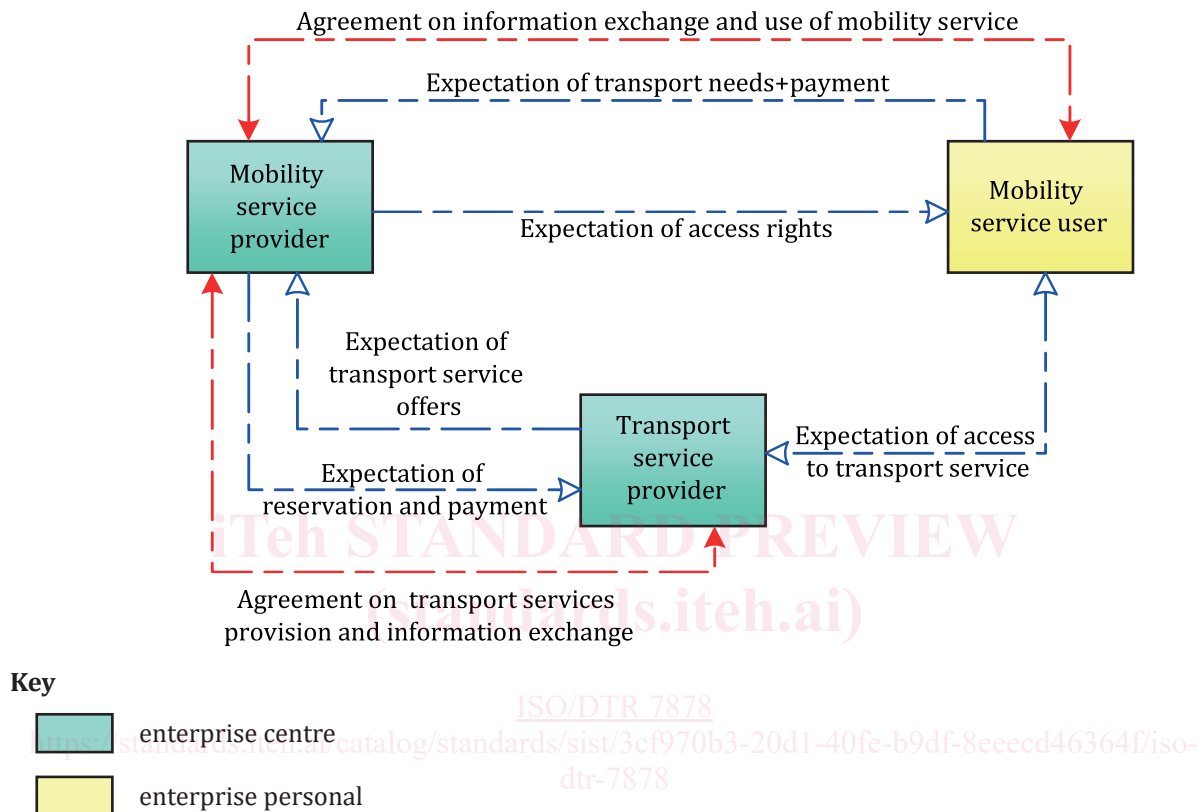


Figure 2 — Enterprise view for the three core enterprise objects

6.2 Mobility service user responsibilities

The enterprise object using the mobility service is called the mobility service user. The user is very often the entity that requests the mobility service, selects the mobility service fulfilling the user needs and preferences, uses the service and pays for it. However, the user responsibilities/activities can be divided between different persons, organizations, legal entities etc. This is also the case in interoperable fare management systems (see ISO 24024-1) where the public transport user is divided into the enterprise objects, "passenger" and "customer". The passenger is the person travelling with the public transport means and the customer is an entity that has an explicit or implicit agreement with the product owner via a retailer and pays for the service. e.g. a parent books and pays a public transport service for a child and an employer book and pays for an employee. This could also be the case for mobility services.

The MOD also includes the transport of goods, in which case the user is not travelling, but the user is still the entity that requests the mobility service, selects the mobility service fulfilling the user needs and preferences, uses the service and pays for it.

Mobility services also include transport services where the user is not a passenger, but rather the driver of the transport means used for the transport service. Finally, the user of a mobility service will sometimes be a non-motorized user as part of a mobility service, e.g. when walking from one transport service to another transport service being part of the mobility service.