TECHNICAL REPORT

ISO/TR 4447

Intelligent transport systems — Mobility integration — Comparison of two mainstream integrated mobility concepts

Systèmes de transport intelligents — Intégration de la mobilité — Comparaison de deux grands concepts de mobilité intégrée

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ISO/TR 4447:2022
https://standards.iteh.ai/catalog/standards/sist/08cc0e95-9a51-4ecd-93ca-db6eb46ae187/iso-tr-
4447-2022

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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

Transport systems and services have remained unchanged for long periods of time and are characterized by slow incremental innovations. However, 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 intelligent transport system (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 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). Connected and autonomous vehicles will also have a significant effect on how travellers plan and implement their journeys between multiple modes of transportation 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 objective of this document is to describe the MaaS and MOD concepts focussing on the relevant services and role models. Further, the objective is to compare the two concepts searching for commonalities that can build a bridge between the MaaS and MOD concepts and form a basis for a common understanding. This could further be used for a convergence towards one world-wide integrated mobility concept description. Establishing a common understanding and terminology will enable greater world-wide collaboration on integrated mobility implementations.

This document is based on a literature review of the references listed in the Bibliography and describes the state-of-the-art for the two mainstreams in integrated mobility, i.e. the MaaS and MOD concepts.

This document includes a proposal for issues for further elaboration and possibly standardization, including:

— an enterprise view on the integrated mobility service;

— a functional view on the integrated mobility service;

— a physical view on the integrated mobility service.

Intelligent transport systems — Mobility integration — Comparison of two mainstream integrated mobility concepts

1 Scope

This document describes the core services and roles and responsibilities models in the "mobility as a service" (MaaS) and "mobility on demand" (MOD) ecosystems. The description is based on a literature review of the references listed in the Bibliography.

This document also includes a comparison of the basic services and roles and responsibilities in order to map any similarities that can potentially be used for bridging and merging the two mainstream concepts in integrated mobility, i.e. MaaS and MOD.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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/

4 Abbreviated terms

API	application programming interface
ARC-IT	Architecture Reference for Cooperative and Intelligent Transportation
CTSA	common transport service account
DOC	Department of Commerce (US)
DOD	Department of Defence (US)
DOE	Department of Energy (US)
DOL	Department of Labour (US)
DSS	decision support system
ERTICO	European Road Transport Telematics Implementation Co-ordination Organisation
ICT	information and communication technologies
IT	information technology
ITS	intelligent transport systems

MaaS	mobility as a service
MOD	mobility on demand
PAYGO	pay-as-you-go
PSP	payment service provider
PTA	public transport authority
SET-IT	Systems Engineering Tool for Intelligent Transportation
UCL	University College London
USDOT	United States Department of Transportation

5 The two mainstream concepts within integrated mobility

5.1 Introduction

There are two mainstream concepts today concerning integrated mobility. The first one is the European mobility as a service (MaaS) concept represented by the MaaS Alliance which is hosted by ERTICO – ITS Europe. The term "MaaS" is described in Reference [1].

The other mainstream concept is the mobility on demand (MOD) concept, led by the US Department of Transportation (USDOT), with the MOD Alliance serving as a coalition of interested stakeholders. The term "MOD" is described in Reference [2].

Both the MaaS and MOD Alliances have members from transport authorities, cities, transport service providers and private sector companies, for example, intelligent transport systems (ITS) industry, and research institutes. A cooperation between ERTICO – ITS Europe, ITS America and ITS Asia-Pacific was established in 2019.[3]

5.2 The MaaS role and responsibility model

The role and responsibility model described in Reference [4] was one of the first role and responsibility models developed by MaaS. It had only three roles: transport operators, MaaS operator and users. The simple model from 2015 was further developed and University College London (UCL) has, as one of the partners in the MaaS Alliance, developed a role and responsibility model which is described in Reference [5] and Reference [6]. These are the references used in this document for the description of the MaaS role and responsibilities model.

The current situation from a users' point of view is shown in Figure 1. A transport service user very often requires an individual interface for each transport service provider. A migration from today's scenario to the MaaS model enables the mobility service user to have one interface concerning access rights, carrier of access rights (media), contract and payment.
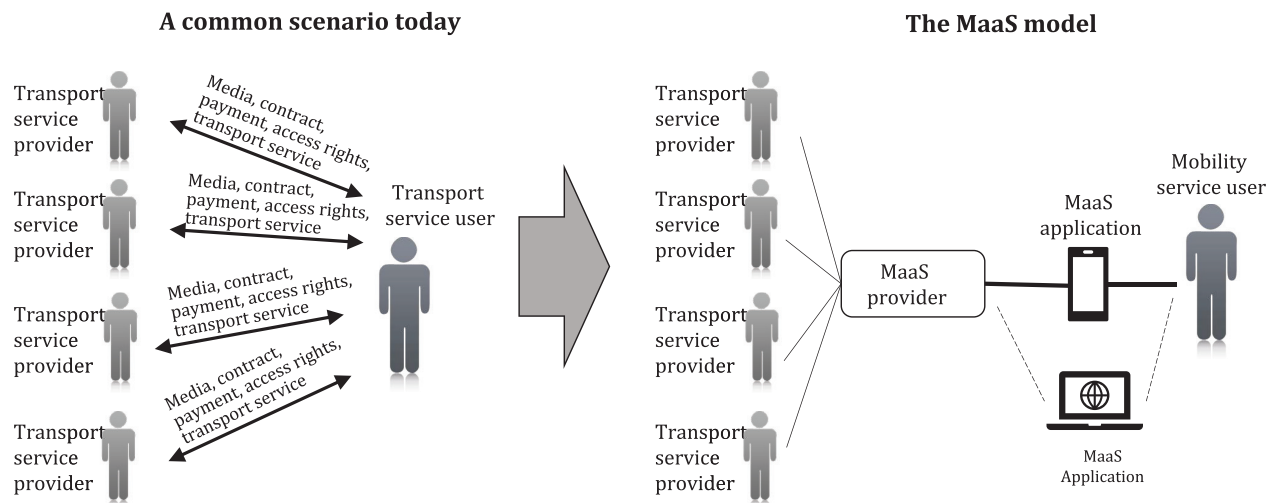
A common scenario today

The MaaS model

Figure 1 — Current and MaaS model situation (based on Figure 1 in Reference [6])

The actors in the MaaS ecosystem described in Reference [6] are distributed on three different layers: Core business, Extended enterprise and Business ecosystem, as shown in Figure 2 (based on Figure 2 in Reference [6]).

The Core business layer consists of the MaaS provider, customers/users, transport operators and data providers.

The MaaS provider is an intermediate between the transport operators and the customers/users. The main responsibility of the MaaS provider is to use the offers from the transport operators, buy capacity from the transport operators and resell it to the users. The MaaS provider can optimize the demand (customer/user request) based on the offers from the different transport operators, the user requirements and preferences and the dynamic status information as regards transport infrastructure and service level.

The main responsibility of the customers/users role is to define a request together with the customer/ user's preferences and choose the preferred transport modes for their trips. In Reference [6], the customer is considered as the passenger, but it is also said that there is a need for defining who could be the customers of the MaaS providers.

The transport operators sell their capacity to MaaS providers and provide access to their data via secure application programming interfaces (APIs). The dynamic status on the transport service status is very important and the transport operators are encouraged to have sensors reporting on the status of the transport modes.

The data providers offer data and analytics capabilities to MaaS providers. Data from the transport operators are processed, and they also collect data from many other sources, e.g. customers media, social media, etc. The data collection and processing also includes data on transport modes and infrastructure status needed by the MaaS provider in order to optimize the mobility service.
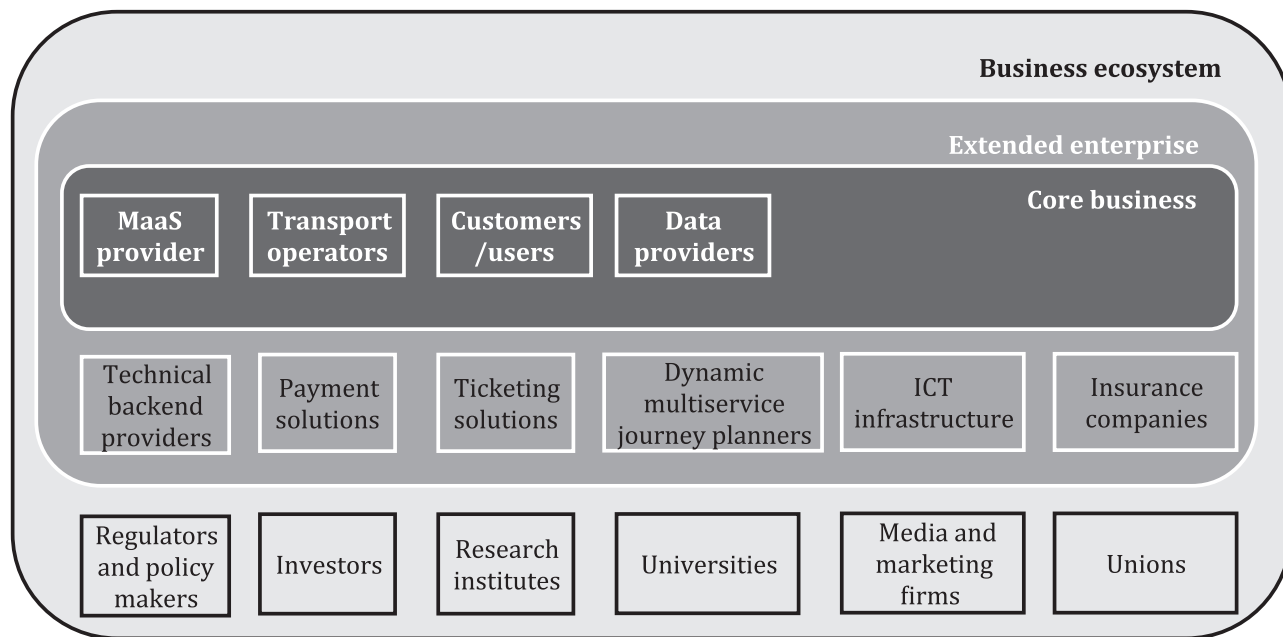
Figure 2 — The MaaS business ecosystem (based on Figure 2 in Reference [6])

The extended enterprise level includes 6 different actors. These are shortly described below:

— Technical backend providers enable the MaaS model by providing big data availability and cloud computing.

— Payment solution providers support the MaaS provider with payment solutions, e.g. credit cards, smartphones and PayPal accounts.

— Ticketing solution providers support the MaaS provider with ticketing technology with the main goal of providing solutions enabling the customer to access as many transport services as possible with one medium carrying the ticket or the access rights.

— Dynamic multiservice journey planner providers support the MaaS Provider with journey planners that cover all available transport modes in an area. The journey planner is also assumed to become dynamic considering the status of the infrastructure and the transport modes, e.g. service level (demand/capacity) in infrastructure and transport modes and means.

— Information and communication technologies (ICT) infrastructure providers support the MaaS provider by the provision of Internet connectivity. High-speed and high-capacity internet connections are crucial for customer access to the MaaS provider, both for request-for-mobility services and real-time status information on their chosen transport modes and means.

— Insurance companies are mentioned as an actor in the MaaS extended enterprise. Their main responsibility will be to handle claims on compensation for 'not-provided' mobility services.

The business ecosystem includes 6 different actors. The most important actor is shortly described below:

— Regulators and policymakers are responsible for the provision and regulation for open standards and interoperable data formats. They can also ensure a sustainable development of the MaaS market as well as fair competition, financing, customer rights, privacy and security, mobility service quality standards, social inclusion and user safety.

5.3 The MOD role and responsibility model

The most extensive documentation of MOD is found in Reference [7], published by USDOT. The MOD ecosystem is described in a supply and demand framework with the MOD stakeholders and the MOD enablers.

5.3.1 The supply and demand side of MOD

The supply and demand side of MOD is shown in Figure 3 (based on Figure 2 in Reference [7]).
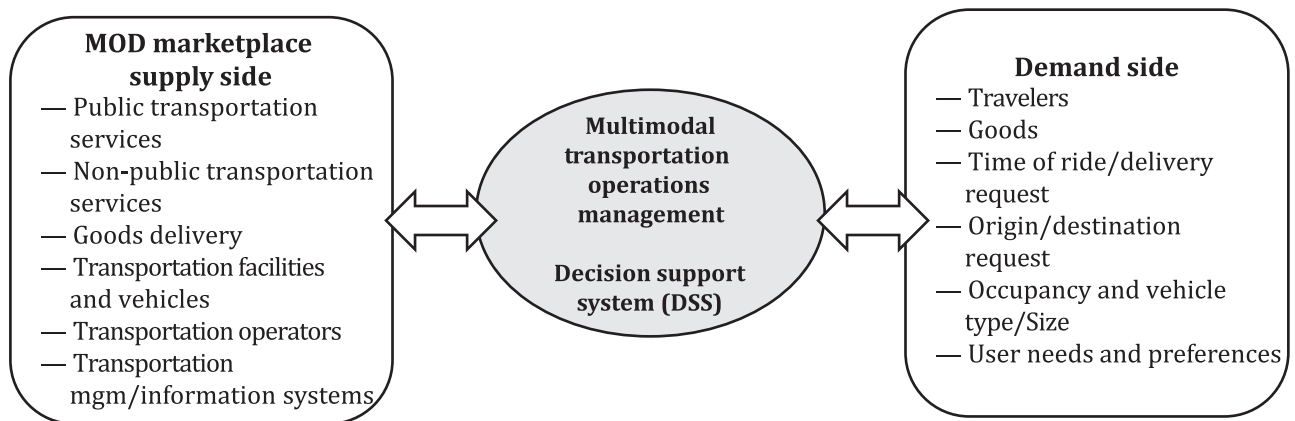

Figure 3 — The supply and demand side of MOD

The supply side of the ecosystem (MOD marketplace) consists of the actors and objects providing transport services for people or goods delivery:

— public transport services, e.g. transport services provided by bus, metro, tram and ferries;

— non-public transport services, e.g. shared services, taxis, car rentals, micro mobility and private cars;

— goods delivery, e.g. intercity freight transport, urban deliveries and last- and first-mile services;

— transportation facilities including parking, tolls, roadways and highways;

— vehicles, e.g. public transport vehicles, private vehicles, goods-delivery vehicles, emergency vehicles and autonomous vehicles;

— transport operators, e.g. public transport operators, taxi companies, companies like Lyft and Uber and companies providing shared transport means, e.g. car, bikes and el-scooters.

— transportation and information systems, e.g. payment systems for parking, toll and public transport, signal systems, mobile apps for trip planning and payment, fleet management systems and navigation systems.

— transport information services including schedule information, dynamic message signs, etc.

The demand side of the ecosystem covers the users of the mobility service and their needs, choices and preferences. This can be covered by the term "user requirements". The following are described as being part of the demand side:

— all travellers, including pedestrians, riders, drivers and cyclists, where the traveller could be of any age, with or without disabilities, etc.;

— goods and merchandise that require transport services (deliveries);