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Intelligent transport systems (ITS) — Nomadic device service platform for micro mobility —

Part 2: Functional requirements and dataset definitions

Systèmes de transport intelligents - Plateforme de services de dispositifs portables pour la micro mobilité - Partie 2 : Exigences fonctionnelles et définitions des données —

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Foreword

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

A list of all parts in the ISO 22085 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

Micro mobility can be defined as a small or compact-sized electric vehicle. Normally, it is designed to be used as a first-mile and last-mile service connecting public transit routes or to provide personal mobility with one or two passengers for a short-distance trip.

The nomadic device service platform aims to accommodate the specific needs of integrated mobility services for either urban or rural areas. The service platform focuses on the use of data exchange interface standards between micro mobility and nomadic devices to enable the development of cloud-based ITS using wireless networks.

This document fosters the introduction of nomadic devices in the public transport and automotive world. It specifies functional requirements and dataset definitions based on Vehicle Interface Data Format (VIDF) at the application level regarding pre-trip, post-trip and while driving, in order to identify connectivity between a user's personal ITS stations (P-ITS-S, for example nomadic devices), roadside-ITS-station, vehicle-ITS-station gateway (V-ITS-S) and central ITS station (C-ITS-S). The functional requirements and the dataset can be used as a measure for exchanging information required to implement mobility services to be included in integrated mobility and parcel delivery services.

Intelligent transport systems (ITS) — Nomadic device service platform for micro mobility —

Part 2: Functional requirements and dataset definitions

1 Scope

This document provides definitions of functional requirements for connectivity among nomadic devices, cloud servers and micro mobility during pre-trip, post-trip and while driving, which is defined in ISO/TR 22085-1, and datasets for providing seamless mobility service. In addition, it also delivers related standards required to develop and operate the service platform between a nomadic device and micro mobility with intelligent transport systems (ITS) technologies. The functional requirements and the datasets can be used as a measure of exchanging information required to promote micro mobility as a new type of urban and rural transport mode, and so increase the possibility of being included in an integrated mobility and parcel delivery system.

This document defines functional requirements and messages set by use case and a dataset of each message to provide services for use cases, which are defined in ISO/TR 22085-1 as follows:

— Pre-trip (Use case 1.1-1.5)

— En-route (Use case 2.1-2.7)

— Post-trip (Use case 3.1-3.4)

2 Normative references

There are no normative references in this document.

3 Terms, definitions, symbols and abbreviated terms

3.1 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 https://www.electropedia.org/

3.1.1
central ITS station
C-ITS-S
network server between personal ITS server (i.e. nomadic device or mobile device) and micro mobility service provider

3.1.2
personal ITS station
P-ITS-S
implementation of an ITS station as a personal ITS subsystem (e.g. nomadic device or mobile device) which provides communication connectivity via a wireless communication network (3G, 4G, and 5G), mobile wireless broadband (WIMAX, HC-SDMA, etc.), WiFi and short-range links, such as Bluetooth, Zigbee, etc. to connect portable devices to the motor vehicle communications system network

3.1.3
micro mobility
MM
new concept of eco-friendly personal electric vehicle for one or two passengers

3.1.4
in mobility network
IMN
local network bus among electrical control units in MM, providing diagnostics information to P-ITS-S through vehicle-ITS-station gateway (V-ITS-S)

3.1.5
micro mobility service provider
MMSP
service provider including parking lot management service, public transit authority, charging station management service, tolling service authority, car sharing service, traffic information service, etc.

3.1.6
micro mobility communication network
MMCN
communication network between P-ITS-S and C-ITS-S

3.1.7
public communication network
PCN
network between MMCS and service providers used to provide MM services information on, for example, charging stations, parking lots and traffic congestion

3.2 Abbreviated terms

C	conditional
Cvt.	convention (M, O, C)
DTC	diagnostic trouble code
EXE	executor
FR	functional requirement
IMN	in mobility network
ITIPS	interconnected transfer information providing service
ND	nomadic device
M	mandatory
MEC	mobile edge computing
MM	micro-mobility

MMCN	micro mobility communication network
MMCS	micro-mobility cloud server
MTS	mobile tolling service
O	optional
OBD	on board diagnostic
PCN	public communication network
R-ITS-S	roadside-intelligent transport system-station
SOC	state of charge
SAPSS	searching available parking space service on the way
SMMRS	shared micro mobility return service
V-ITS-S	vehicle ITS station
WiFi	wireless fidelity

4 Document overview and structure

This document provides all documents and references required to support the implementation of the requirements related to standardized access to nomadic device service platforms for micro mobility. This document consists of three sections:

— General information is provided in Clause 5.

  Clause 5 provides a purpose and overview, including a service framework architecture.

— Functional requirements and messages set by use case are described in Clause 6.

  Clause 6 specifies all use case technical requirements and datasets related to nomadic device service platforms for micro mobility to be interfaced with micro mobility cloud servers and micro mobility service providers. The requirements reflect functional requirements as specified in this document.

— Datasets are described in Clause 7.

  Clause 7 provides definitions of each message including message ID, dataset and data type.

5 General information

5.1 Purpose

This document addresses two major areas:

— Identification of the functional requirements for describing the P-ITS-S interfaced with V-ITS-S and C-ITS-S (or MMCS).

— Definition of the message set required in the general use cases defined in ISO/TR 22085-1.

— Definition of the dataset of each message from the use cases.

5.2 Use case overview

Conceptual aspects of the general use cases of ISO/TR 22085-1 are shown in Figure 1 and are summarized in Table 1.

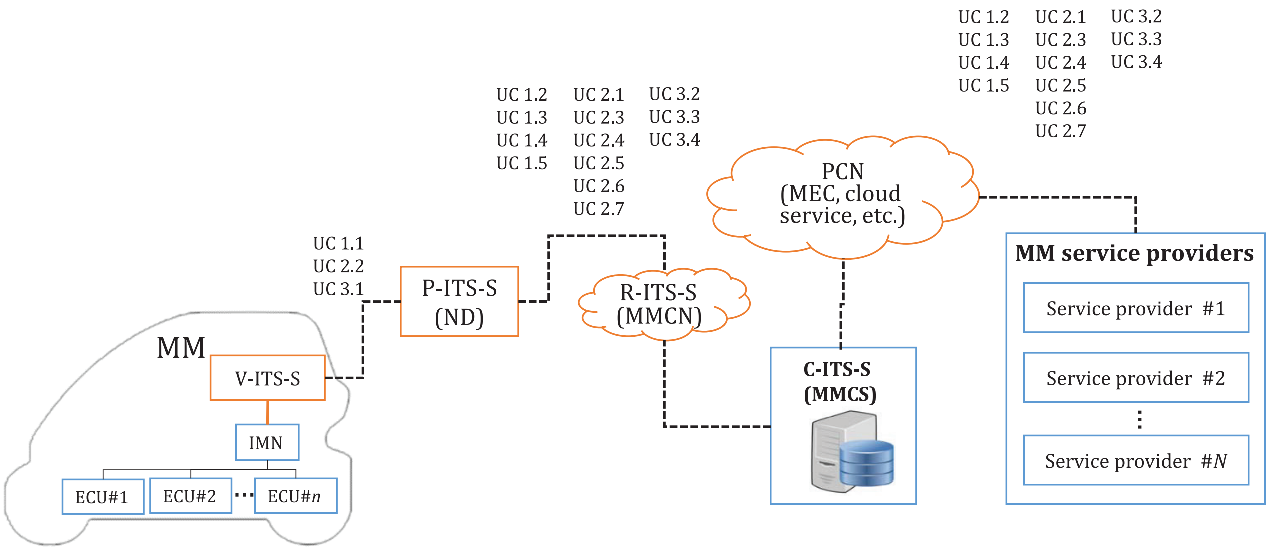

Figure 1 — Conceptual aspects of the general use cases in ISO/TR 22085-1

Table 1 — Use cases clusters and associated use cases overview

Title of use cases cluster	Brief description
1. Pre-trip	This cluster specifies the detailed use cases at the pre-trip stage for micro mobility. It includes 5 different use cases, including MM information providing service, navigation service linked information on charging stations, pre-scanning available parking space service, micro mobility sharing service and micro mobility as an integrated mobility service. — UC 1.1 – Micro mobility information providing services — UC 1.2 – Navigation service linked information on charging stations — UC 1.3 – Pre-scanning available parking space services — UC 1.4 – Micro mobility sharing services — UC 1.5 – Micro mobility as an integrated mobility service

Table 1 *(continued)*

Title of use cases cluster	Brief description
2. En-route	This cluster specifies the detailed use cases at the en-route stage for micro mobility. It includes 7 different use cases, including traffic information providing service, micro mobility fault management service, mobile tolling service, adaptive route management service, searching available parking space service on the way, keyless go service for shared micro mobility and interconnected transfer information providing service. — UC 2.1 – Traffic information providing service — UC 2.2 – Micro mobility status monitoring service — UC 2.3 – Mobile tolling service — UC 2.4 – Adaptive route management service — UC 2.5 – Searching available parking space service on the way. — UC 2.6 – Keyless go service for shared micro mobility — UC 2.7 – Interconnected transfer information providing service
3. Post-trip	This cluster specifies the detailed use cases at the post-trip stage for micro mobility. It includes 4 different use cases, including micro mobility driving information providing service, charging station information service, parked micro mobility position providing service and sharing micro mobility return service. — UC 3.1 – Micro mobility driving information providing service — UC 3.2 – Charging station information service — UC 3.3 – Parked micro mobility position providing service — UC 3.4 – Sharing micro mobility return service

6 Functional requirements and dataset definition

6.1 Functional requirements

This document provides functional requirements (FRs) for providing integrated mobility or postal delivery services using a P-ITS-S, for instance, a nomadic device.

The FRs consist of connectivity, power supply, data collection and data storing for services provided in pre-trip, post-trip, and en-route phases, and requirements for components of the service platform (i.e., P-ITS-S, V-ITS-S, C-ITS-S [or MMCS]).

6.1.1 Functional requirements with related general use cases

Table 2 — Functional requirements overview

FR#	Description
FR1	IMN of MM provides V-ITS-S with status information (mileage, SOC, DTC) of MM.
FR2	V-ITS-S provides P-ITS-S with status information of MM.
FR3	P-ITS-S provides status information of MM to a driver.
FR4	P-ITS-S sends location information along with MM status to C-ITS-S.
FR5	P-ITS-S should always be in V2N (vehicle-to-network) with MM.
FR6	C-ITS-S manages all MM-related information (e.g. charging station, parking space, navigation route information, toll balance information).
FR7	C-ITS-S stores MM driving information and calculates balance after driving.

6.1.2 Functional requirements for the connectivity among P-ITS-S, MM and MMCS

6.1.2.1 P-ITS-S

The P-ITS-S is always interfaced with the V-ITS-S via a wireless communication link.

6.1.2.2 MM

MM should include interfaces which can transfer the MM's information to the P-ITS-S and the MMCS.

6.1.2.3 C-ITS-S (or MMCS)

The C-ITS-S (or MMCS) should be able to store and accumulate information related to the MM's status.

The C-ITS-S (or MMCS) should include interfaces through which data can be exchanged between the C-ITS-S and public service providers (e.g. car sharing service, etc.).

6.2 Dataset definitions

6.2.1 Introduction

This document provides dataset definitions which contain required data and the required data type for each use case defined in ISO/TR 22085-1, in order to provide integrated mobility or a postal delivery service.

6.2.2 Pre-trip

6.2.2.1 General

The following subclauses define datasets in the pre-trip phase, including information on vehicle identification, location and status, which is provided to an MM driver through a P-ITS-S.

6.2.2.2 UC 1.1 Micro mobility information providing service

Use case 1.1 requires a dataset containing the status information of the MM. When the MM is chosen, V-ITS-S-ID and status information of the MM and an MM driver's P-ITS-S identification is transferred to a C-ITS-S (or MMCS) for providing services in use case 1.1. Table 3 shows data, data type and a description of the dataset required for use case 1.1.

Table 3 — Dataset definition for use case 1.1

Use case	**Cluster**	**1- Pre-trip**		Micro mobility (MM) identification (V-ITS-S-ID) and status information such as SOC, DTC is provided to MM driver, who utilizes it to decide to choose the MM or not.
	Name	**UC 1.1 — Micro mobility information providing service**		
Messages	**Subclause**	**Name**	**Exe**	**Description**
	7.1	`request-mm-status`	P	Request that V-ITS-S notifies MM status with SOC, DTC, mileage and V-ITS-S-ID.
	7.2	`mm-status-response`	V	Send MM status information (SOC, DTC, mileage) to P-ITS-S.
	7.3	`stop-notify-mm-status`	P	Stop the communication to the V-ITS-S.
	7.4	`notify-mm-service`	P	Send MM status information, V-ITS-S-ID, position and user information to C-ITS-S. After the first contact, send only the P-ITS-S position and MM status information, V-ITS-S-ID, in a predefined time interval.
	7.5	`stop-notify-mm-service`	P	Stop the communication to the C-ITS-S.