
**Electronic fee collection —
Application interface definition for
autonomous systems —**

**Part 1:
Charging**

iTeh STANDARD PREVIEW
*Perception du télépéage — Définition de l'interface d'application pour
les systèmes autonomes —
(standards.iteh.ai)
Partie 1: Imputation*

[ISO 17575-1:2016](https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016)

<https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 17575-1:2016

<https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	2
3 Terms and definitions	3
4 Abbreviated terms	5
5 Architectural considerations	5
5.1 Business architecture	5
5.2 Technical architecture	6
5.3 Location of the specification interface	7
6 Procedural requirements	8
6.1 General	8
6.2 Toll collection process	8
6.3 Charge report	8
6.4 Charge report response	9
7 Data elements	9
7.1 Overview of data elements	9
7.2 Reporting	10
7.2.1 ChargeReport	10
7.2.2 ChargeReportResponse	11
7.3 Data group General	11
7.3.1 timeOfReport	11
7.3.2 reportPeriod	11
7.3.3 sumVatForThisSession	12
7.3.4 chargeReportCounter	12
7.3.5 mileage	12
7.3.6 Distance	12
7.3.7 Position	12
7.3.8 Period	12
7.3.9 Duration	13
7.4 Data group Security	13
7.4.1 AuthenticatedChargeReport	13
7.4.2 AuthenticatedChargeReportResponse	13
7.4.3 AuthenticatedUsageStatement	13
7.4.4 AuthenticatedReloadAccount	13
7.4.5 AuthenticatedNewAccountLimit	14
7.4.6 AuthenticatedAddToAccount	14
7.4.7 MessageAuthenticator	14
7.4.8 MacMessageAuthenticator	14
7.4.9 MessageAuthenticatorEfc	14
7.5 Data group Contract	14
7.5.1 obelId	14
7.5.2 vehicleLPNr	15
7.5.3 paymentMeans	15
7.5.4 serviceProviderContract	15
7.5.5 tollContext	15
7.5.6 chargeReportFinalRecipient	15
7.5.7 obeStatusForDriver	15
7.5.8 ObeStatus	16
7.5.9 chargeReportRespSender	16
7.6 Data group Usage	16
7.6.1 usageStatementList	16

7.6.2	UsageStatement	16
7.6.3	usageStatementID	17
7.6.4	aggregatedFee	17
7.6.5	aggregatedSingleTariffClassSession	17
7.6.6	currentTariffClass	18
7.6.7	VehicleDescription	18
7.6.8	listOfChargeObjects and DetectedChargeObject	18
7.6.9	ChargeObjectId	19
7.6.10	ListOfRawUsageData, measuredRawData	19
7.6.11	NmeaData	19
7.6.12	additionalGnssData	20
7.6.13	ListOfDSRCUsageData	20
7.6.14	additionalUsageInformation	21
7.6.15	DataReceived	21
7.7	Data group Account	21
7.7.1	accountStatus	21
7.7.2	accountUpdate	21
7.7.3	reloadAccount	22
7.7.4	setAccount	22
7.7.5	addToAccount	22
7.8	Data group Versioning	22
7.8.1	protocolVersion	22
7.8.2	versionInfo	22
7.8.3	versionResponse	23
7.9	Data group Compliance Checking – listOfCCCAttributes and CCCAttributes	23
Annex A (normative) Data type specifications		24
Annex B (normative) Protocol implementation conformance statement (PICS) proforma		25
Annex C (informative) Hierarchical data structure illustration		33
Annex D (informative) Use of this part of ISO 17575 for the EETS		36
Bibliography		38

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

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

This edition of ISO 17575-1 cancels and replaces ISO/TS 17575-1:2010, which has been technically revised. The following changes have been made:

- conversion from a Technical Specification to an International Standard;
- amendments to reflect changes to the underlying base standards, especially ISO 14906;
- adoption of security prescriptions previously located in other standards for specification of authenticated data structures;
- editorial and formal corrections as well as changes to improve readability.

ISO 17575 consists of the following parts, under the general title *Electronic fee collection — Application interface definition for autonomous systems*:

- *Part 1: Charging*
- *Part 2: Communication and connection to the lower layers*
- *Part 3: Context data*

In this edition of the ISO 17575-series the contents of ISO/TS 17575-4:2011 were incorporated into ISO 17575-3:2016. ISO/TS 17575-4:2011 will be withdrawn once ISO 17575-3 has been published.

Introduction

0.1 Autonomous systems

ISO 17575 is a series of standards defining the information exchange between the Front End and the Back End in electronic fee collection (EFC) based on autonomous on-board equipment (OBE). EFC systems automatically collect charging data for the use of road infrastructure including motorway tolls, zone-based fees in urban areas, tolls for special infrastructure like bridges and tunnels, distance-based charging and parking fees.

Autonomous OBE operates without relying on dedicated road-side infrastructure by employing wide-area technologies such as Global Navigation Satellite Systems (GNSS) and Cellular Networks (CN). These EFC systems are referred to by a variety of names. In addition to the terms autonomous systems and GNSS/CN systems, the terms GPS/GSM systems and wide-area charging systems are also in use.

Autonomous systems use satellite positioning, often combined with additional sensor technologies such as gyroscopes, odometers and accelerometers, to localize the vehicle and to find its position on a map containing the charged geographic objects, such as charged roads or charged areas. From the charged objects, the vehicle characteristics, the time of day and other data that are relevant for describing road use, the tariff and ultimately the road usage fee are determined.

Two strengths of the autonomous approach to electronic fee collection are its flexibility, allowing the implementation of almost all conceivable charging principles, and its independence from local infrastructure, thereby predisposing this technology towards interoperability across charging systems and countries. Interoperability can only be achieved with clearly defined interfaces, which is the aim and justification of ISO 17575.

0.2 The parts of ISO 17575

Part 1: Charging, defines the attributes for the transfer of usage data from the Front End to the Back End. The contents of charge reports might vary between toll regimes, hence, attributes for all requirements are offered, ranging from attributes for raw localization data, for map-matched geographic objects and for completely priced toll transactions. A toll regime comprises a set of rules for charging, including the charged network, the charging principles, the liable vehicles and a definition of the required contents of the charge report.

Part 2: Communication and connection to lower layers, defines basic communication services for data transfer over the OBE air-link or between Front End and Back End. The data defined in this part of ISO 17575-1 and ISO 17575-3 can but need not be exchanged using the communication stack as defined in ISO 17575-2.

Part 3: Context data, defines the data to be used for a description of individual charging systems in terms of charged geographical objects and charging and reporting rules. For every toll charger's system, attributes as defined in ISO 17575-3 are used to transfer data to the Front End in order to instruct it on which data to collect and report.

0.3 Application needs covered by ISO 17575

The ISO 17575-series of standards

- is compliant with the architecture defined in ISO 17573:2010,
- supports charges for use of road sections (including bridges, tunnels, passes, etc.), passage of cordons (entry/exit) and use of infrastructure within an area (depending on distance, time),
- supports fee collection based on units of distance or duration, and based on occurrence of events,
- supports modulation of fees by vehicle category, road category, time of usage and contract type (e.g. exempt vehicles, special tariff vehicles, etc.),
- supports limiting of fees by a defined maximum per period of usage,

- supports fees with different legal status (e.g. public tax, private toll),
- supports differing requirements of different toll chargers, especially in terms of
 - geographic domain and context descriptions,
 - contents and frequency of charge reports,
 - feedback to the driver (e.g. “green” or “red light”), and
 - provision of additional detailed data on request, e.g. for settling of disputes,
- supports overlapping geographic toll domains,
- supports adaptations to changes in
 - tolled infrastructure,
 - tariffs, and
 - participating toll schemes, and
- supports the provision of trust guarantees by the toll service provider to the toll charger for the data originated from the Front End.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[ISO 17575-1:2016](https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016)

<https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 17575-1:2016

<https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016>

Electronic fee collection — Application interface definition for autonomous systems —

Part 1: Charging

1 Scope

This part of ISO 17575 defines the format and semantics of the data exchange between a Front End (OBE plus optional proxy) and corresponding Back Ends in autonomous toll schemes. It defines the data elements that are used to generate charge reports containing information about the road usage of a vehicle for certain time intervals, sent from the Front End to the Back End. It also defines the data that can be used to re-configure the ongoing process of gathering charge relevant information in the Front End. The scope is shown in [Figure 1](#).

The constitution of the charge report is dependent on configuration data that are assumed to be present in the Front End. The assembly of charge reports can be configured for each individual toll scheme according to local needs. Charge reports generated in accordance with this part of ISO 17575 are consistent with the requirements derived from the architectural concept defined in ISO 17573:2010.

The definitions in this part of ISO 17575 comprise

- reporting data, i.e. data for transferring road usage data from Front End to Back End, including a response from the Back End towards the Front End,
- data for supporting security mechanisms,
- contract data, i.e. data for identifying contractually essential entities,
- road usage data, i.e. data for reporting the amount of road usage,
- account data for managing a payment account,
- versioning data, and
- compliance checking data, i.e. data imported from ISO 12813:2015, which are required in compliance checking communication.

[Annex A](#) contains the data type specifications using ASN.1 notation.

The protocol implementation conformity statements (PICS) proforma are provided in [Annex B](#).

[Annex C](#) provides a graphical presentation of the structure of the data elements described in [Clause 7](#).

[Annex D](#) provides information on how this part of ISO 17575 can be used in EETS environment and how the requirements that are specified in the EU-Decision 2009/750 are addressed by this standard.

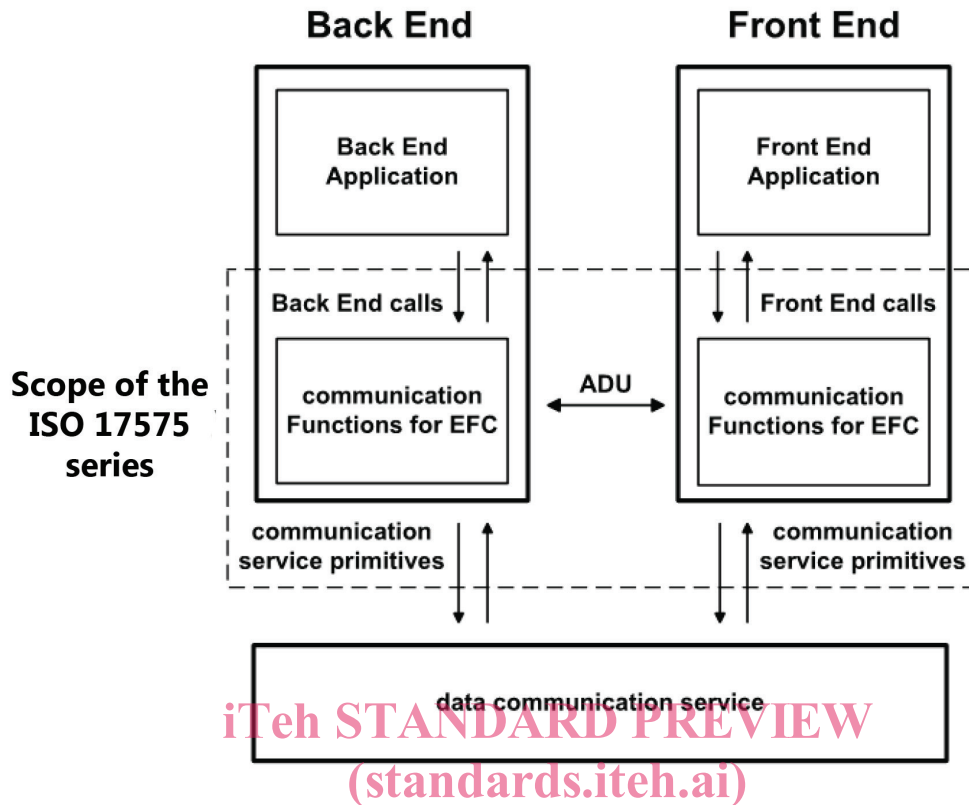


Figure 1 — Scope of ISO 17575-1
<https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016>

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6709:2008, *Standard representation of geographic point location by coordinates*

ISO/IEC 8824-1, *Information technology— Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO/IEC 8825-2:2008, *Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) — Part 2*

ISO/IEC 9594-8:2014, *Information technology — Open Systems Interconnection — The Directory — Part 8: Public-key and attribute certificate frameworks*

ISO 12813:2015, *Electronic fee collection— Compliance check communication for autonomous systems*

ISO 13141:2015, *Electronic fee collection— Localisation augmentation communication for autonomous systems*

ISO 14906:2011/Amd1:2015, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO 17573:2010, *Electronic fee collection — Systems architecture for vehicle-related tolling*

ISO 17575-3:2016, *Electronic fee collection— Application interface definition for autonomous systems— Part 3: Context data*

NIMA TR8350.2, Third Edition — Amendment 1, January 2000, Department of Defense — World Geodetic System 1984, Its Definition and Relationships With Local Geodetic Systems, issued by National Imagery and Mapping Agency (NIMA), US Department of Defense

IETF RFC 5035:2007-08, Enhanced Security Services (ESS) Update: Adding CertID Algorithm Agility

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

area charging

charging based on road usage within a given area

3.2

attribute

addressable package of data consisting of a single data element or structured sequences of data elements

3.3

authenticator

data, possibly encrypted, that is used for authentication

[SOURCE: EN 15509:2014, 3.3]

STANDARD PREVIEW
(standards.iteh.ai)

3.4

Back End

part of a back office system interfacing to one or more *Front Ends* (3.12)

3.5

charge object

geographic or road related object for the use of which a charge is applied

<https://standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016>

3.6

charge report

information containing road usage and related information originated at the *Front End* (3.12)

3.7

cordon

border line of an area

3.8

cordon charging

charging for the crossing of a *cordon* (3.7)

3.9

data element

coded information, which might itself consist of lower level information structures

3.10

data group

class of closely related *attributes* (3.2)

3.11

toll cluster

group of toll schemes operating under a common agreement providing interoperability for road users having a contract with a toll service provider being part of the cluster

3.12

Front End

part of a tolling system consisting of an OBE and possibly a *proxy* (3.13) where road tolling information and usage data are collected and processed for delivery to the *Back End* (3.4)

[SOURCE: ISO/TS 19299:2015, 3.17]

3.13

proxy

optional part of a *Front End* (3.12) that communicates with external equipment and processes the data received into an agreed format to be delivered to the *Back End* (3.4)

3.14

road section charging

tolling principle where the fee is due if predefined sections of roads are used

3.15

tariff modifier

four classes (vehicle class, time class, user class and location class) on which the tariff depends for a given road usage

3.16

toll

charge, tax or duty levied in connection with using a vehicle in a *toll domain* (3.19)

[SOURCE: ISO/TS 19299:2015, 3.42, modified — “any” has been deleted from before “charge”.]

3.17

toll context

logical view as defined by *attributes* (3.2) and functions of the basic elements of a toll scheme consisting of a single basic tolling principle, a spatial distribution of the *charge objects* (3.5) and a single behaviour of the related *Front End* (3.12)

ITEH STANDARD PREVIEW
(standards.iteh.ai)
ISO 17575-1:2016
//standards.iteh.ai/catalog/standards/sist/d5a4e59a-90a6-4c53-ad25-174ac8ceecb/iso-17575-1-2016

3.18

toll context data

information defined by the responsible toll charger as necessary to establish the *toll* (3.16) due for using a vehicle on a particular *toll context* (3.17) and to conclude the toll transaction

[SOURCE: ISO 12855:2015, 3.15]

3.19

toll domain

area or a part of a road network where a certain *toll regime* (3.20) is applied

[SOURCE: ISO 17573:2010, 3.18, modified — “certain” has been added.]

3.20

toll regime

set of rules, including enforcement rules, governing the collection of *toll* (3.16) in a *toll domain* (3.19)

[SOURCE: ISO 17573:2010, 3.20]

3.21

transaction

whole of the exchange of information between two physically separated communication facilities

3.22

transaction model

functional model describing the structure of electronic payment transactions

[SOURCE: ISO 14906:2011, 3.25, modified — “fee collection” has been deleted.]

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply unless otherwise specified.

ADU	Application data unit (ISO 14906)
ASN.1	Abstract Syntax Notation One (ISO/IEC 8824-1)
CCC	Compliance check communication (ISO 12813)
CN	Cellular network
DSRC	Dedicated short-range communication (ISO 14906)
EFC	Electronic fee collection (ISO 14906)
LAC	Localisation augmentation communication (ISO 13141)
GNSS	Global Navigation Satellite System
GPS	Global positioning system
GSM	Global system for mobile communications
HMI	Human-machine interface
MAC	Message authentication code
OBE	On-board equipment
PICS	Protocol implementation conformance statements
RSE	Roadside equipment (ISO 14906)
VAT	Value added tax

5 Architectural considerations

5.1 Business architecture

This clause deals with the complete ISO 17575-series, i.e. ISO 17575-1 to ISO 17575-3.

The definitions of ISO 17575 are relevant not only for interoperable EFC (as described below) but for all possible autonomous EFC schemes.

ISO 17575 complies with the business architecture defined in ISO 17573:2010. According to this architecture, the toll charger is the provider of the road infrastructure and, hence, the recipient of the road usage charges. The toll charger is the actor associated with the toll charging role (see [Figure 2](#)).

As defined in ISO 17573:2010, the role of the toll charger includes the provision of the toll context data. The ISO 17575 concept defines a one-to-one relationship between toll charger ID and toll context. Therefore, it is justified to use the data type provider, as defined in ISO 14906:2011/Amd1:2015, Annex A, to identify a toll context. If a toll charger operates more than one toll scheme, separate identifiers shall be applied for in the central registry as defined in ISO 14906:2011/Amd1:2015.