
Public transport — Interoperable fare management system —

Part 1: Architecture

*Transport public — Système de gestion tarifaire interoperable —
Partie 1: Architecture*

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Contents

	Page
Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	2
3 Terms and definitions	2
4 Abbreviated terms	6
5 Requirements	6
6 System environment for IFMS	7
6.1 General	7
6.2 Mobility platforms	7
7 Conceptual framework for IFMS	7
7.1 General	7
7.2 Description of IFM roles and external roles	8
7.3 Basic framework of the generic IFM functional model	12
8 Use case description for the IFM functional model	13
8.1 Description of IFM-roles and external roles	13
8.2 Define set of rules	14
8.2.1 General	14
8.2.2 Define set of rules for Customer accounts	14
8.2.3 Define set of rules for media	14
8.2.4 Define set of rules for ID services	15
8.2.5 Define set of rules for payment services	15
8.3 Certification	15
8.3.1 General	15
8.3.2 Certification of organizations	16
8.3.3 Certification of components	16
8.3.4 Certification of media	16
8.3.5 Certification of ID services	16
8.3.6 Certification of payment services	17
8.3.7 Certification of application specifications and templates	17
8.3.8 Certification of product specifications and templates	17
8.4 Interaction with external objects	18
8.4.1 General	18
8.4.2 Interaction with external media	18
8.4.3 Interaction with external applications	19
8.4.4 Interaction with external ID services	20
8.4.5 Interaction with external payment services	21
8.5 Registration	22
8.5.1 General	22
8.5.2 Registration of organizations	22
8.5.3 Registration of components	22
8.5.4 Registration of ID services	22
8.5.5 Registration of customer accounts	23
8.5.6 Registration of payment services	24
8.5.7 Registration of media	24
8.5.8 Registration of customer media	24
8.5.9 Registration of application templates	25
8.5.10 Registration of applications	25
8.5.11 Registration of product templates	25
8.5.12 Registration of products	25
8.6 Managing ID services	26

8.6.1	General	26
8.6.2	Enrolment and update of Customer ID data via an application form	26
8.6.3	Enrolment and update of Customer ID data via an external ID service	27
8.6.4	Update of Customer ID data via an online account	27
8.6.5	Re-use of incumbent Customer ID data	28
8.6.6	Management and maintenance of Customer ID data	28
8.6.7	Providing the ID service to IFMS internal and external organizations	29
8.7	Management of customer accounts	29
8.7.1	General	29
8.7.2	Secure login to customer online accounts	30
8.7.3	Connect/disconnect customer media to/from the customer online account	30
8.7.4	Transfer of products between connected customer media	31
8.7.5	Connect system generated account with a customer account	32
8.7.6	Termination of customer accounts	32
8.8	Management of customer media	33
8.8.1	General	33
8.8.2	Provisioning of media	33
8.8.3	Termination of customer media	34
8.9	Management of applications	35
8.9.1	General	35
8.9.2	Dissemination of application templates	35
8.9.3	Acquisition of applications	36
8.9.4	Termination of application templates	36
8.9.5	Termination of applications	37
8.10	Management of products	38
8.10.1	Dissemination of product templates	38
8.10.2	Termination of product templates	39
8.10.3	Management of action lists	40
8.10.4	Acquisition of products	40
8.10.5	Modification of product parameters	40
8.10.6	Termination of products	41
8.10.7	Use and inspection of products	41
8.10.8	Collection of data	42
8.10.9	Forwarding data	43
8.10.10	Generation and distribution of clearing reports	43
8.11	Security management	44
8.11.1	General	44
8.11.2	Monitoring of IFM processes and IFM data life cycle	44
8.11.3	Management of IFM security keys	45
8.11.4	Management of security lists	45
8.12	Customer Service management (optional)	48
9	System interface identification	48
10	Identification	48
10.1	General	48
10.2	Numbering scheme	48
10.3	Prerequisites	49
10.3.1	There is one Registrar within the IFMS.	49
10.3.2	All objects, e.g. templates and components, have an owner who is one of the actors in the IFMS.	49
10.3.3	The identification of the application and product shall be as short and compact as possible due to the minimization of the transaction time between the customer medium and the MAD.	49
11	Security in IFMSs	49
11.1	General	49
11.2	Protection of the interests of the public	49
11.3	Assets to be protected	50
11.4	General IFM security requirements	50

Annex A (informative) Mobility Platform – German example	52
Annex B (informative) Pay-As-You-Go (PAYG) roles and relationships in an IFMS	57
Annex C (informative) Mobility ID service example	63
Annex D (informative) Examples of IFMS implementations	73
Annex E (informative) Media centric management and back-office centric management	79
Bibliography	81

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Foreword

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

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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

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

This third edition cancels and replaces the second edition (ISO 24014-1:2015), which has been technically revised.

The main changes compared to the previous edition are as follows:

- in order to prepare compatibility of Interoperable Fare Management (IFM) systems with mobility platforms encompassing the entire mobility service chain, functions and roles known from IFM are expanded; and
- new roles are introduced to operate mobility platforms.

A list of all parts in the ISO 24014 series can be found on the ISO website.

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

Fare management (FM) encompasses all the processes designed to manage the distribution and use of fare products in a public transport environment.

Fare management is called interoperable (IFM) when it enables the customer to use a portable electronic medium (e.g. a contact/contactless smart card or a Near Field Communications mobile device) with compatible equipment (e.g. at stops, with retail systems, at platform entry points or on board vehicles). IFM concepts can also be applied to fare management systems not using electronic media.

Potential benefits for the customer include reductions in queuing, special and combined fares, one medium for multiple applications, loyalty programmes and seamless journeys.

There are two main changes in this edition of this document compared to the previous edition. Firstly, in order to prepare compatibility of IFM systems with mobility platforms encompassing the entire mobility service chain, functions and roles known from IFM are expanded. Secondly, new roles are introduced to operate mobility platforms. These new roles should act with the roles defined in the IFM and enter into interface relations.

With the introduction of so-called mobility platforms, which can integrate various IFM systems and additional modes of transportation and deliver the travel information across these integrated domains, the customer can benefit from seamless and well-guided multi- or inter-modal travel.

Interoperability of fare management systems also provides benefits to operators and the other parties involved. However, it requires an overall system architecture that defines the system functionalities, the actors involved and their roles, the relationships and the interfaces between them.

Interoperability also requires the definition of a security scheme to protect privacy, integrity, and confidentiality between the actors to ensure fair and secure data flow within the IFM system (IFMS). The overall architecture is the subject of this document, which recognizes the need for legal and commercial agreements between members of an IFM, but does not specify their form. The technical specifications of the component parts and, particularly, the standards for customer media (e.g. smart cards) are not included.

Note that there is not one single IFMS. Individual operators, consortia of operators, public authorities, and private companies can manage and/or participate in IFMSs. An IFMS can span country boundaries and can be combined with other IFMSs. Implementations of IFMSs require security and registration functionalities. This document allows for the distribution of these functions to enable the coordination/convergence of existing IFMSs to work together.

This document intends to provide the following benefits:

- a) It defines a common definition of terms and roles that shall constitute the basis for the other parts of ISO 24014 and technical specifications and technical reports from ISO/TC 204 which address mobility platforms, fare management and interoperability between IFM and other systems.
- b) It provides a framework for an interoperable fare management implementation with minimum complexity.
- c) It provides guidance on how IFM Managers can benefit from external devices and services and how interoperability and appropriate security level can be established in cooperation with systems from other markets.
- d) It aims to shorten the time and lower the cost of IFM procurement as both suppliers and purchasers understand what is being purchased. Procurement against an open standard reduces cost as it avoids the need for expensive bespoke system development and provides for second sourcing.
- e) It aims to simplify interoperability between IFMSs to the benefit of all stakeholders.

In [Annex A](#), this document provides a framework for mobility platforms that integrate fare management and travel information for inter- and multimodal travel. This document also contains other informative

annexes, which elaborate on some specific subjects of the document and offer some national examples with regard to IFMS implementations (see [Annex B](#), [Annex C](#), [Annex D](#) and [Annex E](#)).

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Public transport — Interoperable fare management system —

Part 1: Architecture

1 Scope

This document gives guidelines for the development of multi-operator/multi-service interoperable public surface (including subways) transport fare management systems (IFMSs) on a national and international level.

This document is applicable to bodies in public transport and related services which agree that their systems need to interoperate.

This document defines a conceptual framework which is independent of organizational and physical implementation. Any reference within this document to organizational or physical implementation is purely informative.

This document defines a reference functional architecture for IFMSs and establishes the requirements that are relevant for ensuring interoperability between several actors in the context of the use of electronic tickets.

The IFMS include all the functions involved in the fare management process, such as:

- management of media,
- management of applications,
- management of products,
- security management, and
- certification, registration, and identification.

This document defines the following main elements:

- identification of the different sets of functions in relation to the overall IFMS and services and media from non-transport systems which interact with fare management systems;
- a generic model of an IFMS describing the logical and functional architecture and the interfaces within the system, with other IFMSs and with services and media from non-transport systems;
- use cases describing the interactions and data flows between the different sets of functions;
- security requirements.

In its annexes, this document provides a framework for mobility platforms that integrate fare management and travel information for inter- and multimodal travel (see [Annex A](#)). It also elaborates on specific subjects covered in document and offers some national examples with regard to IFMS implementations (see [Annex B](#), [Annex C](#), [Annex D](#) and [Annex E](#)).

This document does not define:

- the technical aspects of the interface between the medium and the medium access device;

- the data exchanges between the medium and the medium access device;

NOTE The data exchanges between the medium and the medium access device are proposed by other standardization committees.

- the financial aspects of fare management systems (e.g. customer payments, method of payment, settlement, apportionment, reconciliation).

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 <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 account-based ticketing ABT

architectural approach that stores *products* (3.30) in the *IFM* (3.19) system's back-office (i.e. the customer's personal account or a temporary account) and not in the *customer medium* (3.12)

Note 1 to entry: The customer medium carries authentication credentials and an *application* (3.7) that contains references to the account-based products in the back-office.

3.2 action list

list of items related to *IFM* (3.19) *applications* (3.7) or *products* (3.30) downloaded to *medium access devices* (3.24) (MADs) processed by the MAD if and when a specific IFM application or product referenced in the list is encountered by that MAD

3.3 actor

person, *organization* (3.25), or another (sub)system playing a coherent set of functions when interacting with the *IFM system* (3.20) within a particular *use case* (3.36)

3.4 application rules

specification of rules in the *application* (3.7) contract for the use of the application with the Customer as defined by the application owner

3.5 application specification

specification of functions, data elements, and security scheme according to the *application rules* (3.4)

3.6 application template

executable technical pattern of the *application specification* (3.5)

3.7**application**

implemented and initialized *application template* (3.6)

Note 1 to entry: The application may host one or more *products* (3.30) and may support functions which identify and protect the access to these products. For ABT- and ID-based architectures, the application may reside partly in the *customer medium* (3.12) (identification and access control function) and partly in the *IFM* (3.20) back-office (products).

Note 2 to entry: The application is identified by a unique identifier.

Note 3 to entry: The application may house products and other optional customer information (customer details, customer preferences).

Note 4 to entry: The application can be fully installed on a customer media or distributed on the customer media and the IFM back-offices.

3.8**commercial rules**

rules defining the settlement and commission within the *IFMS* (3.20)

3.9**component**

any piece of hardware and/or software that performs one or more functions in the *IFMS* (3.20)

3.10**component provider**

anyone who wants to bring a *component* (3.9) to the *IFMS* (3.20)

3.11**customer account**

data space hosted by the *IFMS* (3.20) (typically the product retailer) that contains all information which is relevant for the business relationship between the Customer and the IFMS

Note 1 to entry: Accounts are maintained and managed by the responsible stakeholder in the IFMS. Accounts which are accessible online may also be established and managed by the Customer.

3.12**customer medium**

medium (3.22) initialized with an *application* (3.7) through an application contract

3.13**derived identity****derived ID**

electronic identifier generated from another *ID* (3.15) (primary ID)

Note 1 to entry: Typically, the derived ID is generated by an identity provider in such a way that the authenticity of the derived ID can be proven but there is no way to conclude from the derived ID back to the primary ID. The concept of derived ID is typically used when primary ID with high security demand (like driver licence or governmental eID) shall not be exposed to an environment that doesn't support high assurance levels.

3.14**external**

object which does not follow the rules of the *IFMS* (3.20) and for which special activities are necessary to implement interoperability and security with the IFMS

3.15
identity
ID

information that describes a specific person or object in a unique and unambiguous way

Note 1 to entry: For instance, a person can be described by the attributes name, birth date, sex, address, etc. Unambiguous identification of a person typically needs, in addition, a unique identifier which is issued by the Identity Provider. An object, e.g. a ticketing machine, can be described by owner, type, and software version. A unique serial number could serve as identifier.

3.16
IFM functional model

model to define functions of *IFM roles* ([3.18](#)) and how they interact

3.17
IFM policy

commercial, technical, security, and privacy objectives of *IFM* ([3.19](#))

3.18
IFM role

abstract object performing a set of functions in an *IFM functional model* ([3.16](#))

3.19
interoperable fare management
IFM

all the functions involved in the fare management process such as management of *application* ([3.7](#)), *products* ([3.30](#)), security and certification, registration, and identification to enable Customers to travel with participating Service Operators using a single portable electronic *medium* ([3.22](#))

3.20
interoperable fare management system
IFMS

all technical, commercial, security, and legal elements which enable *interoperable fare management* ([3.19](#))

3.21
level of assurance
LoA

level of resilience of *IFMS* ([3.20](#)) *components* ([3.9](#)) and processes against a defined attack potential

Note 1 to entry: to entry; Level of assurance is typically defined by the Security Manager for all components of the IFMS and specified in the *set of rules* ([3.33](#)) for security certification.

3.22
medium

physical carrier of *applications* ([3.7](#))

3.23
message

set of data elements transferred between two *IFM roles* ([3.18](#))

3.24
medium access device
MAD

device with the necessary facilities (hardware and software) to communicate with a *customer medium* ([3.12](#))

3.25
organization

legal entity covering the functions and implied responsibilities of one or more of the following operational *IFM roles* ([3.18](#)): Application Owner, Application Retailer, Product Owner, Product Retailer, Service perator, Collection and Forwarding, etc.

3.26**pricing rule**

rules defining the price and payment/billing relationships to the Customer

3.27**product rule**

usage, pricing, and *commercial rules* (3.8) defined by the Product Owner

3.28**product specification**

complete specification of functions, data elements, and security scheme according to the *product rules* (3.27)

3.29**product template**

technical pattern of the *product specification* (3.28)

Note 1 to entry: The product template is identified by a unique identifier.

3.30**product**

instance of a *product template* (3.29) stored in an *application* (3.7)

Note 1 to entry: A product defines a commercial offer to the Customer. By purchasing a product, the Customer is entitled to obtain specific services which are defined by the Product Owner.

Note 2 to entry: It is identified by a unique identifier and enables the Customer to benefit from a service provided by a Service Operator.

3.31**role**

abstract object performing a set of functions

3.32**security policy**

objectives of the *IFMS* (3.20) to secure the public interests and the assets within the IFMS

3.33**set of rules**

regulations for achieving *IFM policies* (3.17) expressed as technical, commercial, security, and legal requirements and standards relevant only to the IFMS

3.34**trigger**

event that causes the execution of a *use case* (3.36)

3.35**usage rule**

rule defining the usage time, the usage area, the personal status and the type of service

3.36**use case**

description of a process by defining a sequence of actions performed by one or more *actors* (3.3) and by the system itself